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Income-specific estimates of competition in European banking

Ioannis Samantas¹

Abstract

This paper constitutes a new endeavor of investigating competitive conditions in European banking. Since the vast literature of competition modeling has produced mixed results, the proposed methodology goes one step further in order to investigate the intensity of key effects on bank competition as decomposed into specific bank activities. The sample comprises nine of the most developed banking markets in the European region during the period 2002-2010. The concluding remarks over the explanatory power of traditional collusion, relative market power and efficiency alongside other key controls on bank pricing conduct, provide considerable policy implications.

JEL Classification: D57; D40; G21; L11; L41

Keywords: Competition; Banking income, Collusion, Market power, Cost efficiency

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1. Introduction

A significant number of empirical applications of contemporary competition modeling has proposed indicators of market structure that suffer from either limited comparability across European countries and over time (Bolt and Humphrey, 2010). The structural approach, that is concentration ratios capturing the structural features of a market, is used in models or interpreted in conjunction with other performance measures to explain the competitive behavior of a specific industry without sufficing stand-alone to extrapolate competitive conditions. Even changes in concentration can be deduced regarding market entries and exits, a feature widely used in U.S for anti-trust purposes.

The next step of the literature is to build up a link between structural changes and bank performance, mainly on the grounds of the Relative Efficiency (RE) and the Structure-Conduct-Performance paradigm (SCP). Non-structural measures developed in response to potential endogeneity and deficiencies of structural models to quantify bank competition based upon the pricing conduct - the New Empirical Industrial Organization (NEIO) approach. Another case may be the degree of contestability in a bank market; few banks implement competitive pricing as price takers in order to discourage 'hit and run' behavior of new entries and thereby second their monopoly power.

Eschewing from conventional competition modeling, Heffernan (2002) tests for contestability and Cournot/Salop-Stiglitz behavior in UK banking industry by proposing a general linear model of competitive pricing of the important retail banking products: deposits, loans, credit cards and mortgages. There is also considerable attention in the literature to the so-called Boone indicator that measures competitive conditions insofar as they are expressed by efficiency dynamics. The

most recent models coming to shed light on the cross-country comparability of alternative competition measures and incorporate the switch of banking income to not-interest bearing sources are those of Carbo et al. (2009) and Bolt and Humphrey (2010), respectively. The econometric analysis applies an error-correction specification to distill competition measures from country-specific effects, and stochastic frontier methodology to provide rankings of banking sectors in terms of relative competitive measures of market structure.

This paper addresses the key effects of market power as proxied by the Lerner index not only in its aggregate form but also with respect to key income sources. The contribution therefore is threefold: a) the sample is focusing on nine developed countries within the European union since the advent of Euro in order to particularly focus on Europe up until the crack of the financial crisis, b) the emphasis is placed on the measurement of marginal costs in order to abstain from potential bias triggered by traditional modelling in the literature and c) it is the first time that potential effects on market power are identified at the income level.

2. Literature review

2.1. Cross-country studies of competition testing

The most widely applied methodology that falls within the NEIO approach is that of Panzar and Rosse (1987), identifying European samples classified in transition and developed economies along with other versions like EU-10, EU-15, European Monetary Union (EMU), Central and Eastern Europe (CEE) or other sub-regions. Monopolistic competition is quite common in large European samples in Staikouras and Koutsomanoli-Fillipaki (2006), in the EU-15 group according to Casu and

Girardone (2006) and in the developing (EU-12) region in the run up to the adoption of Euro (Weill, 2004). Delis et al. (2008) similarly found the PR statistic between 0 and 1 for Greece, Latvia and Spain during the period 1993-2004².

The *Bresnahan-Lau* methodology has met a handful of cross-country applications relatively to the popularity of PR statistic. In particular, an international sample is studied by Shaffer (2001) covering North America, Europe and Asia during the period 1979-1991. They provide evidence over contestability or, alternatively, Cournot-like oligopoly in Belgium, Denmark, France, Japan and US whereas competitive structures are evident in Canada, Germany, Italy, Norway, Sweden and Finland.

Neven and Röller (1999) argued about colluding behavior in the banking markets of Belgium, France, Spain, Germany, Denmark and UK over the period 1981-1999, albeit with a considerable diminishing trend over time. Last, Delis et al. (2008) applied additional dynamic error-correction specifications along the lines of Steen and Salvanes (1999) and concluded about potential bias of static models when they fail to capture short-run dynamics. Indeed, monopolistic competition is generally evident but in dynamic models the market power is relatively higher. Bikker (2003) report on a European sample within the period 1987-1997 with respect to deposits and lending markets. Especially, the deposit markets of the entire European region as well as those of Germany and Spain operate under monopolistic competition, while at the same time the same holds for the lending markets of Germany, Portugal, Spain, Sweden and UK.

² On the contrary, Molyneux et al. (1994) found monopoly conditions in Italy during the sub-period 1987-1989.

The *Lerner index* has been widely applied in the banking literature especially investigating correlations of the degree of competition with other contemporary competitive issues. Hence, it is rarely juxtaposed to the aforementioned methodologies so as to compare and thereby challenge the robust persistence of market power levels. Exception to this pattern is the study of Turk Ariss (2010), which identifies biases of efficiency and monopoly power embedded in the estimation of marginal costs. In addition, Carbo et al. (2009) made cross-country comparisons of various measures of competition by subtracting the macroeconomic effect with the Distribution-Free Approach (DFA).

2.2. Potential effects on competition

Claessens and Laeven (2004) investigated several effects on structural H-statistic for 50 countries over the period 1994-2001. They raised the issue that there is no need to have low concentration in order to experience competitive conditions (contestability). Rather the latter is also favoured by foreign-owned banks and limited restrictions on non traditional activities. On the other hand, Demirgüç-Kunt and Huizinga (1999) argue that interest margins are positively (negatively) related to foreign ownership (asset size), corporate tax and concentration across 80 countries 8 years prior to 1995. Hawtrey and Liang (2008) also investigate interest margins within the OECD group for the period 1987-2001. The evidence shows that scale effects tend to shrink profit margins while the opposite holds for market power, cost inefficiency, risk aversion, volatility of real interest rate and credit risk.

After a long-lasting period of segmented banking system in Europe and volatility in interest rates that induced high margins³, De Guevara et al. (2005) found no significance of collusion and relative market power hypotheses despite the ongoing deregulation process during the period 1992-1999. However, the more efficiency gains, default risk and the intensity of the economic cycle, the more inclined are financial institutions to behave monopolistically in the developed region. In contrast, the SCP hypothesis does hold across 31 European countries during 1994-2001 insofar as foreign ownership is employed (Clayes and Vander Vennet, 2008). The analysis also reports monopolistic tendency when banks enjoy more capital and engage in lending due to the integration of cost-effective risk management techniques.

Khiabani and Hamidisahneh (2012) conducted analysis on the Iranian banking sector and observed how the estimated market power increased over the period 1996-2006 in response to the deregulation of the market in the form of market entries. In particular, bank competition remained stable (until 2000) as soon as entry derestrictions took place and made them act more competitively.

Nguyen et al. (2012) found a non-linear relationship between market power and income diversification. Banks with low marker power engage in revenue diversification, while incumbent banks seem to turn into traditional interest-bearing activities in the ASEAN region.

3. Methodology

The underlying paper estimates the price mark-up over marginal cost combining the estimation of average prices and marginal costs at the bank level. The

³ See Saunders and Schumacher (2000).

average prices are estimated over total assets (TA) along the lines of Shaffer (1993) and Berg and Kim (1994), instead of other earning assets in an attempt to expand as much as possible the observations of the sample since 2002. First, I have to estimate marginal costs by means of running a translog cost function, similar to the version of Turk Ariss (2010) that excludes the use of price of borrowed funds as input price on the grounds that it presumably captures some degree of monopoly power of incumbent banks in the deposits market. The employed model takes the following form:

$$\begin{aligned}
\ln TC = & \alpha + \beta_1 \ln Q + \frac{1}{2} \beta_2 \ln Q^2 + \sum_{k=1}^2 \gamma_k \ln W + \sum_{k=1}^2 \theta_k \ln Z + \frac{1}{2} \sum_{k,j=1}^2 \kappa_{k,j} \ln W^2 + \\
& \frac{1}{2} \sum_{k,j=1}^2 \mu_{k,j} \ln Z^2 + \frac{1}{2} \sum_{k=1}^2 \xi_k \ln Q \ln W + \frac{1}{2} \sum_{k=1}^2 \pi_k \ln Q \ln Z + \frac{1}{2} \sum_{k,j=1}^2 \varphi_{k,j} \ln W \ln Z + \\
& \psi T + \frac{1}{2} \psi T^2 + \frac{1}{2} \psi T \ln Q + \frac{1}{2} \sum_{k=1}^2 \psi_k T \ln W + \frac{1}{2} \psi_k T \ln Z + \varepsilon
\end{aligned} \tag{1}$$

where TC : total costs, Q : total assets, $W1$: price of labour (personnel expenses over total assets), $W2$: price of physical capital (other operating expenses over fixed assets), $Z1$: fixed assets deflated by total equity, $Z2$: Off-balance sheet activities (non-interest operating income) deflated by total equity and T : time trend. I introduce fixed effects to account for different bank specificities and run model 1 separately for each banking market to reflect different technologies in the region. I also employ time dummies to interact with the deterministic kernel in order to capture time-varying and non-neutral technological progress in the banking sector. Homogeneity of degree one in input prices ($\sum \gamma_k = 1$) and symmetry conditions in all quadratic terms are imposed in model 1.

When it comes to the estimation of the Lerner index, I extrapolate the marginal costs by running the following model, which is schematically the partial derivative of total costs with respect to total assets (see Berger et al. 2009):

$$MC = \frac{TC}{Q} \left[\beta_1 + \beta_2 \ln Q + \sum_{k=1}^2 \xi_k \ln W + \sum_{k=1}^2 \pi_k \ln Z + \psi T \right] \quad (2)$$

It is then possible to construct the Lerner index (L) with respect to specific bank activities before delving into the analysis of competition determinants. According to the following structural model,

$$L_{i,t} = \frac{P_{i,t} - MC_{i,t}}{P_{i,t}} \quad (3)$$

where P denotes the average revenue of banks estimated by total income over total assets and MC the marginal cost derived through model 2. Their subscripts signify the use of Lerner index as the only proxy of market power at the bank level over time. The following model 4 encompasses the conditioning of market power to various information sets that comprise some key effects that have been under scrutiny in the literature and other variables depicting conditions in the banking industry, institutional and macroeconomic environment. Therefore, I maintain the structure of four specifications in models 4 and 5 in order to draw upon the changes of significance in the key coefficients employed.

$$L = f(BANKS, INDUSTRY, ECONOMY, DUMMIES) \quad (4)$$

There are some econometric issues involved in this case. First, I run Hausman test to see whether fixed or random effects are appropriate, an amended Wald test for present groupwise heteroskedasticity, Wooldridge test for first degree of autocorrelation and the significance of using time fixed effects (testparm). I come up with concurrent heteroskedasticity, autocorrelation in the model urging us to opt for cluster robust standard errors at bank level.

As a next step, the analysis goes further down by replacing the aforementioned Lerner index with indexes that are based upon specific bank activities, namely income

on loans, other interest-bearing income, fees and commissions and other non-interest income. Employing other sources of bank income is impossible since they lack considerable amount of information. In the underlying case, the Seemingly Unrelated Regressions (SUR) framework accounts for error autocorrelation within banks. In other words, running equation-by-equation OLS regressions would be consistent but, nonetheless, inefficient since all equations are interrelated through the correlation of the error term. It is also of interest to verify, through the Breusch-Pagan test, the degree of error correlation across the equations of each bank and thereby the imperative to employ the SUR framework.

The following model 5 comprises the contemporaneous pricing power of specific bank products based upon various information sets. The latter refers to the key features of banking entities, the market they operate within and other effects of economic environment. I denote as l_i the income on loans, other interest income⁴, fees and commissions and other non-interest income⁵:

$$\begin{bmatrix} l_1 \\ l_2 \\ l_3 \\ l_4 \end{bmatrix} = f(BANKS, INDUSTRY, ECONOMY, DUMMIES) + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \end{bmatrix} \quad (5)$$

For the SUR to be properly applied, the models of every income-specific Lerner index should have exactly the same size but different information set. Otherwise, the estimation falls into equation-by-equation OLS. As for the employed data, the selection of variables stems from the ability of the banking literature to pin

⁴ Interest income stemming from the trading book, investment securities and other short-term funds. It excludes insurance-related income (Bankscope).

⁵ Sustainable operating income that is related to the core business of a bank, totally demarcated from trading, derivatives, other securities and insurance income (Bankscope).

down a theory of the interconnection amongst them and to verify it empirically. Thus, the analysis picks up the factors (as well as those of the baseline model) that determine the highest possible explanatory power for the whole sample before it comes to repeat the regressions for every bank type. I also use bootstrapping methodology (Cameron and Trivedi, 2010) to reduce the inference bias induced by group-wise heteroskedasticity along with the within-panel correlation of standard error across models⁶. In some cases (commercial, other banks) where standard errors could not be computed by bootstrapping due to limited observations, I opt to exclude time effects from the analysis. I winsorise all dependent variables at 5% of each distribution tail in order to alleviate skewness persistence.

3.1. Competition determinants

Size is introduced in the form of log of total assets as a control variable in order to allow for the heterogeneous European sample that is associated with either relative market power or scale economies. I opt to plug in the model a quadratic term to verify whether it is the case of non-linear relationship between size and competition. The analysis tests the SCP paradigm with the significance of Herfindahl-Hirschman index (*concentration*), which is the sum of the squared market shares of all banks operating in a country. Taking into account Corvoisier and Gropp (2002), the effect of concentration may be different if expressed in terms of total deposits and loans. On the contrary to the use of aggregated information for the concentration proxy, the estimation of HHI stems from the sample data in order to examine how the endogenous synthesis of market shares may constitute an exogenous force towards

⁶ The Breusch-Pagan test is always rejecting the null hypothesis of no correlated residuals. Though not included for space considerations, they are available upon request.

market power. However, data from non-consolidated accounts by no means exclude large banks that otherwise would depict larger-than-national regions, since they comprise information of at least a part of banks' operations disaggregated at national level.

Market share reflects the ratio of a bank's total assets over those of a national banking industry. It is also expressed in terms of total deposits and loans to specify the channel, through which the efficiency hypothesis may hold. However, its statistical significance should be interpreted in conjunction with that of efficiency and concentration in order to give credit to the power of alternative competition theories. I use the first order lag of loan impairment charges over average gross loans as a proxy of *credit risk* abstaining from the traditional non-performing loans over gross loans since it lacks considerable amount of observations from 2002 and onwards. Moreover, the former is a direct measure of loan losses as it is deducted at the end of the year from profits and, hence, is taken into account when it comes to price bank products the year after; the latter is more obscure when it comprises doubtful loans that may or may not end up nonperforming.

I employ *cost-to-income ratio* as a direct measure of operational performance that may be attributed to superior management or production technologies. The RE hypothesis assumes that banks of higher efficiency engage in competitive pricing in order to grasp greater market shares and lead eventually to high market concentration. The degree of *income diversification* of bank portfolios is indicated by the proxy of off-balance sheet activities over total assets. It is ambiguous, however, whether the sign of effect is going to be positive or negative since banks willing to engage in other than traditional loan and deposit services may have a different strategic pricing contingent on the bank type, region, economic cycle, between others.

Total equity as a percentage of total assets (*capital*) to account of further size effects on the Lerner index of other non-interest income. The intuition here is that banks of greater size or high capital buffers are willing to expand non-traditional banking. *Liquidity*, proxied by the amount of liquid assets over customer deposits and short term funding, is an important driver in the models of interest-bearing Lerner indexes so as to quantify the correlation of pricing conduct with the ability of banks to facilitate a potential bank run.

Bank claims on the private sector over GDP proxy the *elasticity of aggregate demand* so as to verify whether the dependence on bank financing may be associated with benefits on the real economy or loan losses and bank instability. Apart from the effect of real GDP growth (*cyclical*) capturing the procyclical or countercyclical effect of market expansion on market power, the use of the real GDP per capita and inflation to see whether it is the case of population (*GDPPC*) or price effect (Inflation) of the business cycle in Europe. In addition, the control for *sector regulation* by the strength of legal rights index essentially measures the efficacy of regulatory laws with respect to collateral and bankruptcy issues in order to safeguard the rights of borrowers and lenders. It takes values between 0 and 10, with higher scores indicating that access to credit is facilitated to expand further.

I use dummies for the divergent *specialisation* of European banks, viz. commercial banks, savings banks, cooperative banks and ‘other’ banks that incorporate any bank holding and holding companies, clearing institutions and custody, finance companies, group finance companies, investment and trust corporations, investment banks, Islamic banks, other non-banking credit institutions, private banking and asset management companies, real estate and mortgage banks, securities firms and specialised governmental credit institutions. The last dummy

'other' is excluded for multicollinearity reasons. The analysis employs the Dummy Variable Least Squares (DVLS) version of the fixed effects modelling, using *country dummies* for Austria, Denmark, France, Germany, Luxembourg, Netherlands, Spain, Sweden and UK; Netherlands are excluded to eschew multicollinearity. I add *time dummies* to allow for time fixed effects after verifying their significance each time the information set is altered in the regression model.

Other effects already tested in the literature, namely regulation and supervision, liquidity risk, equity capital, implicit interest payments or degree of risk aversion turn out insignificant without affecting the regression output whatsoever. I end up with a parsimonious information set omitting additional bank-specific and institutional variables that lack sufficient statistical information during the underlying period.

3.2. Data

The sample encompasses features of financial statements of banks operating within nine developed countries of the European Union as they enjoy the most available data recently. Particularly, they amount to 19699 observations of 2752 banks in Austria, Denmark, France, Germany, Italy, Luxemburg, Spain, Sweden and United Kingdom. I retrieve data of unconsolidated accounts from the Bankscope database, macroeconomic and other regulatory variables from the World Bank and Eurostat. Banks are dropped off the sample that are not capable of preserving a satisfactory time dimension (3 years) during the period 2002-2010.

I get rid of the outliers in order to come up with appropriate values of the Lerner index that lie in-between negative infinity and one. All the determinants of bank competition as a second stage of our analysis narrow down the observations to 15219 and, even, to levels of 9503 observations. Last, the third stage substantiates the persistence of market power effects on income-specific Lerner indexes analysing a sample that fluctuates between 798 and 8798 observations.

[Insert table 1 here]

Table 1 displays the summary statistics of the key variables used in the stochastic frontier model 1 averaged by country over the period 2002-2010. It is evident that Germany dominates the sample enumerating more than the half of total observations (62.3%) while the year 2002 displays the least available information for all countries with a gradual escalation year by year. The sample includes fewer banks for Spain and relatively more banks for Italy and Austria; all the rest observations are close to the range of 413 to 587 banks.

[Insert table 2 here]

Table 2 summarise the key statistics of the variables employed in model 1 with total costs over total assets ranging from 3.8 in Spain to 7.1% in France while banks in UK and Luxembourg bear comparably higher costs in levels up to 4.7 and 8.2 millions of Euro, respectively. The structure of balance sheets in European banking is indicative after a closer look at the descriptive statistics of variables used in models 4 and 5 (table 3).

[Insert table 3 here]

4. Results

Table 4 depicts the mean values of the Lerner index and those indexes at the income level per banking industry as well as the average marginal costs that used for the estimation of the former. What really stands out in the column of marginal cost is the high values of the banking sectors in United Kingdom and France at about 6.7%; the remainder falls in-between the range of 3.8% in Sweden to 5.4% in Luxembourg. When it comes to compute the Lerner index, sectors with high marginal costs are expected to enjoy relatively greater competitive conduct. In contrast to the almost perfect competition in UK, France demonstrates 21%, which is higher than others values in countries of higher marginal costs. However, Sweden and Denmark enjoy the highest monopolistic rents at levels of circa 39 and 33.3%, respectively. The negative sign in Spain indicates irrational behaviour of bank managers pricing products below marginal costs.

Supposing that irrational behaviour takes the form of competitive market in the eyes of customers, the results are close to the competition efficiency scores estimated by Bolt and Humphrey (2010). In addition, the negative values in the last four columns, bank-specific indexes are supposed to constitute not a straightforward metric of income-specific market power but, alternatively, the relative contribution of each L_i to the construction of the Lerner index; from a different perspective, the analysis provides evidence of the specific products that sufficiently 'reimburse' the marginal cost. Ideally, the overall index (L) should be the sum of the 4 sub-indexes, although some sources are excluded from the analysis as unavailable and, thus, the lack of data does not permit us to delineate rankings of relative market power at income level, but rather to investigate its possible effects (table 4). I should note, however, that the weighting of each source in the construction of a banks' portfolio is

calibrated as if there is nothing missing in order to highlight the distance from the respective level of marginal cost and intuitively the degree of portfolio specialisation and strategic orientation of profit-maximizing institutions.

[Insert table 4 here]

I run model 4 for the whole sample (table 5) along with the inclusion of squared asset size and the disaggregated indicators of concentration and market share in the deposits and loans markets regressions. The analysis also allows for type-specific prediction of several factors on the pricing behaviour of four bank categories, namely commercial, cooperative, savings and ‘other’, which includes all the rest failing to construct a sufficient size of panel series (table 6). The necessity of doing so is to explain how the market power of each specialisation is formulated given the divergence of strategic priorities and corporate expertise.

[Insert table 5 here]

As table 5 indicates, there is a negative relationship between size and market power, particularly traced in cooperative, savings and ‘other’ banks (see table 6). Non-linearities are present through the quadratic term of asset size, which remains at the same levels significant with negative sign; positive correlation does exist at least up to a certain level of the asset size of savings and ‘other’ banks, reminiscent of contestable conduct or economies of scale that turn it negative; cooperative banks, however, experience a negative pattern only in lower values of total assets due to the homogenous German industry of equally sized institutions.

As for market structure, there is a positive stand-alone effect of concentration on market power. It is nonetheless significant in the panel fixed-effects model (column 3), rendering the investigation of concentration on loans and deposits an imperative along the lines of De Guevara et al. (2005). The Cournot-type oligopoly is confirmed by the significantly positive coefficient of deposit-related concentration of savings banks, alongside collusive practices in the loans markets of both savings and 'other' banks. Hence, specific bank types endorse the tendency of taking advantage of cost efficiency or monopolistic pricing to guarantee high profitability.

Contrarily opposed to the relative market power hypothesis, market share performs insignificant and negative coefficient with a positive indication traced in 'other' banks and cooperative banks. However, a more competitive pricing seems a common practice for commercial banks and for cooperative banks of relatively low market share. Efficiency structure hypothesis is verified by the negative and significant coefficient of cost-to-income ratio at the 1% level along the lines of Koetter et al. (2012), who concluded the same for US banks. In fact, the strategic option of banks to exploit lower costs in favour of their customers either in the form of lower loan rates or higher deposit rates (Vennet, 2002). Furthermore, credit risk motivates commercial and cooperative banks to apply higher profit margins, a strategy which is contradistinction with that of 'other' banks. In cases where the element of increased market share is not verified empirically as it is assumed by the theory, banks with lower costs have relatively higher margins along the lines of pure efficiency hypothesis.

Credit risk as proxied by loan impairment charges over average gross loans motivates commercial and cooperative banks to apply higher profit margins, contrary

to what 'other' banks appear to do. It bears negligible effect in the FE model as indicated by its opposite coefficient and statistical insignificance, though the omission of it causes almost a 3% loss of explanatory power. That is attributable to the total absorption of bank specificities in the panel FE model, since our heterogeneous sample may blur the trend of banks with different specialisation. Furthermore, portfolio diversification proclaimed by the use of off-balance sheet activities over total assets demonstrates a stable positive pattern with a level of significance up to 1% level. Thus, banks are willing to impose greater prices on products if their portfolios are well diversified against potential market and credit risks; however, that may come at the expense of bank solvency if coupled by potential diseconomies of scope.

The effect of GDP growth remains insignificant in all but one specification, while its positive sign implies procyclical force for savings banks rather than the opposing countercyclical practice of commercial banks. Thus in times of economic expansion, the former enjoys relatively higher margins exacerbating thereby the economic conditions down the road either seconding bubbles or deepening the recession spiral. However, the significance is not robust and, thus, any remark should be drawn with caution. Moreover, the elasticity of aggregate demand, which is a bank-oriented form of firm financing, is significant up to 1% level in the aggregate as well as in the case of commercial and cooperative banks. The negative effect means that as more credit is demanded and granted to the private sector, banks tend to narrow down profit margins.

After accounting of all fixed effects in European banking, the negative effect of lending-facilitating laws is considerably significant on market power and in particular for cooperative and commercial banking. Regulatory and supervisory

policies are expressed in the degree of law stringency acting preventively against monopolistic practices and in favour of borrowers and lenders in order to facilitate access to credit.

[Insert table 6 here]

Up next, I apply seemingly unrelated regressions of income-specific Lerner indexes on key features of market structure and power (Herfindahl index, asset size, market share) along with the quadratic term and disaggregated variables on bank deposits and loans. There is also need for different information set for each index since otherwise the methodology would fall into equation-by-equation OLS. The dependent variables are Lerner on loans (L_1), other interest income (L_2), fees (L_3) and other non-interest income (L_4). In particular, I include the following new variables most akin to the previous factors employed:

$$L_1 = f(\text{size, CONC, market share, cost-to-income ratio, loan losses, liquidity}) + \varepsilon_1$$

$$L_2 = f(\text{size, CONC, market share, liquidity, GDPPC, legal strength}) + \varepsilon_2$$

$$L_3 = f(\text{size, CONC, market share, diversification, private credit, inflation}) + \varepsilon_3$$

$$L_4 = f(\text{size, CONC, market share, diversification, equity, private credit}) + \varepsilon_4$$

Table 7 exhibits the lowest fit of the 830 observations, as R-squared ranges between 62.7% and 68.4%. The fact that banks specialized in lending/deposit-taking enjoy higher margins due to long-lasting relationships may justify the low explanatory power of the commercial modeling (Petersen and Rajan, 1995; Berlin and Mester, 1999). Furthermore, asset size seems to be highly significant for L-otherint and L-otherint models with a negative bearing while it turns negative for L-loans. In other words, as banks increase their size, prices on other interest and non-interest products

(loans) are plummeting (increasing). Non-linearities exist in all cases but L-otherint; as banks are getting bigger in asset size they tend to offer lower other interest and non-interest profit margins and higher loan rates. After a certain point, higher bank size goes the other way around making banks follow the exactly opposite trend.

[Insert table 7 here]

Moreover, insignificant correlation between concentrated structures in loans (deposits) with all Lerner indexes (L-loans) fails to corroborate the studies of Cetorelli and Gamberra (2001) and Angelini and Cetorelli (2003). The significant and positive effect of aggregate concentration on the Lerner index of fees partly shows the ability of European member states to exploit concentrated markets in order to boost their performance. Besides, the market share is negatively correlated with monopolistic pricing in the L-fees case; however, when it comes to their disaggregated constituents, banks tend to decrease (increase) prices on loans as their market share in the deposits (loans) markets is getting higher. Such evidence, coupled with relative efficiency gains (significant TC/TI), is indicative of the 'cream skimming' hypothesis, which assumes that the process of integration force foreigners to pick up banks of higher operational efficiency to grasp higher market shares monopolising loan markets. Accounting of the negative coefficient of market share in deposits, it gives more credit to the competitive conduct of banks in the deposit market so as to attract new customers. It is also interesting that the pattern of market share in the loan markets is opposite between traditional (loans) and off-balance sheet activities (otherint) possibly on account of risk sharing or hedging. These results are perhaps reminiscent of the hold-up problem of relationship banking, namely the

ability of banks with monopoly power and proprietary information to charge higher loan rates on customers.

Loan losses have a significant and negative impact on L-loans, implying that banks may tend to react by imposing lower loan prices and holding other risk-free investments in order to rationalize their loan books. Commercial banks with high share of liquid assets are willing to impose lower prices on loans, a pattern which is not accepted *ex ante*. In fact, banks may consider liquid assets as a safety net for potential losses and have no need for excessive risk-taking. In times of economic booms when inflation pressures are considerable, commercial banks lessen their fees and commissions in an attempt to boost the volume of transactions. In addition, legal framework that protects both borrowers and lenders enhances competition in other interest products.

In table 8, cooperative banks enumerate 6331 observations with a R-squared ranging from 64.5% in L-otherint to 89.4% in L-fees; the rest are up to levels of 77.9% and 77.5% for L-loans and L-othernint, respectively. The natural logarithm of total assets is negatively associated with all cases but L-fees at 1% level of significance while there exists non-linear relationship in the models of L-loans and L-fees. It is positive up to a certain level of assets when it turns negative at higher levels of scale economies. However, the trend in L-othernint is exactly the opposite, according to which the negative bearing switches to positive.

SCP paradigm is rejected on the grounds of insignificant effect of aggregate concentration on the price of any income source. I nonetheless observe negative association of concentration in the deposit market with L-loans. The positive sign in the loans markets, as Corvoisier and Gropp (2002) argued also about, instantiates the passing-through mechanism of causality in the specific case of cooperative banks.

[Insert table 8 here]

In addition, banks with greater market share behave competitively when they impose prices on other interest income, fees and commissions. Relative market power is scantily existent in the L-loans model having a negative (positive) bearing in the deposit (loan) market. It is also the case of efficient structure hypothesis for L-loans as the pertinent coefficient is negative at 1% level of significance with considerable credit losses making also banks reluctant to succumb to high prices on loans. According to it, amid competitive conditions in the market more efficient banks are likely to survive by means of eliciting greater market share from less efficient institutions (Demsetz, 1973).

The share of OBS to total assets has a considerably positive impact on L-fees and L-otherint corroborating the tendency of well-diversified banks to impose high margins. Bank capital demonstrates, as expected, a positive sign suggesting that a higher degree of risk aversion (high capital ratio) is transmuted to higher margin on OBS activities to make up for the inherent systematic risk⁷. What is more, the degree of liquidity of bank assets turns out to have a negative effect on L-otherint, as opposed to the case of more liquid commercial banks that prefer lower prices on loans.

Private credit is also an important factor for L-fees with a negative sign without losing significance when there is disaggregation of concentration and market share or the non-linear term of asset size. Moreover, the indication that the price effect of economic growth as well as proactive legal initiatives in favour of consumer

⁷ Alternatively, it may constitute a signal in the market of creditworthiness, but since the sample comprises only developed economies with strong legal environment, there need to be high capital buffers in order to restore depositor confidence (Claeys and Vennet, 2008).

protection operates procyclically towards monopolistic practices in fee and other interest income, respectively.

[Insert table 9 here]

Next, the regression output for savings banks (table 9) based upon 3390 observations in each model. The fit here is between 60.5% (L-otherint) and 95.4% (L-fees) while the rest settles at about 78%. Asset size does have a positive effect on L-otherint and a negative one on L-fees. Non-linearities are traced in the L-loans following a negative trend as soon as it turns negative in higher scale economies. In contrast, L-fees and L-otherint models report a positive-to-negative nexus, although the latter comes with 10% significance level. Concentration in EU member states has only a positive effect in the aggregate on L-otherint followed by the market share with the same pattern, as well.

Cost efficiency along with credit risk is negatively interconnected with L-loans at 1% level compatible with the practice of banks to exercise market power on the grounds of reducing costs. Thus, there is no indication of 'quit life' hypothesis, according to which banks not vulnerable to intense competition, managers by no means seek to maximise profits through an everlasting cost reduction (Berger and Hannan, 1998; Delis and Tsionas, 2009). Rather pure efficiency hypothesis comes into play, which sets out the ability of efficient banks to engage in monopolistic pricing without intending to higher market shares. In addition, diversified portfolios make banks feel safer to charge higher margins on OBS activities offsetting at least in part the positive effect of loan losses on competitive pricing of loans.

Moreover, banks with high share of liquid assets engage in competitive pricing on loans and monopolistic conduct on other interest-bearing activities;

however, that is in contrast with the pattern observed in cooperative banks. As cooperative banks operate in a decentralised system of rather national as well as regional outreach, liquid assets enable banks to enhance long-standing relationships through cheaper loans and more expensive prices on trading and investment securities. That may also be conducive from the opportunity cost that banks are bound to bear as a result of their obligation to withhold liquid reserves. Thus, higher loan prices compensates for potentially higher interest rates being available in the financial markets (Hawtrey and Liand, 2008). It is intuitively relevant the argument of Lakonishok et al (1992), according to which larger banks with low liquid assets share demonstrate a herding behaviour in excessive risk-taking in other (interest) income sources by charging higher profit margins.

More private credit and legal stringency are persistently significant and negatively related to L-othernint and L-otherint, respectively. As inflation and GDP per capita are insignificant I conclude that there pricing conduct is not contingent on different stages of economic development.

The remaining banking sector (table 10) constitutes a heterogeneous group of different financial institutions. In table 10, the results are produced out of 396 observations concluding to moderate R-squared values ranging from 66.1% in L-othernint to 74.7% in L-loans model; the 31.4% fit in L-fees model is the half of that in the first specification of no disaggregation and non-linear term. That may be attributed to the more terms that exacerbate the degree of multicollinearity.

As for asset size, it takes a positive coefficient at 1% significance level for L-otherint and negative for L-loans, L-fees and L-otherint. Besides, non-linear relationship between size and competition is evident in the first three models, in which savings banks seem to charge higher (lower) prices on loans and fees (other

interest-bearing products) but further down the road they reap the benefits of scale economies to reverse their strategy.

[Insert table 10 here]

In the model of L-loan, some sort of contestability justifies the negative sign of concentration in the deposits markets at 5% level of significance. On the other hand, collusion in the deposit market motivates incumbent banks to monopolise the market through higher margins on other interest income. Furthermore, banks tend to exploit their relative market power by imposing higher prices on other interest-bearing products and fees, and lower margins on loans and other non-interest activities. That is further decomposed into a negative bearing of market share in deposits markets on L-loans as well as positive (negative) effect of it in the deposits (loans) market.

Cost efficiency persistently contains a negative effect on L-loans corroborating the results of Maudos and De Guevara (2007) diversification in bank portfolios and demand elasticity positively affect L-othernint and L-fees, respectively. Legal stringency maintains its preemptive repercussion against market monopoly.

5. Conclusion

The advent of Euro and the concomitant formulation of a single market brought about considerable challenges and opportunities for the whole banking industry. The analysis of the market power in 9 developed markets suggests imperfect competition but not at levels that signify collusive tendency. However, the markets of Denmark and Sweden seem to experience more than 33% of price mark-up over

marginal cost whereas Spain lies in the other extremum with negative Lerner index highlighting potential predatory pricing or irrational pricing conduct since cost-raising strategy is not illustrated by high marginal costs.

I then attempt to explain competition in terms of which are the significant drivers conducive to it. In particular, monopolistic pricing appears a common practice in small-sized savings and 'other' financial institutions as far as their increased size makes them act competitively. In contrast, cooperative banks tend to impose low prices in an attempt for high market shares albeit at greater levels the same positive pattern holds. I take account of non-linearities, if any, between asset size and market power and provide evidence that different bank types tend to behave asymmetrically along the pace of increasing assets. Indeed, monopolistic pricing on other non-interest bearing products comes along in savings banks and 'other' banks of higher size while banks turn out to impose high prices on loans (except savings banks), fees (except commercial banks); other interest income activities are highly charged by savings banks of limited asset class. Our analysis, therefore, gives insight to the contribution of size on pricing conduct and its role in upcoming bank failures.

I endorse also the necessity for antitrust policies that stand up against collusive practices of concentrated markets, as savings (commercial) banks implement higher other interest income (fees). With concentrated loans markets, market power is also evident in 'other' and commercial banks while the same holds for the latter in deposits markets. Even so, cooperative ('other') banks enjoy higher profit margins on loans (other interest products) if the loans (deposits) market is considerably concentrated. Likewise, banks with high market shares tend to behave competitively opposing to the operation of 'other' banks, which appear to entertain higher fees due to their high market share in the deposits market. Hence, insignificance (except for

‘other’ banks) of the relative market power hypothesis suggests that policy makers should take account of certain banks enjoying high margins in specific product categories amid collusive practices across either loans or deposits markets.

In addition, the efficient operation turns out significant in European banking as low costs induce banks to charge lower interest rates on loans or higher deposit rates. However, that gives no credit to the inherent impetus of banks for higher market shares in order to exploit their power, with the exception of ‘other’ banks and in high levels of market share of cooperative banks. In contrast, commercial, cooperative with higher market shares impose low fees, while cooperative and savings banks utilise low other interest charges. Cost economies, therefore, constitute an indispensable catalyst of convergence towards competitive prices while incentives in favour of income diversification induce banks (cooperative, commercial, ‘other’) for higher fees and others (cooperative, commercial) for high other non-interest rates.

More capitalised banks (cooperative, savings) also tend to surrender to high prices of other non-interest bearing activities, an issue which is directly linked to capital requirements given that they constitute a considerable part of a bank’s portfolio. Furthermore, I signify the extension of Basel III in incorporating liquidity requirements towards stable institutions that provide liquidity to market participants effectively and manage payment transactions across different regions. Along the lines, more liquid cooperative (commercial) banks offer other interest products (cheap loans) at low prices although savings banks tend also to counterbalance the opportunity cost of liquid assets through higher non-interest rates.

Moreover, the need of additional requirements on a countercyclical basis exists only for savings given that commercial banks react contrarily to the business cycle. The latter, however, may imply poor monitoring and screening practices as

well as (limited) securitisation of low 'quality'. In addition, in economies of high GDP per capita and inflation cooperative banks tend to charge higher other interest prices to make up for possible losses on fixed loan rates. Hence, there is room for further institutional reforming especially in the cases of 'other' banks, which seem to exploit higher elasticity of aggregate demand and impose higher fees.

Table 1: Number of banks

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Austria	27	125	143	147	155	159	146	133	106	1141
Denmark	11	44	47	47	50	50	62	61	56	428
France	25	62	65	75	74	75	66	62	53	557
Germany	326	1328	1346	1619	1625	1609	1565	1515	1344	12277
Italy	18	19	22	572	581	595	582	555	406	3350
Luxembourg	27	50	54	52	51	55	53	44	27	413
Spain	8	9	15	68	69	52	56	61	48	386
Sweden	25	75	73	77	71	69	58	56	56	560
UK	14	50	61	71	76	82	83	81	69	587
Total	481	1762	1826	2728	2752	2746	2671	2568	2165	19699

Source: Own estimations of data retrieved from Bankscope.

Table 2: Summary statistics of variables in model 1

Country	TOTAL COSTS	TOTAL ASSETS	PERS EXP	OTHER OPER EXP	FIXED ASSETS	OBS	EQUITY
Austria	0.045	842.83	0.013	0.011	0.017	0.014	0.087
Denmark	0.053	625.65	0.019	0.016	0.012	0.018	0.140
France	0.071	2182.14	0.016	0.020	0.014	0.028	0.112
Germany	0.049	1443.27	0.015	0.011	0.015	0.011	0.068
Italy	0.044	1519.12	0.015	0.013	0.016	0.012	0.117
Luxembourg	0.052	4757.09	0.013	0.013	0.005	0.030	0.104
Spain	0.038	1345.14	0.011	0.009	0.017	0.009	0.117
Sweden	0.044	240.82	0.015	0.016	0.014	0.016	0.141
UK	0.062	8273.54	0.018	0.023	0.011	0.032	0.155
Average	0.049	1661.42	0.015	0.012	0.015	0.013	0.087

All figures are expressed as a percentage of total assets apart from total assets being in millions of Euro.
Source: Bankscope database.

Table 3: Variables of models 4 and 5

Variable	AUS	DEN	FRA	GER	IT	LUX	SP	SWED	UK
CONC	0.071	0.133	0.059	0.013	0.107	0.123	0.150	0.040	0.273
CONC (deposits)	0.073	0.075	0.062	0.010	0.113	0.127	0.155	0.040	0.373
CONC (loans)	0.071	0.142	0.053	0.011	0.136	0.126	0.127	0.048	0.424
Market share	0.008	0.021	0.016	0.001	0.003	0.022	0.023	0.016	0.015
Market share (deposits)	0.008	0.021	0.016	0.001	0.003	0.022	0.023	0.016	0.016
Market share (loans)	0.008	0.021	0.016	0.001	0.003	0.023	0.023	0.016	0.017
TC/TI	0.669	0.679	0.665	0.708	0.691	0.586	0.628	0.642	0.800
Loan impairment	0.893	1.204	-2.821	2.173	0.675	0.807	1.912	0.604	1.430
OBS/TA	0.014	0.018	0.028	0.011	0.012	0.030	0.009	0.016	0.032
EQ/TA	0.087	0.140	0.112	0.068	0.117	0.104	0.117	0.141	0.155
Liquidity	0.306	0.245	0.273	0.188	0.273	0.831	0.296	0.166	0.653
GDPGR	0.017	0.006	0.011	0.009	0.002	0.028	0.019	0.022	0.016
Private credit	1.147	1.878	0.996	1.116	0.970	1.486	1.633	1.167	1.754
GDPPC	30367	37989	27322	27789	24367	65344	20900	33044	30289
Inflation	1.811	1.944	1.867	1.600	2.222	2.689	2.833	1.811	2.200
Legal Strength	7.000	8.714	6.000	7.571	3.000	6.800	6.000	6.714	10.000

The estimation of CONC and market share along with their constituents takes account of the available information in Bankscope database, which enumerates up to 19761 observations of our sample. Source: World Bank, Eurostat and own estimations.

Table 4: Marginal costs and Lerner indexes

Country	MC	L	L1	L2	L3	L4
Austria	0.049	0.103	-4.107 (16.2%)	-0.488 (68.8%)	-16.312 (12.6%)	-90.441 (2.4%)
Denmark	0.048	0.332	-0.953 (60.4%)	-2.470 (21.3%)	-5.389 (14.4%)	-190.856 (3.9%)
France	0.068	0.210	-2.179 (47.4%)	-15.724 (27.8%)	-18.621 (18.1%)	-90.447 (6.7%)
Germany	0.052	0.118	-0.604 (66.4%)	-12.776 (18.2%)	-8.513 (12.3%)	-44.055 (3.1%)
Italy	0.049	0.126	-2.561 (70.3%)	-11.748 (15.9%)	-8.082 (10.9%)	-37.187 (2.9%)
Luxembourg	0.054	0.215	-3.081 (69.6%)	-77.182 (12.8%)	-5.010 (13.3%)	-72.152 (4.3%)
Spain	0.050	-0.010	-0.846 (2.1%)	-9.623 (61.5%)	-18.705 (35.4%)	-120.919 (1%)
Sweden	0.038	0.390	-1.061 (71.5%)	-21.066 (9.8%)	-3.650 (17.1%)	-89.223 (1.6%)
UK	0.066	0.003	-4.307 (7.7%)	-32.977 (41.7%)	-16.982 (47.1%)	-81.170 (3.5%)
Average	0.051	0.129	-1.062	-13.526	-9.255	-53.557

MC=Marginal Cost; L=Lerner index; L1=Lerner with respect to income on loans; L2=Lerner index with respect to other interest income; L3=Lerner index with respect to fees and commissions; L4=Lerner index with respect to other non-interest income. All estimates are expressed in average terms per industry sector with the last row estimating the averages of the 9-country sample. The percentage in the parentheses highlights the weights of income sources on banks' portfolio.

Table 5: Regression output (whole sample)

Competition Determinants	MODEL SPECIFICATION					
	(1)	(2)	(3)	(1)	(2)	(3)
LnQ	-0.0148*** (0.001)	-0.0112*** (0.002)	-0.0367*** (0.008)	0.0149* (0.008)	0.0337*** (0.011)	0.0577 (0.038)
(LnQ)^2	-	-	-	-0.0024*** (0.001)	-0.0037*** (0.001)	-0.0072** (0.003)
Concentration	0.1399 (0.101)	0.1504 (0.119)	0.2784*** (0.101)	-	-	-
Concentration (deposits)	-	-	-	0.1852* (0.098)	0.2347** (0.106)	0.2653*** (0.081)
Concentration (loans)	-	-	-	0.1630*** (0.050)	0.1604*** (0.054)	0.0530 (0.048)
Market share	-0.5458 (0.344)	-0.7222 (0.448)	0.0857 (0.770)	-	-	-
Market share (deposits)	-	-	-	-0.5367 (0.413)	-0.1282 (0.527)	1.0430 (0.662)
Market share (loans)	-	-	-	0.1381 (0.399)	-0.2285 (0.601)	-0.6136 (0.547)
Cost/TI	-0.5834*** (0.034)	-0.5738*** (0.046)	-0.5795*** (0.066)	-0.5821*** (0.034)	-0.5734*** (0.046)	-0.5722*** (0.065)
Loan impairment	0.0103*** (0.004)	0.0088* (0.005)	-0.0081 (0.008)	0.0107*** (0.004)	0.0092* (0.005)	-0.0082 (0.008)
OBS/TA	0.7486*** (0.181)	0.7920*** (0.180)	0.3526** (0.142)	0.7433*** (0.180)	0.7818*** (0.178)	0.3682** (0.154)
GDPGR	0.0164 (0.149)	0.0757 (0.198)	0.1038*** (0.017)	0.0489 (0.147)	0.1253 (0.193)	0.0874*** (0.017)
Private credit	-0.0582** (0.028)	-0.0330 (0.037)	-0.0106 (0.019)	-0.0979*** (0.026)	-0.1058*** (0.034)	-0.0433** (0.021)
Legal strength	-0.0071** (0.003)	-0.0075* (0.004)	-0.0098*** (0.001)	-0.0047* (0.003)	-0.0026 (0.004)	-0.0087*** (0.001)
Specialisation dummies	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES
Intercept	0.5166*** (0.051)	0.4372*** (0.061)	0.8223*** (0.055)	0.4701*** (0.052)	0.3971*** (0.062)	0.5511*** (0.126)
R-squared	0.750	0.770	0.901	0.753	0.776	0.901
Obs	15219	15219	15219	15216	15216	15216

Column (1): standard OLS regression with standard errors clustered at the bank level using country and time fixed effects to allow for unobserved heterogeneity; Column (2): Fixed effects model estimation with clustered standard error at the bank level along with probability country weights. In so doing, I apply the inverse of the number of banks operating within a national banking sector for cases where sample is overrepresented by some countries (e.g. Germany); Column (3): Fixed effects model estimation with clustered standard error at the bank level with time fixed effects. Standard errors are in parentheses while asterisks ***, **, * denote the significance level being at 1%, 5% and 10%, respectively⁸.

⁸ We drop the dummies of 2002 and Spain for multicollinearity reasons.

Table 6: Regression output per bank type

Competition Determinants	MODEL SPECIFICATION							
	Commercial		Cooperative		Savings		Other	
LnQ	-0.0085 (0.006)	-0.0085 (0.038)	-0.0171*** (0.001)	-0.0163** (0.006)	-0.0089*** (0.001)	0.0423** (0.017)	-0.0390*** (0.009)	0.1419*** (0.035)
(LnQ)^2	-	-0.0001 (0.002)	-	-0.0001 (0.001)	-	-0.0036*** (0.001)	-	-0.0124*** (0.002)
Concentration	0.0799 (0.176)	-	0.0272 (0.056)	-	-0.3895* (0.215)	-	0.0937 (0.293)	-
Concentration (deposits)	-	0.2490* (0.130)	-	-0.7215 (0.520)	-	-0.0990 (0.432)	-	0.1804 (0.217)
Concentration (loans)	-	0.1374** (0.066)	-	0.7243 (0.504)	-	-0.1395 (0.398)	-	0.2707* (0.153)
Market share	-1.2176*** (0.417)	-	-1.3911*** (0.265)	-	0.6267 (0.404)	-	1.0301* (0.556)	-
Market share (deposits)	-	-1.2171 (0.738)	-	-3.2271*** (0.670)	-	0.5640 (0.831)	-	0.8079 (1.193)
Market share (loans)	-	0.3098 (0.796)	-	1.8082*** (0.566)	-	-0.3401 (0.570)	-	0.7306 (0.689)
Cost/TI	-0.5112*** (0.072)	-0.5075*** (0.073)	-0.6216*** (0.012)	-0.6218*** (0.012)	-0.6448*** (0.020)	-0.6356*** (0.020)	-0.6431*** (0.030)	-0.6362*** (0.028)
Loan impairment	0.0197*** (0.004)	0.0197*** (0.004)	0.4730*** (0.128)	0.4812*** (0.123)	0.2974 (0.223)	0.2949 (0.219)	-0.0096* (0.006)	-0.0093 (0.006)
OBS/TA	0.6101*** (0.191)	0.6031*** (0.198)	3.7762*** (0.517)	3.7687*** (0.519)	5.1893*** (1.071)	4.8759*** (1.026)	0.6541** (0.269)	0.7350*** (0.260)
GDPGR	-1.2818*** (0.465)	-1.2030** (0.467)	0.0814 (0.098)	0.1429 (0.113)	0.4602** (0.184)	0.4771*** (0.180)	0.5598 (0.549)	0.6401 (0.546)
Private credit	-0.2033*** (0.056)	-0.2502*** (0.053)	-0.0981*** (0.020)	-0.1060*** (0.022)	-0.0394 (0.035)	-0.0464 (0.035)	0.2093 (0.130)	-0.0132 (0.154)
Legal strength	-0.0053 (0.005)	-0.0013 (0.005)	-0.0124*** (0.003)	-0.0104*** (0.003)	-0.0007 (0.004)	-0.0025 (0.004)	-0.0149 (0.010)	-0.0052 (0.011)
Country effects	YES							
Time effects	YES							
Intercept	0.7863*** (0.123)	0.8063*** (0.178)	0.7156*** (0.035)	0.7085*** (0.037)	0.4751*** (0.071)	0.3196*** (0.089)	0.3334 (0.274)	-0.0161 (0.309)
R-squared	0.656	0.655	0.833	0.834	0.870	0.875	0.796	0.809
Obs	1612	1611	8798	8798	4009	4009	800	798

OLS regressions for every single productive specialisation of banks (commercial, cooperative, savings, other) with clustered standard errors at the bank level utilising country and time fixed effects to allow for unobserved heterogeneity. The second column per bank type is the expansion of the information set to comprise the quadratic term of asset size as well as the concentration and market share with respect to deposits and loans markets. Standard errors are in parentheses while asterisks ***, **, * denote the significance level being at 1%, 5% and 10%, respectively⁹.

⁹ We drop the dummies of 2002 and Spain for multicollinearity reasons.

Table 7: SUR for commercial banks

Commercial	L-loans	L-otherint	L-fees	L-othernint	L-loans	L-otherint	L-fees	L-othernint
InQ	0.034*** 2.84	-0.716** -2.16	-0.021 -0.09	-3.629** -2.15	0.340*** 5.00	-2.127 -1.27	-2.515** -1.98	-32.562*** -3.60
(LnQ)^2		-			-0.022*** -4.73	0.103 0.84	0.175** 2.20	2.044*** 3.36
Concentration	-1.395 1.57	2.978 0.19	15.554** 2.20	98.523 0.94				
Concentration (deposits)					-1.484 -1.38	2.375 0.10	10.059 0.86	78.132 0.71
Concentration (loans)					-0.691 -1.42	7.454 0.60	4.973 0.57	-22.432 -0.31
Market share	-0.917 -1.01	28.477 0.93	-19.847** -1.99	50.969 0.54				
Market share (deposits)					-4.316*** -3.14	78.435 1.62	-24.921 -1.56	230.891 1.40
Market share (loans)					5.635*** 4.69	-65.045 -1.56	-2.822 -0.19	-308.762** -2.21
Cost/TI	-0.480*** -3.65	-	-	-	-0.416*** -3.36	-	-	-
Loan impairment	-0.064*** -4.37	-	-	-	-0.052*** -3.88	-	-	-
OBS/TA			14.791 0.53	104.071 0.59			13.811 0.51	93.689 0.60
EQ/TA				14.561 0.75				10.694 0.55
Liquidity	-0.157*** -2.76	-0.118 -0.13			-0.124** -2.28	-0.510 -0.52		
GDPPC		1.673 0.15				2.032 0.18		
Private credit			1.017 0.66	9.263 0.46			0.106 0.06	13.017 0.61
Inflation			-46.226*** -2.83				-51.325*** -3.10	
Legal strength		-1.036** -2.38				-1.038** -2.38		
Country effects			YES				YES	
Time effects			NO				NO	
R-squared	0.660	0.656	0.627	0.645	0.684	0.659	0.632	0.653
Obs	830	830	830	830	830	830	830	830

The table summarizes the results of commercial banks through two Seemingly Unrelated Regressions, the first one including total assets, market share and concentration apart from other controls and country fixed effects and the other analyzing the effect of total assets squared, concentration and market share with respect to deposits and loans. I opt to exclude time fixed effects since otherwise standard errors could not be estimated. The estimation allows for correlation among errors across the four models within each bank as well as heteroskedasticity by means of bootstrapping. The four models have as independent variables Lerner indexes specific to four distinctive sources of bank income: Loans, other interest income, fees/commissions and other non-interest income. T-statistic is reported below each coefficient while asterisks ***, **, * denote the significance level being at 1%, 5% and 10%, respectively.

Table 8: SUR for cooperative banks

Cooperative	L-loans	L-otherint	L-fees	L-othernint	L-loans	L-otherint	L-fees	L-othernint
lnQ	-0.019*** -5.24	-0.353*** -4.30	0.399*** 10.87	-3.747*** -15.89	0.053** 2.49	-0.574 -1.12	5.001*** 16.13	-11.900*** -8.23
(LnQ)^2			-		-0.006*** -3.67	0.018 0.34	-0.396*** -16.69	0.700*** 4.63
Concentration	0.585 1.62	-3.215 -0.54	0.355 0.07	16.908 0.84		-		
Concentration (deposits)					-13.175*** -3.03	80.076 0.34	-33.922 -0.20	-822.439 -0.68
Concentration (loans)					13.854*** 3.02	-83.087 -0.35	37.683 0.23	818.669 0.66
Market share	0.947 1.29	-113.862*** -3.87	-59.845*** -4.41	44.741 0.30				
Market share (deposits)					-26.258*** -4.94	140.772 1.50	47.742 1.17	154.660 0.62
Market share (loans)					23.452*** 3.03	-224.168*** -4.11	-21.603*** -5.31	-212.271 -1.37
Cost/TI	-1.087*** -21.93	-	-	-	-1.095*** -41.96	-	-	-
Loan impairment	-4.427*** -8.47	-	-	-	-4.612*** -5.05	-	-	-
OBS/TA	-	-	294.011*** 9.26	2166.794*** 13.26	-	-	271.227*** 9.16	2215.934*** 32.33
EQ/TA	-	-	-	115.077*** 5.08	-	-	-	116.478*** 59.67
Liquidity	0.007 0.24	-3.048*** -3.88	-	-	0.047 1.26	-3.263*** -4.62	-	-
GDPPC	-	12.327 1.11	-	-	-	16.067*** 8.65	-	-
Private credit	-	-	-5.097*** -3.17	8.358 0.79	-	-	-6.281* -1.93	9.174 0.30
Inflation	-	-	66.989* 1.82	-	-	-	34.653 0.95	-
Legal strength	-	1.000 1.16	-	-	-	1.000 1.16	-	-
Country effects			YES				YES	
Time effects			NO				NO	
R-squared	0.776	0.645	0.886	0.754	0.779	0.646	0.894	0.755
Obs	6331	6331	6331	6331	6331	6331	6331	6331

The table summarises the results of cooperative banks through two Seemingly Unrelated Regressions, the first one including total assets, market share and concentration apart from other controls and country/time fixed effects and the other analysing the effect of total assets squared, concentration and market share with respect to deposits and loans. The estimation allows for correlation among errors across the four models within each bank as well as heteroskedasticity by means of bootstrapping. The four models have as independent variables Lerner indexes specific to four distinctive sources of bank income: Loans, other interest income, fees/commissions and other non-interest income. T-statistic is reported below each coefficient while asterisks ***, **, * denote the significance level being at 1%, 5% and 10%, respectively.

Table 9: SUR for savings banks

Savings	L-loans	L-otherint	L-fees	L-othernint	L-loans	L-otherint	L-fees	L-othernint
LnQ	-0.005 -1.28	0.185 1.12	-0.125*** -3.21	6.242*** 9.67	-0.044*** -3.01	2.393* 1.66	2.216*** 6.03	6.305* 1.70
(LnQ)^2					0.003*** 3.34	-0.159* -1.89	-0.162*** -7.36	0.012 0.04
Concentration	-1.17 -1.06	61.661** 1.99	-11.216 -1.32	-185.585 -0.88				
Concentration (deposits)					-3.643 -1.03	51.943 0.24	-35.470 -0.56	-1041.498 -1.34
Concentration (loans)					-0.268 -0.10	138.899 1.62	31.849 0.58	689.327 0.92
Market share	0.176 0.57	-108.646*** -3.87	5.136 0.52	-377.764 -1.25				
Market share (deposits)					-7.610 -1.15	305.896 0.73	-21.090 -0.53	-959.774 -0.73
Market share (loans)					7.438 0.87	-385.343 -0.73	6.085 0.15	500.170 0.31
Cost/TI	-1.032*** -28.73				-1.032*** -34.39			
Loan impairment	-10.857*** -21.10				-10.820*** -22.35			
OBS/TA			415.473*** 14.21	4333.502*** 16.03			407.844*** 10.72	4474.753*** 5.60
EQ/TA				74.371** 2.10				67.813* 1.68
Liquidity	-0.321*** -6.79	11.551*** 19.91			-0.304*** -4.56	10.803*** 3.62		
GDPPC		22.278 0.83				37.148 1.63		
Private credit			-0.727 -0.56	-103.363*** -7.62			-2.108 -1.29	-104.621*** -8.14
Inflation			8.931 0.30				2.253 0.06	
Legal strength		-0.990*** -2.65				-1.015*** -3.03		
Country effects			YES				YES	
Time effects			NO				NO	
R-squared	0.778	0.605	0.953	0.777	0.780	0.610	0.954	0.779
Obs	3390	3390	3390	3390	3390	3390	3390	3390

The table summarises the results of savings banks through two Seemingly Unrelated Regressions, the first one including total assets, market share and concentration apart from other controls and country/time fixed effects and the other analysing the effect of total assets squared, concentration and market share with respect to deposits and loans. The estimation allows for correlation among errors across the four models within each bank as well as heteroskedasticity by means of bootstrapping. The four models have as independent variables Lerner indexes specific to four distinctive sources of bank income: Loans, other interest income, fees/commissions and other non-interest income. The information sets of the models are equally sized but not equivalent whatsoever; otherwise I would fall into the standard case of equation-by-equation OLS. T-statistic is reported below each coefficient while asterisks ***, **, * denote the significance level being at 1%, 5% and 10%, respectively.

Table 10: SUR for 'other' banks

Other	L-loans	L-otherint	L-fees	L-othernint	L-loans	L-otherint	L-fees	L-othernint
LnQ	-0.051*** 3.24	0.651* 1.88	-1.224*** -5.02	-8.790*** -6.12	0.231*** 2.79	-4.753** -2.38	3.736*** 3.19	-0.196 -0.02
(LnQ)^2		-			-0.014** -2.41	0.389*** 2.99	-0.324*** -4.29	-0.626 -1.14
Concentration	-0.635 -0.58	17.604 0.92	16.706 0.72	78.663 0.36				
Concentration (deposits)					-1.670** -2.27	38.086** 1.97	-0.174 -0.01	81.991 0.45
Concentration (loans)					-0.279 -0.85	-9.189 -0.78	10.526 0.80	92.924 1.15
Market share	-6.835*** -4.02	89.601*** 2.83	59.033** 2.57	-368.921** -2.29				
Market share (deposits)					-6.644** -2.11	36.130 1.11	157.260*** 4.37	-204.002 -0.82
Market share (loans)					4.617 1.26	-38.753 -1.25	-108.576** -2.55	-93.461 -0.31
Cost/TI	-0.358*** -3.85				-0.369*** -3.79			
Loan impairment	0.022 0.03				0.082 0.11			
OBS/TA			29.895 1.44	178.205** 2.54			37.087* 1.80	191.014*** 2.64
EQ/TA				-17.541 -0.87				-26.490 -1.17
Liquidity	-0.097 -1.59	-1.411 -1.10			-0.066 -1.08	-1.825 -1.38		
GDPPC		20.913 1.32				18.341 1.11		
Private credit			10.877** 2.55	3.890 0.11			5.368 1.05	-40.142 -1.10
Inflation			0.777 0.02				-6.282 -0.21	
Legal strength		-1.666*** -3.28				-1.676*** -3.06		
Country effects		YES				YES		
Time effects		NO				NO		
R-squared	0.746	0.661	0.781	0.663	0.747	0.664	0.314	0.667
Obs	396	396	396	396	396	396	396	396

The table summarizes the results of 'other' banks through two Seemingly Unrelated Regressions, the first one including total assets, market share and concentration apart from other controls and country fixed effects and the other analyzing the effect of total assets squared, concentration and market share with respect to deposits and loans. I opt to exclude time fixed effects since otherwise standard errors could not be estimated. The estimation allows for correlation among errors across the four models within each bank as well as heteroskedasticity by means of bootstrapping. The four models have as independent variables Lerner indexes specific to four distinctive sources of bank income: Loans, other interest income, fees/commissions and other non-interest income. T-statistic is reported below each coefficient while asterisks ***, **, * denote the significance level being at 1%, 5% and 10%, respectively

References

Angelini, P. and Cetorelli, N., 2003. The effects of regulatory reform on competition in the banking industry. *Journal of Money, Credit and Banking* 35, 663-684.

Berg, S.A. and Kim, M., 1994. Oligopolistic interdependence and the structure of production in banking: an empirical evaluation. *Journal of Money, Credit and Banking* 26, 309-322.

Berger, A.N., Klapper, L.F. and Turk-Ariss, R., 2009. Bank competition and financial stability. *Journal of Financial Services Research* 35, 99-118.

Berger, N.A. and Hannan, H.T., 1998. The Efficiency Cost of Market Power in the Banking Industry: A Test of the "Quiet Life" and Related. *The Review of Economics and Statistics* 80, 454-465.

Berlin, M. and Mester, L.J., 1999. Deposits and relationship lending. *Review of Financial Studies* 12, 579-607.

Bikker, A.J., 2003. Testing for imperfect competition on EU deposit and loan markets with Bresnahan's market power model. *Kredit und Kapital* 36, 167-212.

Bikker, A.J. and Groeneveld, J.M., 2000. Competition and concentration in the EU banking industry. *Kredit Und Kapital* 33, 62–98.

Bolt, W. and Humphrey, D., 2010. Bank competition efficiency in Europe: A frontier approach. *Journal of Banking and Finance* 34, 1808-1817.

Cameron, A.C. and Trivedi, P.K., 2010. *Microeconometrics using stata*. Vol. 5. College Station, TX: Stata Press, p. 166.

Carbo, S., Humphrey, D., Maudos, J. and Molyneux, P., 2009. Cross-country comparisons of competition and pricing power in European banking. *Journal of International Money and Finance* 28, 115-134.

Casu, B. and Girardone, C., 2006. Bank competition, concentration and efficiency in the single European market. *The Manchester School* 74, 441-468.

Cetorelli, N. and Gamberra, M., 2001. Banking market structure, financial dependence and growth: International evidence from industry data. *Journal of Finance* 56, 617-648.

Claessens, S. and Laeven, L., 2004. What drives bank competition? Some international evidence. *Journal of Money, Credit and Banking* 36, 563-583.

Claeys, S. and Vennet, R.V., 2008. Determinants of bank interest margins in Central and Eastern Europe: A comparison with the West. *Economic Systems* 32, 197-216.

Corvoisier, S. and Gropp, G., 2002. Bank concentration and retail interest rates. *Journal of Banking and Finance* 26, 2155-2189.

De Guevara, J.F., Maudos, J. and Perez, F., 2005. Market power in European banking sectors. *Journal of Financial Services Research* 27, 109-137.

Delis, M.D. and Tsionas, E.G., 2009. The joint estimation of bank-level market power and efficiency. *Journal of Banking and Finance* 33, 1842-1850.

Delis, M.D., Staikouras, K.C. and Varlagas, P.T., 2008. On the measurement of market power in the banking industry. *Journal of Business Finance and Accounting* 35, 1023-1047.

Demirgüç-Kunt, A. and Huizinga, H., 1999. Determinants of commercial bank

interest margins and profitability: Some international evidence. *The World Bank Economic Review* 13, 379-408.

Demsetz, H., 1973. Industry structure, market rivalry and public policy. *Journal of Law and Economics* 16, 1-10.

Hawtrey, K. and Liang, H., 2008. Bank interest margins in OECD countries. *The North American Journal of Economics and Finance* 19, 249-260.

Heffernan, S.A., 2002. How do UK financial institutions really price their banking products?. *Journal of Banking and Finance* 26, 1997–2016.

Khiabani, N. and Hamidisahneh, M., 2012. The effects of entry regulation on bank competition: The case of the Iranian banking industry. *Journal of Applied Economics* 15, 119-137.

Koetter, M., Kolari, J.W. and Spierdijk, L., 2012. Enjoying the quiet life under deregulation? Evidence from adjusted Lerner indices for US banks. *Review of Economics and Statistics* 94, 462-480.

Lakonishok, J., Shleifer, A. and Vishny, R.W., 1992. The impact of institutional trading on stock prices. *Journal of Financial Economics* 32, 23-43.

Maudos, J. and De Guevara, J.F. 2007. The cost of market power in banking: Social welfare loss vs. cost inefficiency. *Journal of Banking and Finance* 31, 2103-2125.

Molyneux, P., Lloyd-Williams, D. and Thornton, J., 1994. Competitive conditions in European banking. *Journal of Banking and Finance* 18, 445-459.

Neven, D. and Röller, L.H., 1999. An aggregate structural model of competition in

the European banking industry. *International Journal of Industrial Organization* 17, 1059-1074.

Nguyen, M., Skully, M. and Perera, S., 2012. Bank market power and revenue diversification: Evidence from selected ASEAN countries. *Journal of Asian Economics* 3, 688-700.

Panzar, J.C., Rosse, J.N., 1987. Testing for 'monopoly' equilibrium. *The Journal of Industrial Economics* 35, 443-456.

Petersen, M.A. and Rajan, R.G., 1995. The effect of credit market competition on lending relationships. *Quarterly Journal of Economics* 110, 407-443.

Saunders, A. and Schumacher, L., 2000. The determinants of bank interest rate margins: an international study. *Journal of International Money and Finance* 19, 813-832.

Shaffer, S., 1993. A Test of Competition in Canadian Banking. *Journal of Money, Credit and Banking* 25, 49-61.

Shaffer, S., 2001. Banking conduct before the European single banking license: a cross-country comparison. *The North American Journal of Economics and Finance* 12, 79-104.

Staikouras, C.K. and Koutsomanoli-Fillipaki, A., 2006. Competition and concentration in the new European banking landscape. *European Financial Management* 12, 443-482.

Steen, F. and Salvanes K., 1999. Testing for Market Power using a Dynamic Oligopoly Model. *International Journal of Industrial Organization* 17, 147– 77.

Turk Ariss, R., 2010. On the implications of market power in banking: Evidence from developing countries. *Journal of Banking and Finance* 34, 765-775.

Vennet, R.V., 2002. Cost and profit efficiency of financial conglomerates and universal banks in Europe. *Journal of Money, Credit, and Banking* 34, 254-282.

Weill, L., 2004. On the relationship between competition and efficiency in the EU banking sector. *Kredit und Capital* 37, 329–352.