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WORKING PAPER

Competition versus Efficiency: What drives franchise values in European banking?

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Competition versus Efficiency:

What drives franchise values in European banking?*

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Abstract

This paper investigates how stock market investors perceive the impact of market structure and efficiency on the long-run performance potential of European banks. To that end, a modified Tobin's Q ratio is introduced as a measure of bank franchise value. This measure is applied to discriminate between the Market Structure and Efficient-Structure hypotheses in a coherent forward-looking framework, in which differences in banks' horizontal and vertical differentiation strategies are controlled for. The results show that banks with better management or production technologies possess a long-run competitive advantage. In addition, bank market concentration does not affect all banks equally. Only the banks with a large market share in a concentrated market are able to generate non-competitive rents. The paper further documents that the forward-looking, long-run perspective and the noise adjustment of the performance measure overcome most of the drawbacks associated with testing these hypotheses in a multi-country set-up. Finally, notwithstanding the international expansion of bank activities, the harmonization of regulation and the macroeconomic convergence in the European Union (EU15), we still find that country-specific macroeconomic variables have a significant impact on bank performance. The findings indicate that there is a trade-off between competition and stability that should be taken into account when assessing mergers or acquisitions.

Keywords: charter value, market power, efficiency, Tobin's Q, stochastic frontier

JEL: G21, G28, G32, L11.

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1 Introduction

The European banking sector has been characterized by a number of profound changes over the last two decades. On the one hand, advances in technology, financial liberalization, the ongoing economic and regulatory integration and the introduction of the Euro should increase the degree of competition and efficiency in the European banking sector. On the other hand, the wave of bank mergers and acquisitions, which has reduced the number of competitors significantly, may produce the opposite effect. Furthermore, the impact of regulatory initiatives aimed at increasing diversification of financial activities is theoretically unclear. Consequently, the combined net result of these changes on banks' long-run performance is uncertain.

Many banking studies, using different methodologies, have tried to quantify the overall impact of changes in market structure and bank efficiency on bank performance (see e.g., Berger, 1995; Corvoisier and Gropp, 2002; Vander Vennet, 2002). This paper uses a stock market based valuation metric to investigate the effect of competition and efficiency on banks' franchise values. In addition, we also control for the degree of horizontal (product mix) and vertical (quality) differentiation. We test these relationships simultaneously in a coherent forward-looking empirical framework on a database of listed European banks. Hence, we are able to assess the factors that influence banks' stock market performance in European countries.

Our contribution to the literature is threefold. First, most banking studies ignore that it may take time for the effects of competition and efficiency to materialize. Our approach differs from the bank competition literature by investigating the competition-performance relationship using a longer-term concept of firm rents, namely the franchise value of a bank. The franchise value is the present value of the current and future profits that a bank is expected to earn as a going concern. When contrasting the estimation results obtained when using a short-run accounting measure instead of a long-run market-based performance measure, we observe multiple differences in the factors that drive bank performance. By comparing our results to those reported in Vander Vennet (2002), we conclude that the difference between our baseline results and papers using accounting profits can be attributed to the forward-looking performance measure rather than a bias created by the sample composition[1].

Second, our long-run performance measure is based on two concepts, i.e. Tobin's Q ratio and market value inefficiency (Hughes et al., 1999). The former is proxied by the ratio of a bank's market value to its book value, which has traditionally been used as a measure of bank franchise value. The latter is obtained using a stochastic frontier methodology which allows decomposing the difference between actual performance and potential performance in an inefficiency and noise component. We document that correcting for noise is both

[1] Vander Vennet (2002) examines the impact of market structure and efficiency variables on European banks' performance. However, he uses accounting profits, covers the period 1995-1996 and includes both listed and unlisted banks. Using our sample period and composition, we obtain similar results when using accounting profits (return on equity). Hence, limiting the analysis to the set of listed banks seems not to affect the conclusions when using similar profitability measures.

statistically and economically relevant (especially in multi-country studies).

Third, we control for time-varying country-specific differences in banks' long-term valuation. Next to analyzing the impact of concentration, we verify the impact of macroeconomic conditions and differences in regulation on bank performance. Whereas bank-specific variables can explain 11.7% of the variation in bank performance, the country-specific drivers explain more than 30% of the variation. In particular, most of the explained variation in the banks' valuation is due to the Hirschmann-Herfindahl index of concentration and the macroeconomic variables, rather than the regulatory variables. On the one hand, this is indicative for the fact that banks operating in the European Union share to a large extent a common regulation. On the other hand, the importance of the local economic environment in determining banks' valuations indicates that the European banking industry is not yet fully integrated.

From a policy perspective it is important to have a solid understanding of the effects of competition and efficiency on bank behavior. Knowledge of the essential drivers of bank profits is important for antitrust authorities, who are looking for algorithms to assess the trade-off between the value-enhancing effects of mergers and acquisitions and their potentially negative impact on competition. The relative-market-power hypothesis and the structure-conduct-performance paradigm claim that mergers could be motivated by the ability to affect prices unfavorably for customers (thereby eroding consumer surplus) and to increase margins. The efficient-structure hypotheses, in contrast, state that mergers and acquisitions improve overall welfare. Hence, they call for different actions by the competition authorities, both at the national level and at the level of the European Commission, which is responsible for merger and competition cases with an EU dimension. Moreover, regulators are interested in the sources of financial instability and mechanisms to avoid it. An analysis of the determinants of franchise values can yield further insight in the sources of financial instability[2] and helps supervisors and regulators in judging which actions are optimal.

In the next section, we elaborate on the hypotheses of interest (Section 2.1). We also discuss why and how they should be tested in a forward-looking framework. We describe the construction of the dataset in Section 2.2. In Subsection 2.3, we introduce our method to measure a bank's franchise value. We show how inefficiency and noise in market valuation can be disentangled and find that both concepts are significantly present. Section 3.1 presents the methodologies to estimate the relationships between franchise value, competition and efficiency. Our analysis of the impact of market share, concentration and efficiency on long-run performance yields new empirical results and has implications for the relative importance of the underlying drivers of competition in (European) banking (Section 3.2). In Section 3.3 we investigate the relationships

[2]Since the seminal paper by Keeley (1990), many economists have examined, both theoretically and empirically, the relationship between the franchise value of a bank, risk taking by banks and financial stability. However, little empirical evidence exists on the determinants of the franchise value itself. In this paper we shed some light on the bank-, market- or country-related factors that influence the market value of a bank.

between macroeconomic variables, differences in regulation and supervision and banks' franchise values. We devote Section 4 to document the importance of controlling for noise in market valuation and using a long-run performance measure rather than accounting profits. Finally, Section 5 summarizes the main conclusions and draws some policy implications.

2 Market Structure and Performance

2.1 Drivers of long-run bank performance

Four hypotheses are typically postulated as potential drivers of a positive relationship between market structure and bank performance (Stigler, 1964; Demsetz, 1973; Berger, 1995). First, the traditional structure-conduct-performance paradigm states that the positive relationship between profit and market structure reflects non-competitive pricing behavior in more concentrated markets. Second, the relative-market-power hypothesis claims that only banks with large market shares, irrespective of market concentration, are able to exercise market power and earn abnormal profits. The third and fourth hypotheses share the idea that efficiency may account for the relationship between concentration, market share and profitability. That is, any observed relationship between market structure and performance is a spurious correlation driven by bank efficiency. The X-efficiency version asserts that banks with superior management or production technologies have lower marginal costs. As a result, they simultaneously reap higher profits and gain larger market shares (by passing the cost advantage to their customers via lower lending rates). The scale-efficiency version assumes that some banks operate at a more efficient scale than others. These banks may experience cost and/or revenue advantages, leading to lower unit costs and higher profits. Due to the lack of robust empirical support, there exists, however, no general consensus about the validity and the relative importance of these competing hypotheses, neither for Europe nor the US. Nevertheless, knowledge of the essential drivers of bank profits is important for antitrust policy.

There are several reasons why different studies lead to conflicting evidence. First, many studies fail to consider the four hypotheses simultaneously. Only since Berger (1995) introduced a reduced form, which nests all four hypotheses, the observational equivalence problem encountered in previous studies has been taken into account. Furthermore, accounting profits (such as return on assets or return on equity) have been utilized to measure firm rents. These are, however, noisy measures of firm profitability as a result of differences in tax treatment and (discretion over) accounting practices across countries, or different provisioning and depreciation practices. Noise and biases in the dependent variable may result in low values of goodness-of-fit tests

in basically all empirical setups (Smirlock et al., 1984; Stevens, 1990). In addition, accounting profits reflect short-run performance, rather than capturing long-run equilibrium behavior. Finally, accounting profits are backward-looking by nature. They only reflect the relative success of past investments and other operational decisions. On the other hand, changes in market structure and efficiency (e.g. caused by consolidation) will create new equilibria, which will not be incorporated in bank profits immediately. The effects will need some time to accrue before becoming observable in bank financial statements.

For the above-mentioned reasons and because the relative-market-power, the structure-conduct-performance and the efficient-structure hypotheses are stated in a forward-looking context, we prefer to analyze them using a long-term market-based performance measure. Assuming semi-strong efficiency of financial markets, an adequate forward-looking measure of bank profitability should be based on the market value of a bank (Smirlock et al., 1984). Moreover, stock prices should also incorporate the market assessment of a bank's risk profile (Smirlock et al., 1984). Hence, Tobin's Q ratio, the ratio of the market value of assets to the book value, is a more adequate measure to test the impact of competition and efficiency on long-run performance[3]. In the next subsection, we provide information on the dataset. Subsequently, we show how we modify Tobin's Q ratio to obtain a more precise measure of banks' franchise value.

2.2 The dataset

Since the purpose of the paper is to investigate how competition and efficiency affect banks' franchise values, we employ both accounting data and stock price information. As a consequence, the dataset is limited to listed banks. In terms of bank types, we only consider listed commercial banks and bank holding companies (BHCs henceforth), excluding saving and cooperative banks from the sample. This set of banks is fairly homogeneous and compares to the bank types that are generally studied in research on the US banking industry. The study employs data for 183 banks from 15 European countries (EU15)[4] between 1997 and 2004. The panel dataset is unbalanced due to delistings (e.g., caused by mergers and acquisitions). We account for a potential survivorship bias by also including stocks of banks that have been delisted. On the one hand, focusing on listed banks reduces the sample size. On the other hand, the listed banks are usually relatively large. Together, listed banks account for more than 75% of the total assets of the European banking industry. Nevertheless, in the

[3] Thomadakis (1977), Smirlock et al. (1984), Hirschey (1985) already used Tobin's Q ratio to test the structure-conduct-performance hypothesis for non-financial firms. In empirical banking studies, Tobin's Q ratio has been used to capture bank franchise value and its relationship with banks' risk appetite and financial stability (Keeley, 1990; Allen and Rai, 1996; Salas and Saurina, 2003; Gonzalez, 2005).

[4] The dataset comprises the following 15 countries: Austria (3), Belgium (4), Denmark (45), Finland (4), France (16), Germany (14), Greece (10), Ireland (4), Italy (29), Luxemburg (5), Netherlands (2), Portugal (9), Spain (17), Sweden (4), UK (17). The number in parentheses denotes the number of listed commercial banks or bank holding companies in that country for which we have all the data needed to carry out the analysis.

EU15, on average less than one out of six banks is listed. Austria, France, Germany and Luxemburg have the lowest proportion of listed banks (less than 1 out of 9 commercial banks or bank holding companies is listed). In contrast, in Denmark, Finland, and Greece, there are even more listed than unlisted commercial banks and bank holding companies. Consequently, in some countries (Denmark, Finland, Germany, Greece, Netherlands, Spain, Sweden) the coverage is more than 85% of domestic bank assets. Only in two countries, the share of assets held by listed banks is below 65%, namely Austria (57%) and Luxemburg (29%).

Data on banks' balance sheets and income statements are obtained from the Bankscope database maintained by Fitch/IBCA/Bureau Van Dijk. Stock market returns and market capitalization data are obtained from Datastream. Data on macroeconomic variables are retrieved from Eurostat, whereas all variables related to market structure are obtained from various ECB reports on the European Union banking structure. Finally, information on regulation and supervision is taken from databases compiled by the World Bank and the Heritage Foundation.

2.3 Measuring long-run performance

If a bank possessed comparative advantages that have a positive impact on its long-term performance (e.g., a large market share, being cost efficient,...), this should be reflected in its franchise value. The franchise value of a bank equals the present value of the current and future profits that a bank is expected to earn. This can be proxied by Tobin's Q ratio, the ratio of the market value of assets to the book value. Unfortunately, the market value of a bank's assets cannot be measured directly. An approximation is obtained by summing the market value of its equity (the market capitalization) and the book value of liabilities. The market value of liabilities should be close to its book value, since most of a bank's liabilities are short-term debt (deposits)[5]. However, Tobin's Q ratio has two potential shortcomings. First, although economic theory assumes the maximization of shareholder value, bank managers may not maximize the value of the firm when there is separation between ownership and control. That is, they may not achieve the highest potential market value of their assets given their operating and investment decisions, resulting in inefficiency. Second, measurement error and (bad) luck may have an effect on banks' market valuation (Poterba, 1988). The presence and importance of inefficiency and random noise can be modelled and tested using the stochastic frontier methodology. Following Hughes et al. (1999), we estimate the following model:

$$\ln(MVA_{i,t}) = \beta_0 + \beta_1 * \ln(BVA_{i,t}) + \beta_2 * (\ln(BVA_{i,t}))^2 + \varepsilon_{i,t} \tag{1}$$

$$\varepsilon_{i,t} = v_{i,t} - u_i * \exp(-\eta(t-T)) \tag{2}$$

[5] In our sample, the median deposit-to-assets ratio is 75%.

We opt for a translog specification when fitting a stochastic upper envelope to the market values (MVA) of the bank's assets (BVA). In this study, we estimate one frontier for the entire panel of European banks[6] that we observe over time. Hence i represents the cross-sectional dimension and t indexes time (T is the last time period). The composite error term, Eq. (2), consists of statistical noise, $v_{i,t}$~$iid\, N(0, \sigma_v^2)$, and systematic time-varying departures (shortfalls), $u_{i,t} = u_i * \exp(-\eta(t-T))$, from the translog production frontier (Battese and Coelli, 1995). If the parameter η is positive, then $-\eta(t-T)$ is non-negative, which implies that the inefficiencies systematically decline over time. The u_i's are assumed to be independently and identically distributed and are obtained by truncation at zero (to capture non-negativity) of the $N(\mu, \sigma_u^2)$ distribution.

This methodology allows disentangling banks' market value in three components. First, we obtain an estimate of the potential market value, $\widehat{MVA}$, which is the market value that banks would obtain if they were on the frontier[7] (the fitted values of Eq. (1)). The second component is random noise, $v_{i,t}$, in banks' market valuations. The last building block of the observed market value is the time-varying bank-specific shortfall, $u_{i,t}$, from the frontier (market value inefficiencies). Since $u_{i,t}$ is non-negative by construction, $\exp(-u_{i,t})$ is bound in the unit interval. From the estimation of this stochastic frontier model, we compute the noise-adjusted Tobin's Q ratio, $Q_{i,t}^{NA}$. This measure of the franchise value can be written as:

$$Q_{i,t}^{NA} = \exp(-u_{i,t}) \cdot \frac{\widehat{MVA}_{i,t}}{BVA_{i,t}} \tag{3}$$

The first term is a percentage. The smaller the shortfall $u_{i,t}$, the higher the percentage $\exp(-u_{i,t})$. The second term represents the potential market-to-book value of a bank's assets. Hence, the noise-adjusted Tobin's Q is a fraction of the potential Tobin's Q ratio, where the fraction is determined by the market value inefficiency score. We use this measure of long-run profitability as a proxy for the franchise value[8].

Maximum likelihood estimates of the parameters of the model are presented in Table 1. The middle part of the table confirms that the chosen methodology is appropriate. First, we can confidently reject the hypothesis that $u_i = 0$, i.e. the presence of market value inefficiencies cannot be rejected[9]. We can infer from gamma,

[6] If we estimate bank-specific departures from a country-specific stochastic frontier, we would obtain biased results for the country-specific determinants of the measured shortfall. For instance, if we assume that banks operating in more concentrated banking markets are more efficient, there would be no significant relationship between the measured efficiencies and concentration when we calculate a country-specific frontier, since the frontier moves along with the other banks (Berger and Hannan, 1998).

[7] We also include time dummies in Eq. (1), which allows for parallel shifts of the potential market value over time.

[8] In studies of profit and cost efficiency, it is common to use the estimated (in)efficiency component as the dependent variable in the second step. Hughes et al. (2003a), who estimate an analogous frontier for a sample of US Bank Holding Companies, use the market value inefficiency term, $u_{i,t}$, as the dependent variable in their second-stage regressions. For comparison with other studies that use ordinary Tobin's Q measures, we opt to elaborate on the noise-adjusted Q ratio. However, the correlation between Q^{NA} and $u_{i,t}$ is very high (in absolute value). Hence, we can also compare our results qualitatively with the results obtained by Hughes et al. (2003a, 2003b), who try to explain differences in banks' market value shortfall by relating them to bank ownership characteristics.

[9] A likelihood ratio test allows us to conclude that the stochastic frontier specification, which includes an additional one-sided error

$\gamma = \frac{\sigma_u^2}{\sigma_u^2+\sigma_v^2}$, which is significantly different from zero, that there is considerable variation in the inefficiency scores. A gamma not significantly different from zero would imply that all banks are equally efficient in transforming book value into market valuation. Second, further evidence in favor of our model is that gamma is significantly different from one as well. This supports the stochastic nature of the frontier and is indicative for the presence of (bad) luck and other random noise in market values.

< Insert Table 1 around here >

Table 2 presents summary statistics of our franchise value measure (and its constituent parts) for each year of the sample period. Recall from Eq. (3) that our measure of the franchise value is a function of the potential market-to-book ratio and the shortfall from the frontier. The potential Q ratio, which is the ratio of the market-to-book value that a bank would obtain if it were on the frontier, decreases over the sample period from 1.47 to 1.31. This evolution corresponds to the magnitude of the time dummies (see Table 1). Taking 1997 as the benchmark period, we identify relatively stable potential market values until the end of 1999, the dummy variables for the years 1998 and 1999 are not significant. From 2000 onwards, we observe an increasingly poorer market performance until the end of the sample period (the time dummies are significant and become more negative every year). The table also shows that the level of efficiency, $\exp(-u_{i,t})$, gradually increases over time, but at a very low speed. This is due to the η coefficient, which is small but statistically significant and implies that the shortfalls from the frontier become smaller over time. On average, European banks reached 70% of their potential market value in 1997. By 2003, they have become more efficient in transforming book value into market value. Their market value efficiency is on average $78,4\%$ at the end of the sample period. We also report the minimum and maximum efficiency scores. The absolute minimum is 62% (observed in 1997) and the overall maximum is 99.1%, which shows that they indeed reflect shortfalls, since they are bound between 0 and 1.

< Insert Table 2 around here >

The (evolution of the) adjusted Tobin's Q is a combination of both components. Average Q^{NA} reaches a maximum in 1999. From 2000 until 2003, average (adjusted) market-to-book ratios decrease, reaching a value of 1.016 in 2003. The evolution of the long-run performance measure mimics the overall macroeconomic conditions in the European Union during the sample period. In the euro area, GDP growth increased gradually until early 2000, followed by rapidly decreasing growth rates reaching a minimum of 0.5 in 2003 (ECB, Monthly Bulletin). The traditional Tobin's Q ratio shows a similar behavior over time, but reaches much higher maximum values (not reported) and has a larger standard deviation in almost all time periods compared to the Q^{NA} ratio. The higher standard deviation and higher maximum values underline the value added of the

term, offers a significant improvement in the value of the log likelihood over a model with a single-component error term.

correction and are most apparent in good times. The next two rows of the table depict the correlation between Q^{NA} and Q. The correlation between both performance measures fluctuates between 0.56 and 0.88 over the sample period. The Kendall rank correlation coefficient is always lower. In general, the statistical correction for noise in market values is larger when the stock market booms[10]. However, the ranking between Q and Q^{NA} is slightly more dissimilar in normal or adverse economic situations.

There is considerable variation in the Q^{NA} ratio, both across banks and over time. As an example to show the importance of the variation, we provide information on the percentage and value increase in market capitalization that corresponds to an increase in Tobin's Q of 0.01 (under the assumption that book leverage remains constant). Note that Table 2 also provides summary statistics on both market and book values of total assets and total equity. For the average bank, an apparently moderate increase in banks' Tobin's Q (change of 0.01) corresponds, depending on the time period, to a 9.3 to 15.5% increase in market capitalization. In value terms, this corresponds to an increase in the market capitalization of the bank in the range of 432 to 859 million euro. Or to put it differently, how much value does an average bank lose compared to its best performing peer? A market value efficiency of 75% in 2001, for example, means that the average bank's market value of assets (85 billion euro) could be increased with more than 28 billion euro if this bank were as efficient as its best performing peer. Both the cross-sectional and time variation are economically important and warrant further investigation of the potential sources of variation.

3 What determines banks' franchise value?

3.1 Methodology

In order to discriminate between the alternative competition and efficiency hypotheses, we estimate equations of the following form:

$$Q^{NA}_{i,j,t} = f(MS_{i,j,t-1},\ Conc_{j,t-1},\ X-Eff_{i,j,t-1},\ S-Eff_{i,j,t-1},\ Z^1_{i,j,t-1}, Z^2_{j,t}) + \varepsilon_{i,j,t} \qquad (4)$$

The dependent variable is our preferred long-run performance measure, $Q^{NA}_{i,j,t}$, constructed using stochastic frontier analysis, which varies over banks i, countries j and time t. The franchise value of a bank is a function of market power proxies, efficiency variables and a set of control variables. The right-hand side variables are included as one-period lags to reduce endogeneity. Table 3 shows some summary statistics for the variables used.

< Insert Table 3 around here >

[10] This is consistent with Bond et Cummins (2001) and Poterba (1988) who claim that stock market bubbles may create noise in Tobin's Q.

In order to test the relative importance of the competition, market structure and the efficiency hypotheses, we include four variables in the equation[11]. First, $MS_{i,j,t-1}$ is a proxy for the relative market power of a bank in its home market. $MS_{i,j,t-1}$ is the market share that bank i has in its home market j, measured as bank i's share of assets in the sum of total assets of all commercial banks and bank holding companies in that country[12]. Second, the Hirschmann-Herfindahl index, i.e. the sum of squared market shares (according to total assets) of all banks in country j at time $t-1$, is our preferred measure of concentration, $Conc_{j,t-1}$. It provides information on the distribution of banks' market shares in a country. We extend the baseline regression by including an interaction term between market share and concentration. This interaction term enables to test whether banks with a large market share can only reap excess profits from pricing power when banking markets are concentrated.

Third, the two efficiency measures, X-Efficiency and Scale-Efficiency, are derived from an estimated cost function[13]. We use stochastic frontier analysis to estimate the following translog cost function (Berger and Mester, 1997; Altunbas et al., 2001):

$$\begin{aligned}\ln TC = \; & \alpha_0 + \sum_{i=1}^{3}\alpha_i \ln Q_i + \sum_{l=1}^{3}\beta_l \ln P_l + \tau_1 T + \lambda_1 \ln E \\ & + \tfrac{1}{2}\left[\sum_{i=1}^{3}\sum_{j=1}^{3}\delta_{i,j}\ln Q_i \ln Q_j + \sum_{l=1}^{3}\sum_{m=1}^{3}\gamma_{l,m}\ln P_l \ln P_m + \tau_{11}T^2 + \lambda_{11}\ln E \ln E\right] \\ & + \sum_{i=1}^{3}\sum_{m=1}^{3}\rho_{i,m}\ln Q_i \ln P_m + \sum_{i=1}^{3}\psi_i T \ln Q_i + \sum_{i=1}^{3}\zeta_i \ln Q_i \ln E \\ & + \sum_{l=1}^{3}\phi_l T \ln P_l + \sum_{l=1}^{3}\kappa_l \ln P_l \ln E + \varphi T \ln E + v + u\end{aligned} \tag{5}$$

We suppress bank, country and time indices for notational simplicity. The dependent variable, TC, is a measure of total operating costs[14]. The specification of the cost function is based on the intermediation approach.

[11] The variables of interest correspond to the reduced form suggested by Berger (1995) which allows all four hypotheses to be tested simultaneously. To the extent that any of the key variables have positive estimated coefficients, this may be taken as evidence of the marginal contribution of the corresponding hypothesis.

[12] In all regressions, we measure a bank's market share using total assets. Substituting this for a bank's market share in the deposit market does not affect the results. The correlation between both measures of market share is high (exceeding 0.90).

Furthermore, we also measure market share in the peer group of listed banks in a country. This assumption is supported by the finding that listed (large, multimarket) banks have an impact on the degree of competition and performance of local small banks, but the reverse does not hold (Berger et al., 2007). Since listed banks comprise the vast majority in terms of total banking assets in most countries, this market share measure will not be too different from the overall market share the listed bank has. Only for the period 2002-2004, we are able to accurately compute the share of total assets held by all listed banks in each country. However, this share is remarkably stable over time, but exhibits some cross-country variation. Hence the alternative market share proxy implies a rescaling within a country, but may create slight distortions over countries given that the fraction of listed banks varies across countries.

[13] The estimation output of the cost function is available from the authors upon request.

[14] Interest costs are excluded because they may be influenced by bank pricing power in the loan or deposit market (Berger and Hannan, 1989).

We include three output quantities, Q_i: total loans, securities and off-balance sheet items. Input prices, P_l, represent the price of labor, the price of deposits and the price of physical capital. Bank equity capital, E, is included to control for default risk and differences in banks' risk preferences (as in Mester, 1996). A time trend, T, is included to capture the effect of technological change (as in Altunbas et al., 2001). The traditional error term is decomposed into random noise, v, that is assumed to be $iid\ N(0, \sigma_v^2)$ and a positive disturbance, u, which captures the one-sided deviations from the frontier (u~$N(\mu, \sigma_u^2)$ truncated at zero). The usual symmetry and linear homogeneity restrictions are imposed by normalizing the costs and the input prices by the last input price. From the estimation of the translog cost function, we derive two efficiency measures. First, X-efficiency, $X\text{-}Eff_{i,j,t-1}$, equals $exp(\widehat{u_{t-1}^{\min}} - \widehat{u_{i,j,t-1}})$, and captures how cost efficient bank managers operate their bank. That is, the X-efficiency of bank i at time t is an estimate of the ratio of predicted costs for the most efficient bank in the sample to the predicted costs for bank i (at time $t-1$), for any given vectors of output quantities and input prices. The second efficiency measure, $S\text{-}Eff$, measures how close a bank operates to its optimal scale. It tries to capture any scale-related cost or revenue advantages. Specifically, we measure bank-specific economies of scale as follows:

$$S\text{-}EFF = \sum_{i=1}^{3} \frac{\partial \ln TC}{\partial \ln Q_i} + \frac{\partial \ln TC}{\partial \ln E} \tag{6}$$

Scale economies provide an estimate of the increase in costs when all output quantities (and capital) increase proportionately. $S\text{-}Eff$<1 corresponds to economies of scale (a less than proportional increase in costs when output levels are raised). If $S\text{-}Eff$>1, we observe decreasing returns to scale. This measure is decomposed into scale economy efficiency, $S\text{-}EFF^{EoS}$ (increasing returns to scale) and scale diseconomies efficiency, $S\text{-}EFF^{DEoS}$ (decreasing returns to scale). We distinguish between both cases as follows (Berger, 1995):

$$S\text{-}EFF^{EoS} = \begin{cases} S\text{-}Eff & if\ Y < Y^{SE} \\ 1 & else \end{cases} \text{ and } S\text{-}EFF^{DEoS} = \begin{cases} 1 & if\ Y < Y^{SE} \\ S\text{-}Eff & else \end{cases} \tag{7}$$

It is important to separate the two since they may have different implications for the scale version of the Efficient-Structure hypothesis. In particular, banks that exhibit diseconomies of scale may benefit by reducing their scale. In terms of expected signs, for all variables, except $S\text{-}EFF^{DEoS}$, theory predicts a positive relationship between the variable of interest and long-run performance.

In addition, we incorporate a number of control variables, $Z_{i,j,t-1}^{1}$, that are important both to the hypotheses of interest as well as to banks' valuation. First, we include a bank's capital ratio and its ratio of loan loss provisions to net interest revenues. It has been advocated that a bank's risk profile (measured by the capital

ratio) needs to be accounted for when investigating the structure-conduct-performance conjecture (Brewer III and Jackson III, 2006). Moreover, Kim et al. (2005) document that bank capital and the ability to avoid losses are strategic variables that banks use to differentiate their services from their rivals to soften competition. Both variables thus capture the degree of vertical differentiation.

Second, over the sample period, banks have diversified horizontally (or functionally) and expanded into other business lines. Some banks have benefited from the opportunities created by the Second Banking Directive by combining commercial banking, insurance and securities underwriting in one financial institution. Baele et al. (2007) show that this affects a bank's franchise value. We control for a bank's exposure to non-traditional banking activities by including the ratio of non-interest income to total operating income in the regression. The share of demand and savings deposits in total deposits is another proxy for the business focus of a bank (Berlin and Mester, 1999).

Third, we investigate the importance of country-specific variables ($Z^2_{j,t}$) for banks' long-run performance. The HHI is a proxy for the market structure. In addition, we control for the contestability of the market by including the number of banks in each country and the share of a each country's total banking assets that is held by foreign banks. The other country-specific control variables can be broadly categorized in variables measuring the country-specific macroeconomic environment, on the one hand, and differences in regulation and supervision, on the other hand. The measure of concentration, the macro-variables and the proxies for regulation and supervision have no i index. Hence, this implies that we have to cluster the standard errors at the time-varying country level to obtain unbiased estimates of the standard errors (see e.g. Card, 1995).

The estimation results of the baseline equation are reported in the Table 4. We employ 922 observations in the baseline equation, distributed over 178 banks, 7 years and 14 countries[15]. The R-squared of the regression is high, namely 60%, which means that we are able to explain a large fraction of the variation in banks' long-run valuation.

< Insert Table 4 around here >

We first turn to the results related to competition and efficiency. Next, we will focus on the impact of the macroeconomic environment and regulatory variables.

3.2 Results: Competition and Efficiency

First, we focus on the market power hypothesis. Next to a bank's market share, the baseline regression also contains an interaction term between market share and concentration as an additional regressor (Smirlock, 1985). A positive relationship for the latter would indicate that the rents from collusive behavior are disproportionately distributed in favor of the larger banks. A negative sign would provide support for the hypothesis

[15] Luxemburg is not included since we do not have information on some of the independent variables.

that the ability to exert market power depends on the absence of other large rivals. The sign of the interaction term is positive and the coefficient is significantly different from zero. The coefficient of market share is negative. The combination of market share and the interaction term implies that the effect of market share (and hence the strength of the relative-market-power hypothesis) varies with the level of concentration in the national banking sector. Since HHI is bound in a [0,1] interval, the individual coefficient of market share provides a lower bound for the joint effect. For low levels of concentration, the market share-performance relationship is negative. However, the relationship between market share and Q^{NA} is positive in banking markets where the Hirschmann-Herfindahl index is in excess of 0.12. Hence, stock market investors perceive a large market share in a concentrated market as a solid long-term competitive advantage. From Table 2, we know that for the average bank a change in Tobin's Q by 0.01 corresponds on average with a 12% change in banks' market capitalization (holding book leverage constant). How much does market share need to alter to cause such an impact? For instance, in a concentrated market (HHI=0.20) an increase by 0.01 in the adjusted Q ratio requires, ceteris paribus, an absolute increase in market share of 0.17. An equally large, but opposite effect will be realized if market share increases by 0.20 in an unconcentrated banking market (HHI=0.06)[16]. The economic impact of an increase in market share is relatively moderate and is even weaker for moderately concentrated banking markets (HHI between 0.08 and 0.16).

Controlling for market share and efficiency, we obtain no support for the structure-conduct-performance hypothesis. The coefficient of the Hirschmann-Herfindahl index is negative and significant, namely -0.2669 (as can be seen in the lower panel of Table 4). The finding of a significant negative relationship between concentration and long-run performance supports the hypothesis that high concentration does not necessarily imply tacit and/or explicit collusion. At first sight, one could conclude that the market assesses that these benefits are not sustainable in the long run. This result is also consistent with the interpretation that any benefits from the exploitation of market power in pricing behavior (as a result of concentration) are outweighed by the increased costs from managers enjoying a 'quiet life'[17]. However, due to the significant interaction with market share, the effect is not uniformly negative. Small and large banks will be differentially affected by a change in the market structure. Bank market concentration reduces value for banks with a small or medium market share. Only for banks with a market share in excess of 34.8%, the loss in market value created by managers enjoying a 'quiet life' are balanced by the increased benefits from the exploitation of market power in pricing behavior. In economic terms, the decrease in Q^{NA} associated with a one standard deviation increase in the HHI will exceed 0.01 for all banks with a market share below 8.5%. Given the interaction term, the effect will

[16] Of course, such a large change in market share will also affect the HHI and subsequently bank valuation.

[17] Berger and Mester (1997) and Berger and Bonaccorsi di Patti (2006) find that concentration in US banking markets has a positive effect on profit efficiency. Berger and Mester (1997) and Berger and Hannan (1998) detect a significant negative effect of concentration on cost efficiency. We find that the second effect dominates the first in our sample of listed European banks.

be stronger for smaller banks. For instance, given a similar change in HHI the reduction in Q^{NA} will be 0.015 if a bank's market share is only 4.6%.

Now, we focus on the efficiency variables. First, X-efficiency measures in a $[0, 1]$ interval how close a bank's actual costs are relative to the most cost-efficient bank in the sample. Banks with better management or production technologies will have higher values. The variable $X\text{-}Eff$ is statistically significant and exhibits a positive relationship with Q^{NA}, hence cost efficiency drives long-term profits. Firms with superior management have lower costs and subsequently reap higher profits. Second, we obtain partial support for the scale-efficiency hypothesis. Banks that are larger than their optimal scale will be valued higher by the stock market if they reduce their size accordingly. That is, the relationship between $S\text{-}EFF^{DEoS}$ and Q^{NA} is negative and (almost) significant. However, no such effect is apparent for banks that operate below the optimal scale. The coefficient of $S\text{-}EFF^{EoS}$ exhibits the expected sign but is insignificant. This conflicts with the economies of scale version of the Efficient-Structure hypothesis. An alternative interpretation is that the presence of non-exhausted scale economies indirectly indicates a lack of competition. More intense competition would force banks to exploit all possible scale economies. As a consequence, this may strengthen support for the relative market power hypothesis.

However, the economic impact of the efficiency hypotheses is relatively small in our sample. First, a crucial building block of the efficiency hypotheses is that market structure is affected by efficiency. Berger (1995) suggests estimating auxiliary regressions in order to test the condition that efficiency is related to structure as well as to performance. We find that X-efficiency has a significant impact on market share and concentration, but the coefficients are very small quantitatively. Furthermore, the measures of scale economies significantly affect a bank's market share positively, but not market structure. The conclusions of the auxiliary regressions[18] are roughly similar to Berger (1995). Second, Table 3 shows that most banks operate close to the optimal scale. In addition, the variation in $S\text{-}EFF^{EoS}$ and $S\text{-}EFF^{DEoS}$ is low, consequently their economic impact will be small. On the other hand, the cross-sectional variation in X-efficiency is somewhat larger. A one standard deviation increase in X-efficiency affects the franchise value measure positively with 0.004.

Banks may differ in terms of quality of their services (vertical differentiation) or their business focus (horizontal differentiation). When testing the market structure and efficiency hypotheses, this should be controlled for appropriately. Kim et al. (2005) document that bank capital and the ability to avoid losses are strategic variables that banks use to differentiate their services from their rivals to soften competition. Both variables thus capture the degree of vertical differentiation. The extent to which banks diversify horizontally (or functionally) and expand into other business lines is captured by the ratio of non-interest income to total operating income in the regression. In addition, the share of demand and savings deposits in total deposits is another

[18] The estimation results of the auxiliary regressions are available upon request.

proxy for the business focus of a bank. Except for the loan loss provision ratio, the control variables enter the equation significantly. The share of non-interest income in total operating income, a proxy for functional diversification, is the most important one both from an economic and statistical point of view, indicating that the market judges more diversified banks to have a higher return potential. A one standard deviation increase in this ratio leads, ceteris paribus, to a substantial increase in Q^{NA} of 0.016. This result corroborates the findings of Baele et al. (2007). Moreover, not controlling for banks' business focus affect the coefficients of the efficiency variables. When the diversification measure is not included the coefficient on X-efficiency is only slightly significant and half as large. On the other hand, both scale efficiency variables are larger (in absolute value), negative and significant when functional diversification is not incorporated. While the share of demand and savings deposits in total deposits is a significant source of franchise value, its inclusion has a smaller impact on the other estimated coefficients. The estimation results show that banks, which have access to a stable source of funding (see e.g. Vander Vennet, 2002), are valued higher by the stock market. Hence, controlling for horizontal differentiation of bank activities is important when testing the market power and efficiency hypotheses.

A larger capital buffer acts as a credible signal of lower risk and higher quality. The coefficient of the equity-to-asset ratio is positive and significant. Hence, an increase in bank capital is perceived as a signal of private information on better future performance and a lower risk appetite. Higher quality banks have a higher market valuation (partly because they can ask higher loan spreads, see e.g. De Graeve et al., 2007). We also observe that after controlling for capital, the magnitude and the significance level of the market share and the concentration variable drop a little. This supports the finding of Brewer III and Jackson III (2006) that concentration and market share are less significant when measures of risk are added.

3.3 Results: Macroeconomic conditions and the regulatory environment

Thus far, we largely focused on bank-specific sources of franchise value. However, while the R-squared of the regression is high, namely 60%, which means that we are able to explain a large fraction of the variation in banks' long-run valuation, the within variation (at the time-varying country level) is only 20%. This implies that only 12% (20% of 60%) of the total variation in the adjusted Tobin's Q can be attributed to variables related to competition, efficiency or product differentiation. Hence, the largest contribution to the explained variance in bank performance comes from the country-specific variables. Thus, it seems that institutional and regulatory characteristics as well as macroeconomic conditions may affect the behavior of the listed banks operating in the EU15. The lower part of Table 4 reports the estimated coefficients and t-statistics for these country-specific variables.

First, as already mentioned, the coefficient on the lagged Hirschmann-Herfindahl index is negative and

significant. However, due to the significant interaction with market share (see upper part of Table 4), the effect is not uniformly negative. Small and large banks will be differentially affected by a change in the market structure[19].

Second, we include the number of credit institutions in a country as well as the share of assets held by foreign banks. Data on foreign bank presence are taken from the 'Report on EU banking structure' (ECB, multiple years). Both proxies do not affect the magnitude or significance of the coefficient on the concentration index. The coefficient on the number of credit institutions is negative. This corroborates the idea that more credit institutions may lead to a higher degree of competition, which may erode banking profits. However, this variable is not significant due to a high correlation with the HHI index. The share of assets held by foreign banks proxies for the importance of foreign subsidiaries and is a measure of the contestability of national banking markets. The continuous threat of entry is expected to stimulate competitive bank behavior even in the most concentrated markets. As a consequence, we also expect a negative sign for this variable. However, the point estimate is positive and significant. Apparently, the de facto presence of foreign banks is (yet) unable to prevent incumbent banks to gain larger rents. However, this result should be interpreted with caution. There could be a reverse causality problem if foreign banks' decision to operate in country is driven by the profitability of that country's banking sector.

Third, bank performance varies over the business cycle (Vander Vennet et al., 2005). We control for a country's macroeconomic situation by including four variables: GDP growth, inflation, the long-term interest rate and the return on a country's stock market index. Especially the local macroeconomic environment matters for European listed banks. Both the current GDP growth as the expectations on the growth rate of the economy (as captured by returns on a local stock market index) are significantly and positively related to banks' franchise value. For instance, if current GDP growth increases with 2%, banks' profitability will increase, leading to an increase in the adjusted Tobin's Q of 0.015. Hence, even the revenues of the listed banks, which exhibit the highest degree of geographical diversification, remain dependent on the business cycle in their home market. Inflation does not affect banks' franchise values significantly[20], whereas the long-term interest rate is significantly positively related to long-term performance. This finding supports the idea that inflation expectations rather than current inflation are important in determining banks' valuation. A booming economy will lead to

[19] We obtain similar results when using the CR5, the share of total assets held by the five largest banks in a country, rather than the HHI as the concentration measure.

[20] Admittedly, the correlation between inflation and some of the other country-specific variables is high (around 25% in absolute value), which may raise the issue of multicollinarity. If we only include HHI and inflation in the regression, the coefficient of inflation is positive and significant. Adding the other macro-variables reduces the magnitude of the coefficient without inflating the standard error. This observation is even more pronounced when including the regulatory variables as well. This change in the coefficient is indicative for the fact that inflation may be picking up the impact of other variables if they are (uncorrectly) omitted from the regression (and are thus not appropriately controlled for). The opposite finding (a constant coefficient, but inflated standard errors) would have been an indication of multicollinearity.

higher inflation expectations and, consequently, to higher long-term interest rates.

Fourth, next to concentration measures and macroeconomic variables, we also incorporate variables capturing differences in regulation, supervision and the overall institutional environment. We include the following variables: KKZ, Property Rights, Business Freedom and Banking Freedom (see e.g. Demirgüç-Kunt et al., 2004 or Gonzalez, 2005). The KKZ-index is an aggregate index of the level of institutional development in a country and is based on a survey conducted by Kaufmann et al. (2001). Higher values indicate a better developed institutional framework. Property Rights, Business Freedom and Banking freedom are part of an overall index of Economic Freedom constructed by the Heritage Foundation. The higher the score on a factor, the lower the level of government interference in the economy and the more economic freedom a country enjoys. The factor Property Rights scores the degree to which a country's laws protect private property rights and the degree to which its government enforces those laws. In addition, it analyzes the independence of the judiciary and the ability of individuals and businesses to enforce contracts. Business freedom proxies the ability to create, operate and close an enterprise quickly. Banking freedom measures the relative openness of a country's banking and financial system. More specifically it summarizes information on whether foreign banks and financial services firms are able to operate freely, how difficult it is to open domestic banks and other financial services firms, how heavily regulated the financial system is, how important the presence of state-owned banks is, whether the government influences the allocation of credit, and whether banks are free to provide customers with insurance and invest in securities.

Only the business freedom variable is significant. It has a negative sign. While a larger score on this index reflects more flexibility in creating, operating and closing business; it seems to impact banks' franchise values negatively. This may be due to the higher degree of opacity of new or fast developing firms, which will be more important if doing business is less constrained by regulation. Furthermore, if the importance of young start-ups in an economy grows, banking profits will be reduced since younger firms face, in general, lower loan markups (Kim et al., 2007). In general, the regulatory variables add little to the explanatory power of the regression. Most of the explained variation of Q^{NA} is due to the HHI index and the macroeconomic variables. On the one hand, this is indicative for the fact that banks operating in the European Union share to a large extent a common regulation. On the other hand, the importance of the local economic environment in determining banks' valuation indicates that the European banking industry is not yet fully integrated.

4 What can we learn from the adjusted Tobin's Q, Q^{NA}?

Traditionally, accounting profits are used to discriminate between the drivers of bank performance. However, accounting profits only capture short-run, past behavior. In this paper, we use a forward-looking long-run

performance measure based on Tobin's Q. We further modify the traditional Tobin's Q by purifying the measure for noise inherent in stock prices. In this section, we document how the results would differ when using the traditional Tobin's Q and ROE as the performance measures. Table 5 consists of two parts. Each panel consists of two columns containing, respectively, estimated coefficients and t-statistics. In the left part of the table, we report the results when Tobin's Q is used as the dependent variable. The right-hand side part exhibits the results when return on equity is used as performance measure.

< Insert Table 5 around here >

We first turn to the results obtained when using the traditional Tobin's Q. First of all, we have already shown that adjusting for noise is statistically important. From Table 1, we learn that both the two-sided error term and the one-sided efficiency score are statistically significant in the estimation of the stochastic frontier[21]. In general, standard errors are larger and the R-squared is much lower if we do not correct for noise in market valuation. In the upper part of the table, we observe that the (limited) support for diseconomies of scale vanishes as a result of a larger standard error. Furthermore, whereas most coefficients remain stable, the impact of bank capital is almost twice as large compared to the Q^{NA} results. The differences are even more substantial for the country-specific variables. In addition the return on a country stock index is no longer significant due to higher standard error and a reduction in the magnitude of the coefficient. On the other hand, the KKZ index and the variable that proxies for the strength of the property rights become significant. The result on the KKZ-index could indicate that there is a downward bias in Tobin's Q in countries with a higher KKZ-index (a better developed institutional framework)[22], which results in a negative and significant relationship between Tobin's Q and the KKZ-index and an insignificant relationship with the Q^{NA} ratio. From this we conclude that the results obtained using Q^{NA} are more reliable because the noise-adjustment purifies the long-run performance indicator. The noise in banks' valuation is mostly randomly related to bank-specific variables (except the capital ratio) but shows more deterministic patterns with country-level variables.

To facilitate comparison between a market-based and an accounting-based approach, we also use accounting profits as the dependent variable, while still using our sample of listed banks. This should allow us to establish the benefits of testing the hypotheses in a forward-looking framework. The results are also presented in Table 5. Using accounting ROE as the dependent variable, we discover fewer significant relationships. Regarding the bank-specific variables, we obtain a positive coefficient on the X-efficiency variable. Furthermore,

[21] The tests point to the presence of noise even when we already apply a standard way of smoothing the market value of bank assets by taking yearly averages of daily market capitalization (to remove volatility). If we just take end-of-year market values, we obtain even stronger evidence in favor of the presence of noise.

[22] A country's institutional framework (lower KKZ-index) could for instance be correlated with the liqiduity of a country's stock exchange. A less liquid stock exchange may lead to more noisy share prices. While outside the scope this study, it would be interesting to see whether these effects hold for non-financial firms as well.

functionally diversified banks are also more profitable. Holding bank capital is costly in terms of accounting profitability. When the adjusted Tobin's Q is used as the dependent variable (as in Table 4), bank capital is interpreted as an indication of higher quality leading to higher Q^{NA}. Vander Vennet (2002) also tests the impact of market structure[23] and efficiency variables on accounting profits of European banks. While his dataset covers the period 1995-1996 and includes both listed and unlisted banks, the results are nevertheless fairly similar. Using ROE as the dependent variable, he obtains insignificant coefficients on measures of market share, concentration and scale efficiency. The cost-to-income ratio, a proxy for cost-efficiency, and a dummy for being a financial conglomerate (being functionally diversified) are both significant. The similarity of our findings, when using return on equity as the dependent variable, and Vander Vennet (2002) learns us that limiting the analysis to the set of listed banks does not bias the results or affect the conclusions. Hence, the difference in results between our baseline results and other papers can be attributed to the performance measure rather than the sample composition.

Furthermore, only a few country-specific variables affect bank performance immediately. Bank profits benefit instantaneously from a booming economy. Additionally, more competition, as measured by the number of competitors, lowers profitability. None of the other country-specific variables enters the return on equity equation significantly. Using our noise-adjusted forward-looking measure (Table 4), we additionally discover that the interplay between market share and concentration also affects long-term valuation, rather than leading to immediate effects on performance. In addition, we also obtain support for diseconomies of scale in banks' stock market valuation. Hence, testing this hypotheses in a forward-looking framework adds new insights. Apparently, the impact of differences/changes in market structure materialize over a longer time-span and are therefore not necessarily reflected in short-run profitability. Also, we establish much more significant relationships between macroeconomic variables and banks' valuation. The above-mentioned differences demonstrate that both the forward-looking nature and the noise-adjustment are important features that should be taken into account when measuring bank performance and investigating its drivers.

5 Conclusions

In this study we investigate the determinants of EU banks' franchise values as measures of their long-run performance potential. More specifically, we attempt to discriminate between theories establishing a link between market structure (or competition) and bank performance and alternative explanations based on efficiency considerations. We include variables for these competing theories simultaneously, while controlling for several

[23] Our specification improves on Vander Vennet (2002) in a number of aspects. First, we include an interaction term between market share and concentration. Second, we derive efficiency scores using stochastic frontier analysis (rather than using a simple cost-to-income ratio). Third, we also analyze the impact of macroeconomic and regulatory variables on bank performance while controlling for the degree of horinzontal and vertical differentiation.

bank-specific characteristics and the macroeconomic environment. We disentangle the relative contribution of banks' strategic choices versus the economic and regulatory conditions in which the banks operate to the observed variation, both cross-section and over time, of their stock market valuation.

This empirical setup is motivated by two concerns, which have to be accounted for adequately when trying to explain bank performance. First, we intend to capture the combined effect of very fundamental changes in the banking industry. The forces reshaping the banking industry, not only in Europe, include consolidation, advances in information and communication technology, regulatory initiatives (e.g. new capital adequacy regulation) and, in the case of the E(M)U, ongoing economic and monetary integration. These structural changes may have an immediate impact on bank profits, but more fundamentally they also provoke strategic adaptations by banks, the effects of which require sufficient time to materialize. Thus, accounting-based profit measures, by construction, are ill-suited to capture performance potential. Therefore we prefer using a stock-market-based measure, i.e. Tobin's Q, because the stock market valuation should reflect the discounted value of current as well as future potential earnings. It is our intention to attempt to use this fundamental value to capture the long-run valuation of banks' strategic choices and the variation across banks. Second, we also correct the calculated Tobin's Q ratios with a stochastic frontier methodology. Since the resulting noise-adjusted Tobin's Q, Q^{NA}, is much less volatile than the uncorrected one and varies within an economically well interpretable range, we are confident that our Q^{NA} measure effectively captures the banks' long run potential as judged by the stock market.

The reliance on a market-based performance measure restricts the analysis to listed banks. However, the sample of listed banks we use represents more than 75% of bank assets in the EU15, hence we should capture the fundamental drivers of market value in European banking. Moreover, in the analysis we show that different findings for accounting and market-based performance are not due to differences in terms of sample composition but rather have to be attributed to the type of profit metric used.

The empirical analysis reveals new insights in the determinants of bank franchise value. A noteworthy general finding is that time-varying country-specific variables appear to explain a larger fraction of the variation in bank franchise values than the bank-specific factors. This implies that the effect of banks' strategic choices on their long-run performance potential remains to a substantial extent conditional on macroeconomic conditions and the institutional framework in which they operate. In terms of market structure, and contrary to studies based on accounting measures of bank profits, we do not find unambiguous support for the structure-conduct-performance paradigm. A concentrated banking market does not impact all banks equally. Rather, it is the interaction between concentration and market share that is found to be a significant driver of bank franchise value. Hence, based on the stock market assessment, large banks in concentrated markets are judged to possess a superior long-run profit potential. On the other hand, concentration may even harm the banks with

the smallest market shares.

Furthermore, variables capturing the business cycle contribute to explaining the variation in bank franchise values. We interpret this as evidence that banking markets in the EU are still not considered to be fully integrated. Apparently, this is even not the case for the set of listed banks. Since most studies argue that financial integration is proceeding at different speeds across various banking market segments, with the retail market usually found to be lagging, we expect that country-specific factors will remain important for the revenue-generating capacity of European banks in the foreseeable future. The importance of the macroeconomic variables in the explanation of bank franchise values also stresses the importance of business cycle conditions on the financial condition of banks. Benign macro conditions should enhance the expected profitability of banks, allow them to strengthen their capital base, and pursue various strategic options, which may in turn enhance their profit capacity in the future and render them less vulnerable to unexpected shocks. The combination of these positive profit and risk effects increases the charter value of the banks.

In terms of bank-specific drivers of franchise value, we conclude that operational efficiency is positively associated with future profitability, as expected. Cost efficient banks are found to be able to reap higher profits, now and in the future. The consequence is that banks with superior management or production technologies are valued higher by stock market investors. Although this effect is economically not very large, banks have an incentive to improve their level of productivity and efficiency. We also find that the degree of horizontal differentiation (through non-interest income) and vertical differentiation (bank capital as a proxy of quality) affect banks' long-run valuation positively. This implies that the strategic choices by banks to operate and develop non-intermediation skills are valued by the stock market. Since it is generally assumed that contestability and market integration will increase the degree of competition in traditional banking activities, the alternative revenue sources are interpreted by the stock market as necessary revenue components in a modern financial services firm. Since horizontal differentiation is found to increase the charter value of banks, it may also induce them to hold sufficient levels of capital in order to protect valuable franchises, thereby increasing the stability of the banking system.

These results have implications for regulators and supervisors. First, the results are of interest to competition authorities, which are looking for algorithms to assess the trade-off between the value-enhancing effects of mergers and acquisitions and their potentially negative impact on the degree of competition. The use of market-based long-run performance indicators, such as our adjusted Tobin's Q, may prove to be a useful tool. However, the degree of competition may also affect overall financial stability. Previous research has analyzed the link between charter value, bank risk-taking and financial stability. Since, in this paper, we focus on the building blocks of the franchise value, we are able to provide more insight into the potential drivers of bank system stability and the mechanisms available to supervisors and regulators to maintain stability. It is clear

that competition and stability issues are interrelated and should be considered accordingly. Furthermore, since we also find that country-specific factors still play an important role in the long-run valuation of banks it is important to consider their exposures in different market segments and their vulnerability to local and European shocks. Finally, insight in the causes of the evolution of the adjusted Tobin's Q may also be interesting for the third pillar of the Basel II framework. The third pillar advocates the adoption of market discipline mechanisms for prudential supervision. This approach is based on the assumption that well informed market participants will reward a risk-conscious management strategy by credit institutions in their asset allocation decisions.

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Table 1: Measurement of Q^{NA} : Estimation of the Stochastic Frontier

Dependent variable: ln(Market value of assets)	coefficient	standard error	z-statistic
Independent variable:			
Constant: β_0	0.4674	0.0551	8.49
ln(Book value of assets): β_1	0.9825	0.0111	88.57
(ln(Book value of assets))$^{2:}$ β_2	0.0007	0.0006	1.19
Dummy 1998	0.0080	0.0060	1.32
Dummy 1999	-0.0106	0.0076	-1.39
Dummy 2000	-0.0331	0.0094	-3.51
Dummy 2001	-0.0570	0.0113	-5.05
Dummy 2002	-0.0835	0.0129	-6.47
Dummy 2003	-0.1003	0.0144	-6.94
Dummy 2004	-0.0960	0.0160	-6.01
Total variance: $\sigma^2(=\sigma_v^2+\sigma_u^2)$	0.0053	0.0004	
Share of variance due to inefficiency: γ $(=\sigma_u^2/\sigma^2)$	0.6123	0.0330	
Mean shortfall: μ	0.2498	0.0187	13.36
Rate of change in shortfall: η	0.0588	0.0070	8.36
Value of the Loglikelihood function	1775.54		
Number of cross-sections	200		
Number of time periods	8		
Total number of observations	1218		

This table presents maximum likelihood estimates of the following equation: $\ln(MVA_{i,t}) = \beta_0 + \beta_1 \cdot \ln(BVA_{i,t}) + \beta_2 \cdot \ln(BVA_{i,t})^2 + \varepsilon_{i,t}$. Hence, we specify a translog function when fitting a stochastic upper envelope to the natural logarithm of market values (MVA) of the natural logarithm of bank's assets (BVA). We also include time dummies in the equation, with 1997 as the reference period. In the upper part of Table 1, Column 1 reports the estimated parameters. Columns 2 and 3 show the corresponding standard errors and z-statistics. The composite error term, $\varepsilon_{i,t} = v_{i,t} - u_i \cdot \exp(-\eta(t-T))$, consists of statistical noise, $v_{i,t} \sim \text{iid}\, N(0, \sigma_v^2)$, and systematic time-varying departures (shortfalls), $u_i \sim N^+(\mu, \sigma_u^2)$.

This methodology allows disentangling banks' market value in three components. First, we obtain an estimate of the potential market value, which is the market value that banks would obtain if they were on the frontier. The second component is random noise, $v_{i,t}$, in banks' market valuations. The last building block of the observed market value is the time-varying bank-specific shortfall, $u_{i,t}$, from the frontier (market value inefficiencies). The middle part of the table provides statistics that allow testing the appropriateness of the chosen methodology. We can infer from gamma, which is significantly different from zero, that there is considerable variation in the inefficiency scores. A gamma not significantly different from zero would imply that all banks are equally efficient in transforming book value into market valuation. Second, further evidence in favor of our model is that gamma is significantly different from one as well. This supports the stochastic nature of the frontier and is indicative for the presence of (bad) luck and other random noise in market values. The η coefficient, which is small but statistically significant, implies that the shortfalls from the frontier become smaller over time.

The lower part provides information on the total number of observations (1218), as well as number of time periods (8) and cross-sections (200).

Table 2: Measurement of Q^{NA} : Summary Statistics

		1997	1998	1999	2000	2001	2002	2003	2004
Potential Tobin's Q ratio	mean	1.457	1.468	1.440	1.407	1.373	1.336	1.313	1.319
	standard deviation	0.022	0.022	0.021	0.020	0.019	0.018	0.017	0.018
Market Value Efficiency	mean	0.698	0.713	0.728	0.740	0.750	0.764	0.774	0.784
	standard deviation	0.045	0.044	0.045	0.043	0.038	0.040	0.039	0.038
	minimum	0.620	0.638	0.651	0.667	0.683	0.698	0.680	0.696
	maximum	0.867	0.874	0.916	0.920	0.893	0.990	0.990	0.991
Tobin's Q^{NA} ratio	mean	1.016	1.045	1.047	1.040	1.029	1.020	1.016	1.034
	standard deviation	0.060	0.059	0.060	0.056	0.047	0.050	0.048	0.047
Tobin's Q ratio	mean	1.016	1.049	1.047	1.039	1.027	1.022	1.018	1.036
	standard deviation	0.061	0.097	0.094	0.093	0.054	0.069	0.049	0.047
Pearson Correlation between Tobin's Q^{NA} and Tobin's Q		0.83	0.87	0.86	0.84	0.83	0.88	0.81	0.56
Kendall Tau - rankcorrelation between Tobin's Q^{NA} and Tobin's Q		0.60	0.76	0.79	0.78	0.79	0.75	0.61	0.36
Number of banks		140	143	147	155	143	146	143	127
Market Value of Assets	mean	44689	47237	51592	79303	85754	84056	88476	88406
(million euro)	standard deviation	93992	96966	110957	166897	174497	163123	181546	185037
Book Value of Assets	mean	43232	45204	48554	75640	82741	82517	86136	85907
(million euro)	standard deviation	91558	94230	104148	160194	168646	160058	176540	179583
Market Value of Equity	mean	3318	4017	5238	7296	6925	5323	6444	6722
(million euro)	standard deviation	7786	8327	13327	17011	16396	12434	15738	16740
Book Value of Equity	mean	1860	1984	2202	3632	3914	3784	4102	4221
(million euro)	standard deviation	3845	3925	4657	7988	8411	7937	8904	9710
Book Value of Liabilities	mean	41371	43220	46352	72008	78828	78733	82035	81686
(million euro)	standard deviation	87955	90536	99778	152789	160919	152732	168269	170601
percentage increase in market value of equity as a result of an increase in Q of 0.01 (holding book leverage constant)		13.0	11.3	9.3	10.4	11.9	15.5	13.4	12.8
value increase in the market value of equity (in million euro) as a result of an increase in Q of 0.01 (holding book leverage constant)		432	452	486	756	827	825	861	859

This table presents summary statistics on the (noise-adjusted) franchise value (and its components) of European banks. We consider listed commercial banks and bank holding companies active in the European Union (15 member states) in the period 1997-2004. More specifically, in the upper panel we report information on the potential Tobin's Q, the percentage shortfall from the potential Tobin's Q ratio and the adjusted and standard Tobin's Q ratio. For each variable of interest, we present the mean and the standard deviation in each year. The upper panel also shows information on two correlation coefficients between the adjusted and regular Tobin's Q. The last row contains the number of banks for each year. The middle panel of the table contains information on the variables that serve as an input for the construction (estimation) of the (adjusted) Tobin's Q. Again, for each variable of interest, we present the mean and the standard deviation in each year. The lower part of the table provides intuition on the impact of a small change in Tobin's Q on the market capitalization of the banks in the sample. More specifically, the last two rows document, respectively, the percentage increase and change in the market value of equity when Tobin's Q increases with 0.01.

Table 3: Summary statistics

	Left panel: Averages by year				Right panel: Cross-sectional dispersion				
	1998	2000	2002	2004	mean	standard deviation	1st percentile	median	99th percentile
Dependent variable									
Q^{NA}	1.045	1.04	1.02	1.034	1.034	0.053	0.949	1.021	1.237
Q	1.046	1.042	1.018	1.036	1.034	0.072	0.932	1.020	1.326
Return on equity	11.863	14.152	9.641	11.675	12.068	7.583	-11.540	11.945	34.750
Baseline equation: Independent variables of interest									
Market Share in total assets (Source: Bankscope)	0.06	0.058	0.055	0.055	0.057	0.113	0.000	0.007	0.481
HHI index of concentration (Source: ECB)	0.078	0.065	0.071	0.073	0.073	0.050	0.013	0.057	0.206
Cumulative market share of 5 largest banks (Source: ECB)	0.495	0.523	0.54	0.547	0.480	0.190	0.190	0.450	0.860
X-Efficiency (Source: Bankscope)	0.828	0.839	0.817	0.829	0.830	0.092	0.540	0.853	0.958
Economies of Scale (Source: Bankscope)	0.991	0.992	0.991	0.988	0.991	0.015	0.953	1.000	1.000
Diseconomies of Scale (Source: Bankscope)	1.016	1.02	1.02	1.021	1.018	0.023	1.000	1.011	1.101
Baseline equation: Independent control variables									
Equity to Total Assets (Source: Bankscope)	0.082	0.086	0.076	0.081	0.082	0.043	0.026	0.068	0.182
Bankscope)	0.363	0.406	0.354	0.396	0.364	0.159	0.094	0.343	0.878
Loan loss provisions to net interest revenues (Source: Bankscope)	0.145	0.154	0.201	0.161	0.163	0.165	-0.051	0.142	0.679
Share of demand and saving deposits in total deposits (Source: Bankscope)	0.572	0.563	0.603	0.619	0.581	0.219	0.011	0.581	1.000
Regulation and Macroeconomic Conditions									
GDP growth (Source: Eurostat)	0.037	0.044	0.017	0.028	0.024	0.016	-0.002	0.022	0.085
Inflation (Source: Eurostat)	0.016	0.025	0.026	0.018	0.021	0.009	0.006	0.021	0.048
Long-term Interest rate (Source: Eurostat)	0.051	0.055	0.05	0.042	0.049	0.006	0.040	0.049	0.063
Return on a local stock market index (Source: Datastream)	0.285	-0.038	-0.245	0.191	0.079	0.221	-0.404	0.156	0.656
KKZ-index of institutional development (Source: World Bank)	1.417	1.453	1.472	1.427	1.423	0.356	0.735	1.564	1.883
Property Rights (Source: Heritage Foundation)	81.43	81.43	81.43	81.43	81.106	10.742	50	90	90
Banking Freedom (Source: Heritage Foundation)	64.29	64.29	71.43	71.43	70.043	15.057	30	70	90
Business freedom (Source: Heritage Foundation)	54.29	54.29	55.71	57.14	60.651	13.173	50	50	90
Importance of foreign banks (Source: ECB)	0.165	0.169	0.19	0.226	0.170	0.150	0.027	0.110	0.572
Number of Credit Institutions (Source ECB)	6.518	5.879	5.405	5.111	5.705	6.262	0.570	3.590	29.920

This table shows summary statistics on the variables employed in this paper. The underlying data are annual observations for listed banks in the EU15 for the years 1997-2004. The table consists of two panels. The left hand side panel contains averages of the variables for each even sample year, which provides insight in the time evolution of the variables. In the right hand side panel we provide an indication of the overall dispersion by reporting information on the mean, standard deviation, the first, fiftieth and 99th percentile of the variables. The variables are grouped in four blocks. They are, respectively, the dependent variable(s), the independent variables of interest (market power and efficiency proxies), bank-specific control variables (of horizontal and vertical differentiation) and country-specific control variables (capturing the macroeconomic environment and the supervisory and regulatory framework).

Table 4: Determinants of Q^{NA}

Dependent variable: Q^{NA}		
Bank-specific variables		
Competition versus efficiency		
Market Share $_{t-1}$	-0.0959***	[4.642]
Market Share $_{t-1}$ * Concentration $_{t-1}$	0.7673***	[4.853]
X-Efficiency $_{t-1}$	0.0465**	[2.192]
Economies of Scale $_{t-1}$	-0.0471	[0.363]
Diseconomies of Scale $_{t-1}$	-0.1171	[1.411]
Horizontal and vertical differentiation		
Equity to Total Assets $_{t-1}$	0.1862**	[2.508]
Non-interest Income to Total income $_{t-1}$	0.1005***	[6.157]
Demand and savings deposits to Total Deposits $_{t-1}$	0.0199**	[2.576]
Loan Loss Provisions to Net Interest Revenues $_{t-1}$	0.0008	[0.060]
Constant	1.1154***	[6.718]
Country-specific variables		
Market structure		
Concentration $_{t-1}$	-0.2669***	[3.943]
Share of foreign assets in Total Assets $_{t}$	0.0730***	[3.498]
Number of Credit Institutions $_{t}$	-0.001	[1.405]
Macroeconomic variables		
GDP growth $_{t}$	0.7428***	[4.810]
Inflation $_{t}$	-0.1579	[0.522]
Long-term interest rate $_{t}$	1.2826***	[2.814]
Return on a stock market index $_{t}$	0.0271**	[2.123]
Regulation and supervision		
KKZ-index of institutional development $_{t}$	-0.0006	[0.039]
Banking Freedom $_{t}$	0.0003	[1.226]
Property Rights $_{t}$	-0.0003	[0.556]
Business Freedom $_{t}$	-0.0013***	[4.415]
Observations	922	
R-squared	0.5971	
Robust t statistics in brackets		
* significant at 10%; ** significant at 5%; *** significant at 1%		

This table presents estimates of the following regression equation:

$$Q_{i,j,t}^{NA} = \beta_0 + \beta_1 \cdot MS_{i,j,t-1} + \beta_2 \cdot MS_{i,j,t-1} \cdot Conc_{j,t-1} + \beta_3 \cdot X - Eff_{i,j,t-1} + \beta_4 \cdot S - Eff_{i,j,t-1}^{EoS} + \beta_5 \cdot S - Eff_{i,j,t-1}^{DEoS} + \beta_6 \cdot Conc_{j,t-1} + \beta_Z \cdot Z_{i,j,t} + \varepsilon_{i,j,t} .$$

The equation is estimated for a sample consisting of listed commercial banks and bank holding companies. The vector Z consists of two components. It contains bank-specific control variables that proxy for horizontal and vertical differentiation. The second component of Z is a set of country-specific variables. The latter can be categorized into proxies of bank market structure, variables capturing the macroeconomic conditions and the supervisory and regulatory framework.

The first column contains the estimated coefficients, the second column reports robust t-statistics in brackets. We allow for a random time-varying country effect to capture all remaining unobserved heterogeneity at the time-country level. Furthermore, the standard errors are clustered at the time-country level to obtain unbiased estimates of the standard errors of the variables that do not vary at the bank level (see e.g. Card, 1995).

Table 5: Assessing Q^{NA} : Comparison with Tobin's Q and Return on Equity as dependent variable

Dependent variable	Tobin's Q		Return-On-Equity	
	coefficients	t-statistics	coefficients	t-statistics
Bank-specific variables				
Competition versus efficiency				
Market Share $_{t-1}$	-0.0782***	[2.582]	-2.7931	[0.550]
Market Share $_{t-1}$ * Concentration $_{t-1}$	0.8383***	[3.204]	38.5605	[0.948]
X-Efficiency $_{t-1}$	0.0571**	[2.053]	6.7422*	[1.895]
Economies of Scale $_{t-1}$	0.0872	[0.427]	-14.2306	[0.508]
Diseconomies of Scale $_{t-1}$	-0.0933	[0.787]	6.5544	[0.466]
Horizontal and vertical differentiation				
Equity to Total Assets $_{t-1}$	0.3144***	[2.659]	-18.3676*	[1.763]
Non-interest Income to Total income $_{t-1}$	0.1231***	[5.398]	8.9244***	[3.581]
Demand and savings deposits to Total Deposits $_{t-1}$	0.0292***	[2.999]	0.7049	[0.384]
Loan Loss Provisions to Net Interest Revenues $_{t-1}$	0.0060	[0.357]	-3.0038	[1.547]
Constant	0.8655***	[3.377]	6.0894	[0.192]
County-specific variables				
Market structure				
Concentration $_{t-1}$	-0.3858***	[4.187]	-14.1858	[1.052]
Share of foreign assets in Total Assets	0.0487*	[1.737]	3.8431	[1.247]
Number of Credit Institutions	-0.0026**	[2.222]	-0.2938***	[2.670]
Macroeconomic variables				
GDP growth	0.6028***	[2.600]	63.9342***	[2.822]
Inflation	-0.4428	[0.845]	-6.0625	[0.130]
Long-term interest rate	1.8283**	[1.986]	47.3302	[0.449]
Return on a stock market index	0.0173	[0.636]	2.6822	[1.226]
Regulation and supervision				
KKZ-index of institutional development	-0.0510*	[1.713]	3.6961	[1.478]
Banking Freedom	-0.0002	[0.445]	0.0217	[0.541]
Property Rights	0.0017*	[1.892]	-0.0282	[0.365]
Business Freedom	-0.0011**	[1.984]	-0.0049	[0.096]
Observations	922		922	
R-squared	0.4576		0.4576	
Robust t statistics in brackets				
* significant at 10%; ** significant at 5%; *** significant at 1%				

This table consists of two panels. Each panel presents estimates of the following regression equation:

$$Y_{i,j,t} = \beta_0 + \beta_1 \cdot MS_{i,j,t-1} + \beta_2 \cdot MS_{i,j,t-1} \cdot Conc_{j,t-1} + \beta_3 \cdot X - Eff_{i,j,t-1} + \beta_4 \cdot S - Eff_{i,j,t-1}^{EoS} + \beta_5 \cdot S - Eff_{i,j,t-1}^{DEoS} + \beta_6 \cdot Conc_{j,t-1} + \beta_Z \cdot Z_{i,j,t} + \varepsilon_{i,j,t}.$$

In the left hand side panel, the performance measure ($Y_{i,j,t}$) is the traditional (unadjusted) Tobin's Q. The performance measure in the right hand side panel is return-on-equity, a performance measure based on accounting data. The equations are estimated for a sample consisting of listed commercial banks and bank holding companies. The vector Z consists of two components. It contains bank-specific control variables that proxy for horizontal and vertical differentiation. The second component of Z is a set of country-specific variables. The latter can be categorized into proxies of bank market structure, variables capturing the macroeconomic conditions and the supervisory and regulatory framework.

In each panel, the first column contains the estimated coefficients, whereas the second column reports robust t-statistics in brackets. We allow for a random time-varying country effect to capture all remaining unobserved heterogeneity at the time-country level. Furthermore, the standard errors are clustered at the time-country level to obtain unbiased estimates of the standard errors of the variables that do not vary at the bank level (see e.g. Card, 1995).