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The Quiet Life Hypothesis in Banking - Evidence from German Savings Banks ⋆

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Abstract

The 'quiet life hypothesis (QLH)' posits that banks enjoy the advantages of market power in terms of foregone revenues or cost savings. We suggest a unified approach to measure competition and efficiency simultaneously to test this hypothesis. We estimate bank-specific Lerner indices as measures of competition and test if cost and profit efficiency are negatively related to market power in the case of German savings banks. We find that both market power and average revenues declined among these banks between 1996 and 2006. While we find clear evidence supporting the QLH, estimated effects of the QLH are small from an economical perspective.

Key words: Savings banks, competition, efficiency, quiet life hypothesis
JEL: E42, E52, E58, G21, G28

1 Introduction

If some market participants possess power to influence (output) prices, neoclassic theory predicts that these agents, e.g. banks, set prices above marginal

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cost in order to maximize profits. The extraction of producer rents then entails social welfare losses at the expense of consumers. Alternatively, Hicks (1935) suggested that producers may forego such rents in return for inefficiencies. This has been coined the "Quiet Life Hypothesis" (QLH) since agents might prefer to use their market power to behave systematically inefficient. [1]

According to Rhoades and Rutz (1982), the QLH should apply in particular to banks since they often avoid to exhibit large abnormal returns with respect to their fiduciary duties and due to their regulated status. They are the first to show for the US banking industry that banks with market power tend to reduce risk instead of maximizing profits. Since the late 1980's, competition in the financial industry soared continuously in the wake of economic integration and deregulation in both, the United States and Europe. [2] It is thus surprising that only two recent studies consider the QLH: Berger and Hannan (1998) for US and Maudos and Fernández de Guevara (2007) for European banks, respectively. The former find support for the QLH and show that welfare losses due to cost inefficiencies are substantially larger compared to welfare costs resulting from monopoly pricing. However, they use a concentration measure to proxy for market power, which many empirical studies show to be a weak proxy for competitive behavior (Shaffer, 2004; Fernández de Guevara et al., 2005). Maudos and Fernández de Guevara (2007) estimate competitive behavior more directly with Lerner indices, which measure the ability of a bank to set prices above marginal cost (Lerner, 1934). In contrast to Berger and Hannan (1998), they reject the QLH and report fairly small welfare losses due to inefficiencies relative to those due to market power.

The study of Maudos and Fernández de Guevara (2007) is an important contribution since it highlights that testing the QLH requires to obtain both competition and efficiency measures simultaneously from a single model. [3] However, they carefully caution that a pooled assessment of competition and efficiency in Europe is subject to care since it compares significantly different intermediaries with each other. Bos et al. (2008) show indeed that failure to account adequately for heterogeneity distorts performance measures, thus corroborating the suggestion of Maudos and Fernández de Guevara (2007) to test the QLH for more homogenous banking samples.

Therefore, we use a proprietary data set provided by the German Savings

[1] In fact, some recent bank studies provide evidence on alternative managerial objectives, for example the desire to build empires (Hughes et al., 2003).

[2] See Berger (2007) for a recent overview of international bank efficiency comparisons, Amel et al. (2004) for an assessment of international implications of consolidation in banking, and Hughes et al. (1996) for a specific test on the implications of the interstate branching act in the US during the mid-1990s.

[3] See also Koetter et al. (2008) for a test of the bias in competition measures when neglecting bank inefficiency.

Banks Association ("*Deutscher Sparkassen und Giroverband, DSGV*") of the largest banking market in the European Union: Germany. The data includes detailed financial account information for all 457 savings banks between 1994 and 2006, such as detailed interest income and expenses per product category. These savings banks represent a particularly interesting sample to test the QLH since they share a common business model but do operate in local markets with very different levels of competition. As our analysis shows they also differ significantly in terms of efficiency levels. With this paper we aim to contribute in three important aspects.

First, we test the QLH for a large and homogenous sample of public banks. A number of studies report that government owned banks perform worse compared to privately owned peers, for instance in terms of profitability or productivity proxies.[4] But savings banks have to serve the public by law in Germany. Hence, worse financial performance relative to commercial peers may merely reflect this public duty. However, the *relative ability* to realize optimal profits and costs should not be impaired per se by this additional objective and efficiency is therefore a better benchmark to compare performance. At the same time, savings banks operate in regionally delineated markets in which they might enjoy market power (Hempell, 2004). So while their public mandate prohibits savings banks to exploit (and exhibit) the potential for abnormal profits, they might instead be role models of agents that trade market power for incurring inefficiencies (Brunner et al., 2004). Finally, we formulate the QLH as our null hypothesis because regional politicians often serve on savings banks' supervisory boards, which might reduce the likelihood of efficiency enhancing measures that are unpopular with voters, e.g. branch closures.

Second, we consider explicitly inefficiencies on the output side, i.e. the potential ability but unwillingness of banks to charge mark-up prices on *outputs* in the presence of market power, rather than measuring inefficiencies in the cost dimension only. This is important because mark-up pricing is at the heart of the QLH. The available detailed financial data allows us to estimate - to our knowledge for the first time - a profit frontier for a large banking market outside the US.[5] Therefore, we can allow for systematic deviations from both optimal profits and costs, i.e. for profit and cost inefficiencies, in a single reduced form in the vein of Maudos and Fernández de Guevara (2007) who only consider the cost side in their analysis. We obtain not only marginal cost from a frontier estimation, but also proxies of average revenues that are adjusted for

[4] See, for example, Kumbhakar and Sarkar (2003), Bonaccorsi di Patti and Hardy (2005), and Omran (2007).

[5] Virtually all profit frontier analyses concerning non-US banking markets employ the so-called alternative profit frontier suggested by Humphrey and Pulley (1997), which requires to specify output volumes as exogenous variables in the reduced form. This attracted critique by some authors who argue that this assumption violates the necessary duality requirement between bank production and profit functions.

any inefficiencies. This allows us to determine truely unbiased Lerner indices.

Third, our unique data set allows us to distinguish the output of banks in much greater detail. In contrast, Berger and Hannan (1998) and Maudos and Fernández de Guevara (2007) specify lumpy output proxies, namely total assets and aggregate loans and deposits, respectively, which is likely to bias estimated efficiency levels as well as Lerner index components (marginal cost and average revenues). We separate four different outputs and match these with according income flows to generate output price proxies.

We find that German savings banks exhibit on average 83% cost and 53% profit efficiency, a result in line with previous evidence. Efficiency-adjusted Lerner margins are on average around 23% during the observation period, corroborating previous European evidence (Maudos and Fernández de Guevara, 2007). This indicates that on average savings banks' competitive behavior is similar to other banks. Second stage tobit regressions reveal a statistically significant negative relation between cost efficiency and Lerner margins. Controlling for numerous bank-specific and regional market traits, we find in line with the QLH that savings banks with more market power also operate less efficient than their peers that are exposed to stronger competition. In contrast, higher Lerner margins are associated with higher profit efficiency, implying that inference on the QLH depends crucially on the dimension of efficiency measured. Furthermore, in line with the public mandate of savings banks we find that banks in economically weak regions forgoe more profits, i.e. are less profit efficient, than in stronger regions.

In section 2 we discuss related literature before introducing the methodology to jointly estimate competition and efficiency measures with stochastic panel frontier analysis in section 3. Section 4 describes the data. We discuss the results in section 5 and conclude in section 6.

2 Competition, efficiency, and the quiet life hypothesis

The quiet life hypothesis dates back to Hicks (1935). Instead of extracting rents in a monopolistic market, firms use their market power to allow for inefficient allocation of resources rather than maximizing their profits since management's subjective cost of reaching the optimal profit might very well outweigh the marginal gains. Leibenstein (1966) argues that welfare losses due to firm's misallocation of resources, which he coins X-efficiencies, are of far greater economic importance in market oriented economies than welfare losses due to monopoly pricing.

Early theoretical studies analyze management discretion and its impact on

business decisions. For example, Williamson (1963) suggests that managers, after reaching a certain mandatory profit level, pursue other objectives than pure profit-maximization such as empire building. Related, Hart (1983) develops a formal model that shows the relationship between competition and management behavior. He shows that managerial run firms face the problem of operational slack even if they have optimal incentive schemes in place because the owner is unable to observe the real cost of production. Hence, she cannot observe whether high or increasing total cost are due to mismanagement. Competition, however, reduces slack in management behavior. Hermalin (1992) provides further theoretical evidence on the relationship between competition and managerial action. He proves that increasing competitive pressure is likely to incite management to work harder and consume less agency goods.

To test the QLH, empirical studies thus need to relate proxies of competition and efficiency at the firm level. Both the empirical bank competition and banking literature are by now abundant for respective overviews, see for example Bikker and Haaf (2002b) and Berger (2007). Competition studies frequently rely either on market concentration measures as a proxy for competition (Shaffer, 1982) or on the Panzar-Rose approach (Rosse and Panzar, 1977; Panzar and Rosse, 1982).[6] Regarding the latter, Bikker and Haaf (2002a) analyze competition among small, medium and international banks in 23 countries between 1988 and 1998. They find that competition is weakest among small banks in regional markets. Hempell (2004) analyzes the German market between 1993 and 1998 and finds at a more detailed level that savings and cooperative banks are less competitive than credit banks and foreign banks. Hempell's findings support the ones of Bikker and Haaf (2002a) that competition among larger banks is stronger than among small regional banks.

It is surprising that despite the abundance of competition studies, direct tests of the QLH are nonetheless still scarce. To our knowledge, Rhoades and Rutz (1982) are the first to provide empirical support for the quiet life hypothesis in the banking industry. They investigate the relationship between market concentration and risk taking of banks in the US and report that banks tend to use their market power to reduce portfolio risk rather than to increase profits. More recently, Berger and Hannan (1998) empirically analyze more than 500 banks in the US during the 1980's. They also use market concentration as a proxy for competition and find a negative relationship with efficiency levels in the commercial banking industry, thus serving as a more recent evidence of the QLH. They show that the economic welfare losses associated with operating

[6] The PR approach estimates the elasticity of gross revenues with respect to input prices to measure if suppliers pass input price changes on to consumers. The sum of partial elasticities, the H-statistic, equals 1 for perfect competition. A value between 0 and 1 for monopolistic competition and it turns negative for a monopoly (see, for example, Molyneux et al., 1994; De Bandt and Davis, 2000).

inefficiencies derived from certain monopolistic power are far greater than the relatively small losses attributable to resource misallocations due to higher prices and lower quantities.

But many studies show that neither concentration nor the PR-approach are optimal proxies of competition. In particular, the QLH implies a relationship between market power and efficiency at the firm level (Evanoff and Fortier, 1988; Shaffer, 2004). But both concentration and PR measures are aggregate in nature, thus allowing only inference of the competitive stance of some market aggregate (Bikker and Haaf, 2002a). An alternative measure of competition are Lerner indices, which originate from the theory of industrial organization. The basic notion of Hicks has been further developed by, e.g. Appelbaum (1982) and Corvoisier and Gropp (2002), and entails that banks with market power set loan prices p above their marginal cost. Competition is then measured by the margin between average revenues, usually measured by output prices p, and marginal cost MC scaled by prices (see Freixas and Rochet, 1997; Fernández de Guevara et al., 2005).

Compared to the abundant applications of the PR approach, relatively few studies employ Lerner indices to measure firm-specific competition. Beighley and McCall (1975) are presumably the first to apply the methodology to the US banking market. Among the more recent studies are Shaffer (1993) (Canada) and Angelini and Cetorelli (2003) (Italy). Only recently, Maudos and Fernández de Guevara (2004, 2007) and Fernández de Guevara et al. (2005, 2007) measure banking market competition in the European Union with this firm-specific measure. Fernández de Guevara et al. (2007), for example, show that substantial competition differentials persist across countries. They also report that despite efforts of the EU to integrate markets, average market power (Lerner indices) increased during 1993 and 2000. However, they do not analyze the implications for inefficiency. An explicit test of the QLH is only available in Maudos and Fernández de Guevara (2007), which is the study closest to ours. They report a positive relationship between efficiency and market power in banking markets of the European Union between 1993 and 2002 and thus reject the QLH. Using a translog cost frontier that allows for inefficiency they specify two outputs: aggregate deposits and loans. Lerner indices are then calculated as the difference between loan (deposit) rates, interbank rates, and estimated marginal costs of loans (and deposits) obtained as partial derivatives of the cost frontier, thus, excluding any inefficiencies on the cost side. This approach leaves room for three improvements.

First, the ability to forego output mark-ups vested on firms by market power is at the heart of the QLH. Maudos and Fernández de Guevara (2007) advance beyond previous Lerner studies significantly by allowing for inefficiencies on the cost side. But they neglect the possibility that realized average revenues most likely contain an inefficiency component, too. This is a reflection of the

usual absence of price data in banking. The proprietary data provided to us by the DSGV allows us to test more explicitly to what extent banks forego rents especially on the output side. As we have detailed revenue streams for all product categories available, we are able to estimate a profit frontier - to our knowledge this is the first time for a large banking market outside the US. We obtain bank-specific measures of profit inefficiency and average revenues net of foregone rents due to inefficiencies.

Second, the specification of two outputs in Maudos and Fernández de Guevara (2007) is an improvement to earlier lumpy output specifications as total assets. But it remains a matter of debate if deposits are bank outputs. Proponents of the intermediation approach argue that banks employ deposits as factors to fund loans (Sealey and Lindley, 1977). While this issue seems unlikely to be fully resolved in the near future two aggregate outputs are still likely to be noisy proxies for the production process of banks: obviously, processes and cost to extend a mortgage loan are substantially different from that of a consumer loan. This can lead to biased estimates of inefficiency and marginal cost. We avoid these problems and specify a more detailed output vector for savings banks and complement previous evidence on the QLH based on the widely accepted theoretical model first suggested by Sealey and Lindley (1977), the so-called intermediation approach.

Third, Maudos and Fernández de Guevara (2007) estimate a single cost function for all banks (commercial, savings and cooperative) in Europe. Although they carefully control for a number of other factors that might lead to systematic deviations from estimated optimal cost, they caution themselves that the heterogeneity in their sample could pose difficulties. We follow here their suggestion and investigate the QLH for a sample of homogenous banks regarding their business scope, size, ownership, and unobservable environmental characteristics. Thereby, we are able to test the QLH based on data that is less exposed to concerns regarding excessive heterogeneity and poor quality.

3 Methodology

We test the QLH by estimating firm-specific measures of both competition and efficiency simultaneously from a single reduced form as to alleviate endogeneity concerns. In contrast to previous QLH studies we account explicitly for the multi-output nature of bank production and consider explicitly output pricing inefficiencies by estimating a profit frontier to obtain proxies of average revenues net of inefficiency. Akin to Angelini and Cetorelli (2003) and Maudos and Fernández de Guevara (2007) we use Lerner indices to assess the competitive behavior of savings banks in Germany. Competition is measured as the difference between average revenues, usually measured by output prices p, and

marginal cost MC scaled by prices (Freixas and Rochet, 1997; Fernández de Guevara et al., 2005):

$$L = \frac{(p - MC)}{p}. \tag{1}$$

The Lerner index ranges between 0 and 1 where values close to zero describe highly competitive markets since marginal cost equal average revenues (which equal prices in perfect competition). Values close to 1 indicate monopolistic market behavior, i.e. players are able to set prices well above marginal production cost and earn a premium.

To obtain the components of the Lerner index, we estimate MC from a bank's cost function. We follow the intermediation approach and assume that banks collect financial funds from surplus units and employ other production factors at price w_i. They channel collected funds to investors in the form of loans and other financial products and services y_m conditional on capitalization and other controls z. If banks are price takers in factor markets, they minimize total cost by choosing factor quantities subject to a technology constraint $T(y, x, z)$. This yields an optimum cost function $C^* = C^*(y, w, z)$ that is also conditional on further controls z.[7] To estimate optimal cost we choose the translog functional form:

$$\begin{aligned}
\ln C_{kt}(w, y, z) = {} & \alpha_k + \sum_i \alpha_i \ln w_{ikt} + \sum_m \beta_m \ln y_{mkt} \\
& + \frac{1}{2} \sum_i \sum_j \alpha_{ij} \ln w_{ikt} \ln w_{jkt} + \sum_i \sum_m \gamma_{im} \ln w_{ikt} \ln y_{mkt} \\
& + \frac{1}{2} \sum_m \sum_n \beta_{mn} \ln y_{mkt} \ln y_{nkt} + \delta_0 \ln z_{kt} + \frac{1}{2} \delta_1 (\ln z_{kt})^2 \\
& + \sum_i \omega_i \ln w_{ikt} \ln z_{kt} + \sum_m \zeta_m \ln y_{mkt} \ln z_{kt} + \eta_0 t + \frac{1}{2} \eta_1 (t)^2 \\
& + \sum_i \kappa_i \ln w_{ikt} t + \sum_m \tau_m \ln y_{mkt} t + \delta_2 \ln z_{kt} t + \varepsilon_{kt},
\end{aligned} \tag{2}$$

where k indicates a bank at time t. Contrary to most competition studies that specify only total assets as output (Angelini and Cetorelli, 2003), we distinguish banks' portfolios more carefully. We allow for four different outputs y_m: mortgage loans, consumer loans, corporate loans and Securities.[8] Note that Maudos and Fernández de Guevara (2007) treat both deposits and loans as outputs, restrict inputs to labor and fixed assets and specify only operating cost excluding financial expenses as dependent variable of the estimation. In contrast, we follow here the intermediation approach and include financial expenses in total cost, too, because it is exactly the margin between borrowing

[7] We discuss the specific variable choices in section 4.

[8] We omit fee-based services because of their small share of savings banks' total revenues and the unavailability of consistent volume proxies of these services.

and lending that serves as an indicator of the bank's competitive stance. Moreover, since interest expenses account on average for more than 60% of total expenses, they constitute the crucial component of a bank's performance and should therefore be included. Finally, a potential objective of bank managers implied by the QLH could be to increase market shares and the bank's size to signal power and prestige (Hughes et al., 2003). One obvious way to inflate the balance sheet is to offer favorable conditions to customers. Thus, excluding financial expenses neglects an important part of the QLH.

Given the double-log model in equation (2), we obtain the marginal costs MC component required in equation (1) as:

$$MC = \sum_m \frac{\partial \ln C}{\partial \ln y_m} \times \sum_m \frac{C}{y_m}. \tag{3}$$

As a second innovation, we use stochastic panel frontier analysis to obtain cost function parameters in equation (2) used to calculate marginal costs. Numerous studies show that banks deviate in a non-random fashion from optimal cost due to either employing simply too many inputs, or allocating them in suboptimal proportions given factor prices (Amel et al., 2004; Berger, 2007). Neglecting such inefficiencies in the error term leads to biased parameter estimates in the cost function, resulting marginal costs, and hence Lerner indices. With the exception of Maudos and Fernández de Guevara (2007), all competition studies ignore these production inefficiencies.

We allow for estimation of firm-specific inefficiency and assume a composed error term, ε_{kt}, which consists of random noise, v_{kt}, and inefficiency, u_{kt}. Cost inefficiencies are positive $\varepsilon_{kt} = v_{kt} + u_{kt}$.[9] In contrast to Maudos and Fernández de Guevara (2007), we obtain parameter estimates with a fixed-effect panel estimator (Greene, 2005).[10] The upshot of this model is twofold. First, in contrast to most panel frontier estimators bank-specific efficiency measures are time-variant without imposing any structure on their development a priori. Efficiency scores are calculated using the conditional expectation of u_{kt} given ε_{kt} and range between 0 and 1, where the latter indicates a fully efficient bank. Second, despite the fact that our sample includes only fairly homogenous savings banks, unobserved heterogeneity could still pose a problem. Therefore, we also specify bank-specific fixed effects α_k.

[9] We assume the random error term v_{kt} to be *i.i.d.* with $v_{kt} \sim N(0,\sigma_v^2)$ and independent of the explanatory variables and the inefficiency term, u, following a half-normal distribution (Kumbhakar and Lovell, 2000). We re-parameterize $\sigma = \sqrt{(\sigma_u^2 + \sigma_v^2)}$ and $\lambda = \sigma_u/\sigma_v$. λ indicates the ratio of standard deviation attributable to inefficiency relative to the standard deviation due to random noise. An insignificant estimate of λ means that there are no measurable inefficiencies.

[10] We impose the necessary homogeneity and symmetry restrictions upon estimation.

The third difference of this study relates to the second critical component to calculate Lerner indices, average revenues. As depicted in equation (1), average revenues are usually approximated by total revenues scaled by total assets (e.g. Maudos and Fernández de Guevara (2007) or Angelini and Cetorelli (2003)). However, the same caveat outlined for costs applies to the profit function of banks - realized profits might deviate from predicted optima not only due to random shocks but also because of systematic deficiencies of bankers to choose production plans so as to maximize profits.

Therefore, we obtain average revenue proxies in equation (1) as the sum of predicted average costs $\hat{C}/TA$ and profits $\hat{\pi}/TA$, thus, excluding cost and profit inefficiencies. The former are obtained from equation (2). We derive the latter estimating a standard profit function as suggested by Berger and Mester (1997). Banks maximize profits at given factor and output prices and subject to a technology constraint. Bankers choose quantities based on a vector of output prices, which yields optimal profits $\pi(p, w, z)^*$.[11] Note that we assume that banks face a competitive output market and act as price takers. A number of studies on profit efficiency in the banking industry apply an alternative approach where banks are modeled as price setters (Corvoisier and Gropp, 2002; DeYoung and Hasan, 1998). Whereas there are also some valid arguments for this approach, it is also often driven by data availability since product specific pricing data is not publicly available in most cases (DeYoung and Hasan, 1998; Maudos et al., 2002). Especially for retail banks, the standard neoclassical assumption of competitive markets seems to be reasonable ex ante as retail products are fairly standardized products that can be obtained at increasingly low transaction costs elsewhere.

The reduced form of this model is similar to equation (2) with output quantities replaced by output prices and the dependent variable being now the log profits before valuation $\ln \pi$ (Berger and Mester, 1997).[12] Accounting for both cost and profit efficiency when estimating Lerner index components is critical. For example, if profit inefficiency is neglected, predicted profits will be downward biased because inefficiency u entailing lower than optimal profits $\ln \pi = f(p, w, z) + v - u$. Hence, predicted average revenues would be too low, potentially underestimating the level of Lerner rents or, more precisely, confining Lerner rents with foregone rents due to inefficient exploitation of the bank's pricing opportunity set.

In sum, we obtain Lerner index components, average revenues and marginal

[11] Note that banks' abilities to choose input quantities at given factor cost w implies that cost inefficiency is also considered in this model.

[12] A detailed reduced form is available upon request. We exclude valuation effects since they are lagged by several years, are highly dependent on the economic cycle, and are used by bank managers discretionary to smooth income. Result are qualitatively identical if profit after valuation is used.

cost, from stochastic cost and profit panel analysis and thus avoid confusion of realized rents due to market power and rents foregone due to inefficiencies. We account explicitly for multiple outputs of banks and also consider financial expenses when estimating efficiency and Lerner indices to test the QLH more explicitly.

4 Data

To estimate the cost frontier we specify four outputs $y_{1,..,4}$ (mortgage loans, consumer loans, corporate loans, and securities) and three input prices $w_{1,..,3}$ (personnel cost, the cost of funding, and expenses for fixed assets). To estimate the profit frontier, we specify four output prices $p_{1,..,4}$ (interest rates on mortgages, consumer loans, corporate loans, and securities). The according data is depicted in table 1. We also control for equity to account for different capital structures and risk-preferences among banks. The data is obtained from the German Savings Banks Association's (DSGV) Bank Performance Comparison and covers the period from 1996 to 2006. Balance sheet data is calculated as annual averages of monthly data to permit the combination with annual profit and loss account data to calculate according ratios.

All data are inflation-adjusted using the consumer price index and expressed in millions of 2000 €. The panel is balanced since the DSGV integrated backwards financial accounts of savings banks that merged during the observation period. The sample contains 457 incumbent banks at year-end 2006. After elimination of 93 missing values, the sample contains 4,934 observations for the period from 1996-2006.

Although all savings banks follow the same basic operating model, offer similar products and cater to the same general type of customers, the size of the institutions differs significantly from small local banks with only a few hundred millions in total assets to sizeable regional banks with total assets exceeding ten billion. At the same time they also differ in terms of factor cost. Labor cost, for example, are more than 20 per cent higher for the top quartile than for the bottom quartile. The same is true for funding cost, which differ by almost 35 per cent between the top and the bottom quartile. The diversity among otherwise similar banks underpins the suitability of this sample to test the QLH.

Table 1
Descriptive statistics savings bank production 1996-2006

Variable		Mean	SD	Min	25%p	75%p	Max
Total operating cost	TOC	99.8	133.5	5.4	33.6	115.5	1,701.6
Profit before valuation and tax	PBV	21.6	28.8	0.4	7.7	24.7	409.3
Outputs							
Mortgage Loans	y_1	587.8	841.2	16.5	183.7	691.6	10,836.9
Consumer loans	y_2	150.0	209.5	5.8	44.8	177.7	3,429.8
Corporate Loans	y_3	420.1	638.0	11.8	119.8	479.0	8,567.5
Securities	y_4	561.6	745.9	3.1	177.4	632.3	6,910.9
Factor cost							
Labor cost	w_1	53.1	7.3	30.8	48.8	58.3	95.9
Cost of funding	w_2	3.8	0.7	2.0	3.2	4.4	5.6
Cost fixed assets	w_3	50.6	25.7	13.4	36.9	57.0	543.3
Output prices							
Interest rate mortgages	p_1	5.9	0.9	3.8	5.2	6.6	8.6
Interest rate consumer loans	p_2	8.8	2.4	2.1	6.6	11.1	14.5
Interest rate corporate loans	p_3	8.4	1.5	2.9	7.4	9.4	15.7
Interest rate securities	p_4	5.2	1.2	1.7	4.2	6.0	8.7
Controls							
Equity	z	110.7	154.9	4.2	33.8	126.8	2,172.7

Notes: 4,934 observations. Total operating cost TOC, Profit before valuation and taxes PBV, equity z and all output volumes y1-y4 denoted in millions of 2000 Euros. Labor cost in thousands of Euros per employee (FTE). Funding and fixed asset cost in percentages of total borrowed funds and total fixed assets, respectively. All output prices represent average interest rates in percent.

5 Results

Specification Parameter estimates of both cost and profit frontier are depicted in table 7 in the appendix. Recall that λ equals the ratio of standard deviation attributable to inefficiency relative to the standard deviation due to random noise. An insignificant estimate of λ means that there are no measurable inefficiencies. All of the error is due to random noise and specification of a stochastic frontier model is inappropriate. The significant coefficients of both λ and σ support the existence of systematically skewed error terms and, hence, inefficiency. Log-likelihood ratio tests confirm this result, thereby underpinning the statistical relevance to account for a composed error term. [13]

Table 2 shows average cost efficiencies for savings banks of 83% and average

[13] We also tested for alternative specifications, such as the exclusion of time trends to capture technological change, alternative output mixes with fewer products provided, and simpler functional forms such as the Cobb-Douglas. All of these were rejected and results are available upon request.

Table 2
Results of efficiency and Lerner estimates

Variable		Mean	SD	Min	25%p	75%p	Max
Cost efficiency	CE	0.828	0.039	0.519	0.808	0.855	0.919
Profit efficiency	PE	0.534	0.096	0.038	0.476	0.606	0.757
Lerner index	Lerner	0.237	0.057	0.064	0.196	0.277	0.520

Notes: 4,934 observations in the period 1996-2006.

profit efficiencies of 53.4%, which is in line with previous studies that analyse both efficiency dimensions (Altunbas et al., 2001; Koetter, 2006). The significantly lower efficiency levels on the profit side confirm the importance of slack in banks abilities to generate profits rather than their abilities to scrutinize on expenditures. [14]

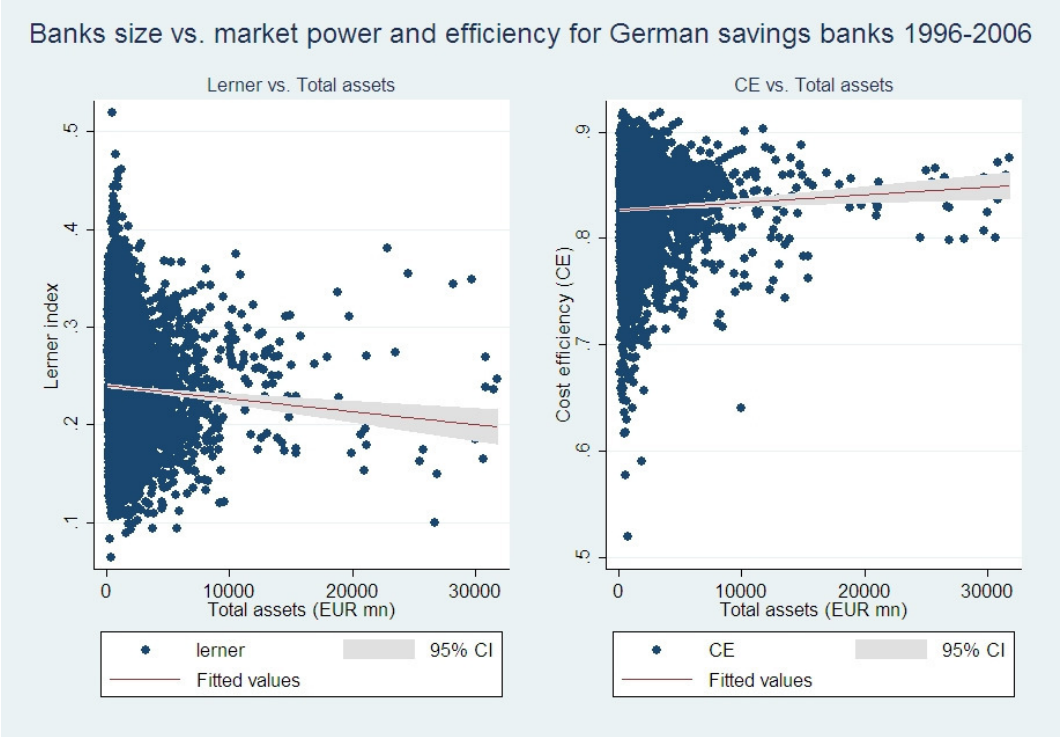
Lerner indices are on average 23.7% confirming other studies, for example, Fernández de Guevara et al. (2007) who report indices for European banks on the order of 20-30%. The high level of profit inefficiencies is in line with the original idea of the quiet life hypothesis (Demsetz, 1973): the best rent of a monopoly is the absence of pressure to maximize profits. On the one hand, this suggests that savings banks can indeed afford considerable inefficiencies in the revenue generating dimension of their business due to (local) market power and their integration in the overall network of public banks. On the other hand, high profit inefficiencies can reflect alternative, societal objectives. The savings bank law of the state of Baden-Württemberg, for example, states that it is the objective of savings banks to provide all people in their region with bank services, take deposits from them and grant loans to them. It is their duty to support the local municipality ("Gemeinde") in the fulfilment of its economical, political, social and cultural tasks. Ideally, we would be able to include such additional benevolent activities as an output of savings banks and account thereby explicitly for the use of resources on outputs other than financial products and services. But since according data is unavailable, more formal tests are unfortunately infeasible. At the same time it is important to note that PE scores are *relative* measures within the group of savings banks only. Hence, even without an explicit specification of such benevolent outputs the result highlights that at least some savings banks appear to realize substantially higher profits at given production plans than others.

Competition and size Most studies hypothesize that market power increases with firm's size. Figure 1 (left-hand side) depicts the relationship between mean Lerner indices, corrected for both cost and profit inefficiencies, and total

[14] The low correlation of appr. 20% between cost and profit efficiency indicates that profit inefficiencies can only partially be explained with inefficiencies on the production side.

assets for each individual savings bank in the observation period 1996-2006. Contrary to this hypothesis the fitted line plot in the scatter graph suggests that larger banks tend to exhibit lower Lerner margins. This, however, might be due to the fact that larger banks are often located in larger cities, which tend to be more competitive.

Figure 1. The relationship between efficiency and bank size



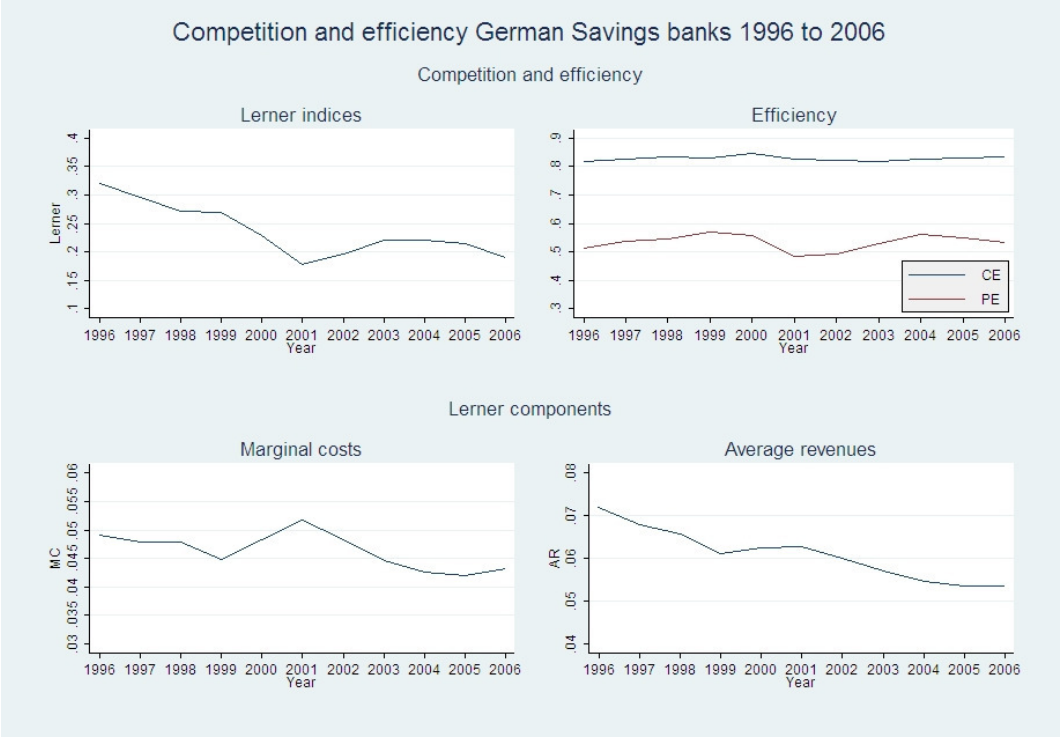
Cost efficiency shown in the right-hand panel of figure 1) appears to be slightly higher for large banks than for smaller ones, which might be due to scale economies. Especially the variation in cost efficiency seems to be significantly higher among small banks. All savings banks with total assets above 15 billion Euros show cost efficiency levels beyond 75% whereas a sizeable number of smaller banks is associated with cost efficiency levels below 75%. However, the most efficient banks in the sample are small ones, too. Thus, size is not per se a prerequisite for efficiency. There is no apparent relationship between profit efficiency levels and size.

Dynamics Note that our prime interest is here to test the quiet life hypothesis rather than 'explaining' efficiency scores.[15] To further explore the characteristics of both competition and efficiency consider figure 2 exhibiting the

[15] Which, in itself, is anything but a trivial issue for both economic and econometric reasons surrounding the 'Greene' problem (Kumbhakar and Lovell, 2000).

dynamic development of either measure as well as the most important Lerner components.

Figure 2. Competition, efficiency, and components



The bottom right graph of figure 2 shows average revenues falling over the whole period 1996 to 2006 from 7.2% to 5.3%[16]. This, together with constant or even increasing marginal cost, led to Lerner indices plummeting from 32% in 1996 to below 18% around the turn of the century. Thereafter, banks were able to stabilize margins by successfully reducing marginal cost (graph bottom left). Falling average revenues might be attributable to two casually observed industry trends. First, competition significantly increased due to new (foreign) competitors that entered markets and a surging penetration of online banking services.[17] Second, interest rate levels were declining continuously during the observed period.[18] It is interesting to note that banks were not able to profit from decreasing interest rates through decreasing marginal cost until 2001. This is another sign for the relatively strong competition on the deposit side.

[16] Profit before valuation over total assets.

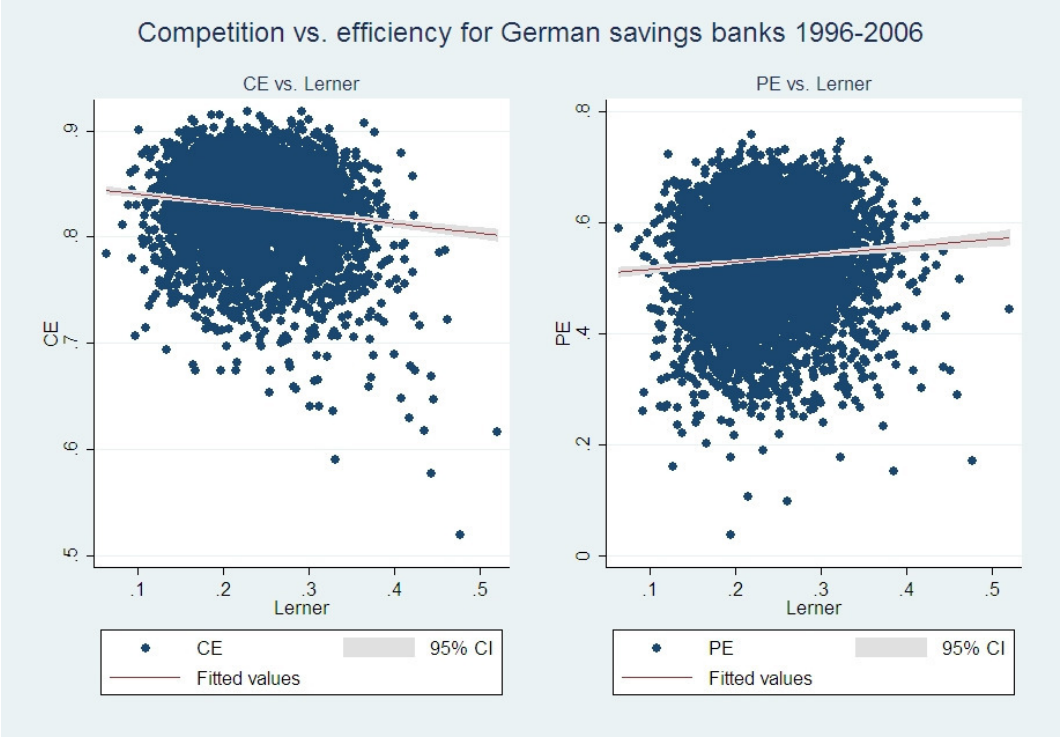
[17] According to figures from the German Central Bank deposits of non-banks held by foreign banks increased some 15-fold between 1996 and 2006 whereas savings banks increased their volume by just 75%. Similarly, loans to private customers extended by foreign banks increased 18-fold in the same period whereas savings banks volumes increased by 127%.

[18] 1Y-EURIBOR dropped from 6.3% in 1996 to 3.8% in 2006.

Note that the reduction in average marginal cost from 5.2% in 2001 to 4.3% in 2006 is not due to better cost management per se. In fact, the relative ability to minimize costs remained fairly stable at high levels of 83% as depicted in the upper right panel of figure 2. Profit efficiency levels increase slightly during the period year-on-year but do take a hit during the market turmoils in the year 2001.

Determinants Figure 3 depicts the univariant relationship between market power, cost efficiency and profit efficiency. The graph suggests that market power is slightly negatively correlated with cost efficiency in line with the QLH. The opposite relationship seems to exist with regard to profit efficiency. The relatively flat slope of the fitted line indicates that the effects are economically not significant though.

Figure 3. The relation between efficiency and market power



However, univariant statistics may be misleading since they cannot grasp possible interactions between efficiency, competition, further bank-specific and other traits. Therefore, we use panel regressions to investigate the relation between cost and profit efficiency and Lerner indices more carefully. As noted by Kumbhakar and Lovell (2000), the truncated nature of the former requires an according empirical specification and we choose here a panel tobit estimator with bank-specific fixed-effects.

In addition to Lerner indices, we use four different sets of explanatory co-

variates to predict cost and profit efficiency scores, respectively. Specifically, we investigate the relation between efficiency and bank's competitive stance controlling for other bank traits (size, performance, business mix), potential impact of mergers and characteristics of the local market including the local market structure.[19] We explain the construction of each covariate subsequently when discussing the results.[20]

Column (1) in table 3 and table 4 depicts the core relation of the QLH, namely the relation between efficiency and competition. The results are highly significant for both, cost and profit efficiency, but do differ in their respective sign. Whereas the relation between market power (*Lerner*) and cost efficiency is negative and, thus, in line with the predictions of the Quiet Life Hypothesis, the relation between market power and profit efficiency is positive. The latter finding provides some support for the so-called efficient-structure-hypothesis (Berger, 1995). Note that we do not imply a causal relationship. In fact, the relation between competition and efficiency is most likely characterized by complex contemporaneous and lagged relations, which up and until here remain largely unknown on theoretical grounds. We therefore limit ourselves throughout to draw inference on relations rather than causation.[21]

The sign and magnitude of reported elasticities remain unchanged as we add further controls for banks and market characteristics (columns (2)-(5) in table 3 and 4).[22] Hence, the results provide evidence for the QLH with regard to cost efficiency. In other words, savings banks with high market power tend to incur higher operating cost to produce the same output compared to their peers with less market power. Assuming that management behavior - rather than ability - is the cause for differences in efficiency levels, competition seems to have a disciplinary impact on management behavior. This is in line not only with the QLH but also with more formal models like in Hart (1983). However, note that the economic relevance is rather low as indicated by the elasticities reported in the tables. A one per cent change in the Lerner index (for an average savings bank) lowers the cost efficiency level by approximately 0.09%.

[19] The bank-specific fixed effect controls for potentially omitted variables. We use heteroscedasticity corrected standard errors, and we control for time-specific effects by including time dummies as well. Alternatively, we also used a standard fixed effects regression. Results are qualitatively identical and available upon request.

[20] Tables 5 and 6 in the appendix provide descriptive statistics and a correlation matrix and subdues multicollinearity concerns, respectively. We also tested proxies on retail to corporate accounts, the account share of small entrepreneurial customers, and the account share of international customers to assess whether these characteristics influence saving banks competitive stance, too. Since results were insignificant across the board we conserve on space and do not report them here.

[21] Note, however, that we also allowed for endogeneity by using IV tobit estimation. Results were unaffected.

[22] Coefficients instead of elasticities are available upon request.

Thus, an increase of the Lerner index by 40% from 20% to 28% (the difference between the lowest and the highest quartile in our sample) will result, ceteris paribus, in a decrease of the cost efficiency level by 3 percentage points from 83% to 80%.

Table 3
The relation between cost efficiency, competition and other bank traits

Tobit estimation with bank and time specific fixed effects of cost efficiency indices on bank-specific and regional characteristics. Figures reported in table are elasticities. Explanatory variables: Lerner index (0=highly competitive, 1=monopolistic behavior): *Lerner*; Gross total assets (in billion EUR): *TA*; Fee over interest income (in percent): *NII*; Mortgage loan share (in percent): *MLS*; Loan loss reserves per total assets (in percent): *LLR*; M&A dummy indicating merger in particular year: *MA*; Population density (in thousand inhabitants per square kilometer): *POP*; Primary income per inhabitant (in thousand EUR): *INC*; GDP growth (in percent): *GDPG*; Number of banks operating in the region (based on commuter streams): *BANKS*. Constant included in estimation but not reported. 457 savings banks included in the observation period from 1996-2006 in column (1)-(3), 93 observations deleted due to missing data; observation period in column (4)-(5) limited to 1996-2004 due to availability of economic data. Rho measures the explanatory power of the bank specific fixed effect.

Variable		**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Lerner index	Lerner	-0.0716***	-0.0787***	-0.0792***	-0.0906***	-0.0919***
Gross total assets	TA		0.0017**	0.002***	0.0017*	0.0018**
Fee over interest income	NII		-0.0319***	-0.0321***	-0.0374***	-0.0376***
Mortgage loans over total loans	MLS		-0.0149***	-0.0151***	-0.0161***	-0.0151***
Loan loss reserves over total assets	LLR		-0.0171***	-0.0174***	-0.018***	-0.0177***
M&A activity	MA			-0.0005***	-0.0005***	-0.0005***
Population per area	POP				0.0013	0.0006
Primary Income	INC				-0.0068	-0.015**
GDP growth	GDPG				-0.0009**	-0.001**
Number of banks in Region	BANKS					0.0067***
Observations		4934	4934	4934	4006	4006
Number of banks		457	457	457	457	457
Rho		0.08	0.1	0.11	0.14	0.13

Notes: Robust standard errors and time-specific effects not reported. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4
The relation between profit efficiency pe, competition and other bank traits

Tobit estimation with bank and time specific fixed effects of cost efficiency indices on bank-specific and regional characteristics. Figures reported in table are elasticities. Explanatory variables: Lerner index (0=highly competitive, 1=monopolistic behavior): *Lerner*; Gross total assets (in billion EUR): *TA*; Fee over interest income (in percent): *NII*; Mortgage loan share (in percent): *MLS*; Loan loss reserves per total assets (in percent): *LLR*; M&A dummy indicating merger in particular year: *MA*; Population density (in thousand inhabitants per square kilometer): *POP*; Primary income per inhabitant (in thousand EUR): *INC*; GDP growth (in percent): *GDPG*; Number of banks operating in the region (based on commuter streams): *BANKS*. Constant included in estimation but not reported. 457 savings banks included in the observation period from 1996-2006 in column (1)-(3), 93 observations deleted due to missing data; observation period in column (4)-(5) limited to 1996-2004 due to availability of economic data. Rho measures the explanatory power of the bank specific fixed effect.

Variable		**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Lerner index	Lerner	0.044**	0.0529***	0.0524***	0.0708***	0.0742***
Gross total assets	TA		-0.0004	0.0006	0.0021	0.0019
Fee over interest income	NII		-0.0205*	-0.0215**	-0.0491***	-0.0504***
Mortgage loans over total loans	MLS		-0.0568***	-0.0575***	-0.099***	-0.0985***
Loan loss reserves over total assets	LLR		-0.0605***	-0.0614***	-0.0334***	-0.0336***
M&A activity	MA			-0.0019***	-0.0019***	-0.0019***
Population per area	POP				-0.0081**	-0.007**
Primary income	INC				0.0728***	0.0849***
GDP growth	GDPG				-0.0012	-0.0011
Number of banks in Region	BANKS					-0.0095
Observations		4934	4934	4934	4006	4006
Number of banks		457	457	457	457	457
Rho		0.04	0.04	0.04	0.08	0.08

Notes: Robust standard errors and time-specific effects not reported. * significant at 10%; ** significant at 5%; *** significant at 1%

In column (2) we add bank size, accounting based performance measures and proxies for the business mix of each bank. Bank size is measured by gross total assets TA. Performance indicators include total loan loss reserves scaled by total assets LLR as an indicator for the risks taken by the bank in the loan business. With fee income over interest income FEE and the share of mortgages of total assets MLS we control for banks' efforts to venture into alternative businesses to avoid the increasingly narrow-margined credit business. The share of fee income controls for the neglect of the former as output in the intermediation model used to estimate profit and cost efficiency. Thus, savings banks with a higher share of fee business tend to obtain lower efficiency ratios as labor dedicated to fee business is included in total operating cost but the corresponding output is neglected. All coefficients are highly significant and show the expected sign. It is worth mentioning that an increase in size results in a slight but significant increase in cost efficiency, which indicates benefits from exploiting scale economies. Size has no significant influence, however, on profit efficiency. A higher share of mortgage business and more risky loans are associated with lower cost efficiency, which is reasonable as mortgages and riskier loans normally require more intensive maintenance. For the stated reasons above, the negative sign associated with the share of fee income is expected. The same findings hold for the profit efficiency.

In column (3) we add a control for merger activities MA. Cost efficiency drops in the year of merger activities, which is expected as resources are bound in merger related activities on the detriment of output. With regard to the profit side Bloch and Vins (2007) show that merger activities can result in temporary adverse effects on the revenues of a bank. A significantly negative coefficient on the profit side confirms these findings.

Furthermore, we include a couple of controls for the local economic environment in column (4): the population density POP to distinguish between urban and rural regions, the primary income per inhabitant INC to control for regional prosperity and the growth in GDP $GDPG$ to take the local economic development into account. Results are mixed. With regard to cost efficiency only GDP growth seems to have a negative impact. On the profit side, population density has a significant negative impact and regional prosperity a positive one. The latter effect might be a result of the aforementioned public duty of savings banks: they might forgoe some profits in less developed regions to foster the local economic development.

We further control for the market structure by including the number of banks in the economic planning region ("Raumordnungsregion, ROR") in column (5).[23] This proxy is one of the few structural measures, which are also avail-

[23] Of which 97 are defined based on commuter streams in Germany. Funke and Niebuhr (2005) argue that this spatial taxonomy reflects economic interdependencies

able for the large nationwide operating retail banks at a local level. There is a positive relation between the number of banks and cost efficiency and no significant relation regarding profit efficiency. Note that these results mirror our main findings with regard to the Lerner index. Savings banks with more potential competitors operate more cost efficient. Based on the idea of the structure-conduct-performance paradigm, a greater number of competitors goes along with more competitive behavior of the market participants.

Finally, bank specific fixed effects explain part of the variation of both cost and profit efficiency as measured by *Rho* of 4% and 14%, respectively. Thus, savings bank efficiency is influenced significantly by unobserved factors such as certain technologies, know-how or just management competency.

To check for the potential problem of endogeneity between Lerner indices and efficiency, we also estimate a IV tobit model instrumenting the Lerner index with itself lagged by one period. Results are qualitatively identical since the coefficient of the Lerner index remains unchanged. We also run the analysis excluding all savings banks involved in merger activities to control for potential selection biases due to the backward integration in our data set of banks that merged during the observation period. Again, results remain unchanged. [24]

6 Conclusion

In this paper, we suggest three main innovations to test the quiet life hypothesis (QLH) among banks. First, we obtain bank-specific measures of both cost and profit efficiency as well as market power (Lerner index) simultaneously from a single reduced form. This allows us explicitly to take the possibility into account that savings banks forego potential profits in the output pricing dimension rather than due to suboptimal sourcing decision. Second, we use a unique sample of all savings banks operating in Germany between 1996 and 2006 provided by the German Savings Banks Association ("DSGV"). Paired with the use of panel-frontier estimation this alleviates concerns of excessive heterogeneity of cross-country studies. Finally, the available detailed financial data on both stock and flow variables allows us to account more explicitly for the diversity of bank's asset portfolios (outputs) compared to previous studies. Our main findings are the following three.

First, we estimate cost and profit functions for German savings banks using stochastic cost and profit panel frontier analysis. In line with previous evidence, we find that savings banks could have produced the same output with

much better than political units.

[24] Results available on request.

83% of actual cost. Foregone profits, in turn, are much higher since mean profit efficiency is only 53%. This may suggest that German savings banks conduct unprofitable or less profitable business to fulfill their public duty, e.g. charge lower interest rates than appropriate based on the risk involved or provide current accounts to the poor.[25] Alternatively, it may indicate that savings banks can afford not to fully exploit profit opportunities. Since profit efficiency scores are relative measures and because we benchmark here only savings banks, any potential omitted variable bias (i.e. charitable activities) appears to apply differently to the population of savings banks. Therefore, it seems likely that at least some savings banks realize substantially higher profits given a production plan than others, thereby contributing to optimal profit estimates fairly high above what the majority of savings fails to realize.

Therefore, we derive marginal cost and average revenue estimates to calculate Lerner indices as competition proxies that avoid to confine market power with inefficiency on the basis of estimated efficient frontiers. Adjusted Lerner indices are on average 24%, which is also in line with results reported in cross-country studies of European banking markets. This result indicates that savings banks indeed possess some market power. However, we also find that the competitive stance is rather dispersed with a difference of 8 percentage points between the 25% and the 75% quantile. Furthermore, we find that average market power has been falling within our observation period from 32% to 19%, thus, indicating a sizable increase in competition in local retail banking markets. At the same time average revenues over total assets declined from 7.2% to 5.3%, which can partially be attributed to this increase in competition.

Third, we employ panel tobit regressions with fixed effects to estimate the relationship between efficiency and market power (Lerner indices), thereby testing the Quiet Life Hypothesis of Hicks (1935) more explicitly. We find a slightly negative relationship between cost efficiency and the Lerner index. This supports the QLH and implies that more market power induces banks to also incur more slack in the operating dimension of their business. The relation between profit efficiency and market power, however, is significantly positive. This does not lend support to the QLH.[26] Although statistically highly significant, both effects are of little economic significance. The maximum difference in the range of observed Lerner values influences, ceteris paribus, the cost efficiency levels of an average savings bank by only 3 to 4 percentage points.

In sum, we cannot reject the possibility of a quiet life among German sav-

[25] The variation in systematic abilities to realize profits could not be explained by differences in donations and other social activities since these are, to our knowledge, included in extraordinary expenses, which are not part of the operating profit figure used in our analysis.

[26] It is rather in line with the so-called structure-performance paradigm which posits that only the most efficient banks remain in the market and shape it's structure.

ings banks. Especially on the operating side, higher Lerner margins of savings banks, i.e. higher market power, are associated with cost inefficiencies. It is worthwhile to note, however, that we cannot control in this study explicitly for the (different) measures of savings banks to support the local communities out of their operating business, e.g. by staff using some of their time for activities not associated with the operating business. In the same vein we find on the profit side that savings banks in poorer areas tend to be less profit efficient lending support to the idea that they forgoe profits to support the local economy. While we argue that this most likely affects only the level of mean efficiency rather than it's relation to competition, future research on the role of such activities is certainly fruitful.

Appendix

Table 5
Descriptives of explanatory variables

Variable		Mean	SD	Min	25%p	75%p	Max
Lerner index	Lerner	0.24	0.06	0.06	0.20	0.28	0.52
Gross total assets	TA	2,015	2,701	108	687	2,316	31,794
Fee/interest income	NII	22.04	4.89	4.99	18.79	25.01	53.04
Mortgage loans/total loans	MLS	39.76	13.84	4.75	29.01	51.48	80.46
Loan loss reserves/total assets	LLR	3.61	1.37	0.04	2.67	4.46	9.82
Population per area	POP	0.54	0.66	0.04	0.13	0.77	4.01
Primary income per inhabitant	INC	18.23	3.53	10.08	16.15	20.48	29.58
GDP growth	GDPG	2.12	3.09	-15.25	0.39	3.75	26.28
Number of banks in region	BANKS	76	37	14	53	90	222

Notes: Lerner index (*Lerner*) as markup over price; total assets (TA) in millions of 2000 Euros; Fee over interest income (*NII*) in percent; Mortgage loans over total loans (*MLS*) in percent, Loan loss reserves over total assets (*LLR*) in percent; Population per area (*POP*) in thousand people per square kilometer; Primary income per inhabitant (*INC*) in thousand Euros per inhabitant; GDP growth (*GDPG*) in per cent; Number of banks (*BANKS*) indicates the number of banking institutions operating in the same region according to the statistics of the central bank. All data available for period 1996-2006 (4,934 observations), except macroeconomic data (*POP*, *INC*, *GDPG*) only available from 1996-2004 (4,007 observations).

Table 6
Correlations between fixed effect tobit regression covariates

	Lerner	TA	NII	MLS	LLR	MA	POP	HHINC	GDPC
Lerner	1.00								
TA	-0.06	1.00							
NII	0.26	0.04	1.00						
MLS	-0.37	0.07	-0.12	1.00					
LLR	-0.02	0.03	-0.31	0.01	1.00				
MA	-0.06	0.12	-0.03	0.02	-0.01	1.00			
POP	-0.01	0.54	0.09	0.02	0.06	0.05	1.00		
HHINC	-0.32	0.22	0.33	-0.01	-0.17	0.02	0.17	1.00	
GDPC	0.02	-0.03	0.05	0.04	-0.04	0.01	-0.08	0.03	1.00
BANKS	0.09	0.20	0.22	-0.09	-0.10	0.00	0.34	0.43	0.04

Table 7
Parameter estimates stochastic cost and profit frontier

Cost efficiency estimate			**Profit efficiency estimate**		
	Beta	*p-value*		*Beta*	*p-value*
A1	0.663	0.000	Q1	0.081	0.783
A2	0.304	0.009	Q2	-8.782	0.000
B1	0.441	0.000	R1	5.448	0.000
B2	-0.142	0.054	R2	3.159	0.000
B3	0.727	0.000	R3	1.638	0.009
B4	0.638	0.000	R4	-0.880	0.036
C1	-0.790	0.000	S1	0.742	0.000
A11	0.072	0.413	Q11	0.838	0.003
A12	-0.054	0.514	Q12	2.721	0.000
A22	0.037	0.672	Q22	-3.062	0.000
B11	0.038	0.014	R11	3.122	0.003
B12	-0.029	0.012	R12	-0.236	0.523
B13	0.036	0.026	R13	-0.678	0.150
B14	-0.167	0.000	R14	0.013	0.972
B22	0.069	0.000	R22	0.152	0.572
B23	-0.009	0.335	R23	0.060	0.812
B24	-0.028	0.000	R24	0.398	0.025
B33	0.037	0.047	R33	1.822	0.000
B34	-0.098	0.000	R34	-0.122	0.607
B44	0.226	0.000	R44	-0.291	0.020
C11	-0.235	0.000	S11	0.017	0.022
D11	-0.031	0.441	T11	-2.078	0.000
D12	0.016	0.704	T12	-0.028	0.962
D21	0.129	0.000	T21	-1.390	0.000
D22	-0.124	0.000	T22	0.942	0.001
D31	-0.159	0.000	T31	-0.309	0.302
D32	0.180	0.000	T32	-0.621	0.045
D41	-0.150	0.000	T41	0.138	0.443
D42	0.126	0.000	T42	-0.167	0.500
E11	0.119	0.000	U11	0.046	0.466
E21	-0.007	0.636	U21	0.046	0.130
E31	0.059	0.004	U31	0.019	0.624
E41	0.050	0.001	U41	-0.026	0.390
F11	0.238	0.000	V11	0.097	0.013
F21	-0.229	0.000	V21	-0.194	0.000
G1	-0.075	0.000	W1	-0.036	0.478
G2	0.001	0.132	W2	0.004	0.033
G11	0.006	0.120	W11	0.062	0.244
G12	-0.008	0.003	W12	0.057	0.026
G13	0.011	0.000	W13	0.013	0.681
G14	0.008	0.000	W14	0.024	0.191
G21	0.005	0.624	W21	-0.049	0.125
G22	-0.004	0.686	W22	-0.097	0.007
G31	-0.019	0.000	W31	-0.007	0.052
σ	0.832	0.000	σ	2.897	0.000
λ	12.708	0.000	λ	14.112	0.000

Notes: $\sigma = \sigma_u + \sigma_v$

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