

## **The cost of market power in banking: social welfare loss vs. cost inefficiency**

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### **Abstract**

This paper analyses the relationship between market power in the loan and deposit markets and efficiency in the EU-15 countries over 1993-2002. Results show the existence of a positive relationship between market power and cost X-efficiency, allowing rejection of the so-called quiet life hypothesis (Berger and Hannan, 1998). The social welfare loss attributable to market power in 2002 represented 0.54% of the GDP of the EU-15. Results show that the welfare gains associated with a reduction of market power are greater than the loss of bank cost efficiency, showing the importance of economic policy measures aimed at removing the barriers to outside competition.

Key words: market power, welfare loss, X-inefficiency, banking

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## 1. Introduction

Economic theory emphasizes the gains that perfectly competitive markets represent over those in which market power exists, insofar as the existence of market power implies a net loss of social welfare. In the case of the banking sector, the analysis of market power is especially important because it translates into a higher cost of financial intermediation, a lower volume of savings and investment, and therefore lowers economic growth.

The economic authorities have always been aware of the importance of reducing the levels of market power in banking markets so that they can be as competitive as possible. Thus, since the mid-1980s, both national and European authorities have adopted measures tending to the liberalization of banking markets with initiatives like the freedom to branch expansion throughout the country, the liberalization of interest rates, the opening of the sector to foreign competition, the elimination of compulsory investment coefficients, etc. More recently, the Second Banking Directive (implemented between 1991 and 1994 by the different European countries), the creation of the European Monetary Union in 1999, and the approval and implementation of the Financial Services Action Plan (FSAP) by the European Commission between 1999 and 2005 gave new impulse to the creation of a single European financial services market<sup>1</sup>.

In the academic sphere there has also been great interest in the measurement of the degree of competition in banking markets. Thus, in recent years there have appeared a substantial number of studies that use different indicators of competition (Lerner index, Panzar and Rosse's test, Bresnahan's mark-up test, conjectural variation parameter) with empirical applications whose purpose is to analyze competitive rivalry in banking markets<sup>2</sup>.

In the specific case of European banking sectors, the results of the studies carried out show the existence of market power (Neven and Röller, 1999<sup>3</sup>), not being possible to reject the situation of monopolistic competition (Bikker and Haaf, 2002; De Bandt and Davis, 2000; Fernández de Guevara *et al.*, 2006). In general, the studies referring to the European banking system have focused on measuring the degree of competition without analyzing the factors that may explain the existence of market

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<sup>1</sup> Barros *et al.* (2005) examines the changes that have taken place in banking in the European Union over the last few years. The authors note that perhaps the most significant development that has taken place in this sector has been the launch of the FSAP. The Report reviews progress that has been made in eliminating regulatory and non-regulatory barriers to trade in banking services and the degree to which European banking markets have become integrated.

<sup>2</sup> See a recent survey of this issue in Berger *et al.* (2004).

<sup>3</sup> Neven and Röller (1999) find significant monopoly collusive behaviour when they consider the corporate and household loan market across six European countries between 1981 and 1989.

power. Only Fernández de Guevara *et al.* (2005) try to identify the factors that explain this non-competitive behavior, using as an empirical reference the principal European banking sectors. Also, few studies have quantified the capacity of banking firms to set prices above the marginal costs in different banking products. As Fernández de Guevara *et al.* (2005) also show using aggregate information on interest rates, the degree of competition varies depending on the banking product considered (consumer loans, mortgage loans, deposits, etc).

An important question that has not received attention in the European case is the analysis of the consequences of market power for the efficient management of banks. In markets where the pressure of competition is low there may be an incentive for managers not to concern themselves with reducing inefficiency. The rationality of this behavior can be justified basically for the following reasons. First, the managers may have fewer incentives to manage the firm efficiently because the capacity to establish a price above marginal cost generates sufficient profits to justify their management. Second, thanks to market power, the managers may pursue objectives other than the maximization of profit, such as the growth of the firm, of the staff, or the reduction of labor conflict by means of higher wages, at the expense of efficiency. Furthermore, the managers may devote resources to maintaining and increasing the levels of market power.

The positive relationship between market power and inefficiency is known as the “quiet life” effect. In the case of the banking sector, the only study that tests this hypothesis is Berger and Hannan (1998) for U.S. banks, which considers the relationship between cost efficiency levels and the market power of banking institutions. Nevertheless, this study presents the limitation of using market concentration (the Herfindahl index) as a proxy for market power. Thus, recent studies show the limitations of using market concentration measures as indicators of banking competition (Berger *et al.*, 2004; Maudos and Fernández de Guevara, 2004; Fernández de Guevara *et al.*, 2005; Claessens and Laeven, 2004 and 2005; among others).

In this context, the study has three fundamental aims: a) to quantify the level of market power in European banking sectors distinguishing different types of products (loans and deposits); b) to analyze the relationship between X-inefficiency in costs and the market power of the European banks; and c) to estimate the loss of welfare associated with market power. In the latter case, we analyze and quantify the two ways in which market power generates costs: the loss of net social welfare (Harberger’s triangle) associated with the setting of prices above marginal costs, and the loss of efficiency in the management of the banks associated with the “quiet life” hypothesis.

Although we take as our starting point the study by Berger and Hannan (1998), the contributions of the study are as follows. Firstly, in order to avoid the limitations presented by the use of measures of concentration as indicators of competition, we use Lerner indices of market power. The advantage of the Lerner index over other indicators of competition (such as Panzar and Rosse's test) is that it allows market power to be proxied at bank level and its evolution over time analyzed. Secondly, considering that banks can exercise different market power on either side of the balance sheet, we estimate indicators of market power separately for the markets of loans and deposits, this being the only study (as far as we know) that deals with this question in the case of European banks. Furthermore, unlike what is usual in the literature which deals with the measurement of market power, we estimate the marginal costs necessary for the calculation of the Lerner indices on the basis of a frontier costs function. And thirdly, we estimate the welfare losses associated with market power, both those related to the social loss from higher prices (welfare triangle), and the possible losses attributable to the cost inefficiency generated by the relaxation in bank management (quiet life effect). To estimate the social cost associated with market power, instead of making assumptions regarding the demand elasticities and market power as in Berger and Hannan (1998), we use a direct measure of the welfare loss following the methodology used in Oroz and Salas (2003) and Fernández de Guevara and Maudos (2004).

Results referring to the banking sectors of the EU-15 show that although market power has decreased in the deposit market, the relative margins (Lerner index) have increased in the loan market. In the deposit market, margins are negative in the last years of the period analyzed, which suggests that banks follow a loss leader pricing strategy. We find a positive relationship between market power and cost X-efficiency, permitting us to reject the quiet life hypothesis. The social welfare loss attributable to market power in 2002 represented 0.54% of the EU-15 GDP, with substantial variability across countries. Our results suggest that the welfare gains associated with a fall in market power may be far larger than the loss of bank cost efficiency driven by this lower level of market power. This fact shows the importance of the economic policy measures aimed at removing the barriers or obstacles that protect national markets from outside competition.

The rest of the paper is structured as follows. Section 2 reviews the literature on the relationship between market power and efficiency. Section 3 describes the approximation used in the estimation of market power, efficiency and the quantification of welfare loss from mis-pricing. Section 4 shows the results of the estimation of market power and the welfare triangle referring to the banking sectors of the EU-15. Section 5 focuses on the relationship between efficiency and market power. Finally, section 6 contains the conclusions.

## **2. Market power and efficiency: background**

This section reviews the theoretical and empirical background of the relationship between market power and efficiency. The literature on this issue is related to the hypotheses that explain the relationship between market structure and performance. In fact, the quiet life hypothesis is considered a special case of one of these hypotheses (the market power hypothesis).

In this context, there are three main hypotheses explaining the relationship between market structure and performance. The first one is the collusion hypothesis, also called the structure-conduct-performance (SCP) hypothesis (Bain, 1956). This hypothesis postulates that greater profits are the results of collusion between the firms of the industry. Thus, the SCP paradigm assumes that higher concentration enables banks to collude, which translates into extra profits.

The second one is the efficient structure hypothesis (Demsetz, 1973) which proposes an alternative explanation for the positive correlation between concentration and profitability, affirming that the most efficient banks obtain both greater profitability and market shares and, as a consequence, the market becomes more concentrated. In this case, the positive relationship observed between concentration and profitability is spurious and simply proxies for the relationship between superior efficiency, market share and concentration. More recently, Berger (1995) divided this hypothesis into the X-efficiency and scale efficiency hypotheses.

The third one is the relative market power hypothesis. Shepherd (1982 and 1986) establishes that the variance in performance is explained by efficiency as well as by the residual influence of the market share, because market share captures the influence of factors unrelated to efficiency, such as market power and/or product differentiation. Under this hypothesis, individual market share is the proxy variable for assessing market power.

The quiet life hypothesis can be considered a special case of the market power hypothesis. This hypothesis postulates that the higher market power, the lower the effort of managers to maximize operating efficiency, a negative correlation thus existing between market power and efficiency. Up to date, in the empirical testing of this hypothesis, market concentration measures are traditionally used as proxy for market power.

Berger and Hannan (1989) summarize the reasons that may explain the influence of market structure, as a proxy for market power, on efficiency. First, according to the quiet life hypothesis, if banks that compete in a market with higher concentration can

set prices above marginal costs, managers do not have incentives to work as hard to keep costs under control. In other words, monopoly power allows managers to relax their efforts. Second, market power may allow managers to pursue objectives other than profit maximization (such as expense preference behavior). Third, in a non-competitive scenario, managers devote resources to obtaining and maintaining market power, which raises costs and reduces cost efficiency. And fourth, if banks enjoy market power, incompetent managers can survive without a wilful shirking of work efforts.

For the United States and the European banking sectors, although studies exist that test the hypotheses that may explain the profit-structure relationship (Berger, 1995 for the US and Molyneux *et al.*, 1994 and 1996; Goddard *et al.*, 2004; Goldberg and Rai, 1996; Maudos, 1998; Vander Venet, 2002 for the European case), as far as we know, there is only one study that analyses the relationship between market power and efficiency. More precisely, Berger and Hannan (1998) examine for the U.S. banking sector whether banks in more concentrated markets exhibit lower operating efficiency, and compare the efficiency cost of concentration with the loss measured by the welfare triangle. Results are consistent with the quiet life hypotheses and indicate that the efficiency costs estimated are much higher than the social cost occasioned by non-competitive pricing.

### 3. Methodology

#### 3.1 The Lerner index of market power

The Lerner index of market power defines the disparity between price (interest rate) and marginal cost ( $mc$ ) expressed as a percent of price. In the case of the banking sector, under standard assumptions (see Freixas and Rochet, 1997), the first order conditions of a profit maximization problem yields the following expression:

$$\frac{[r_L^* - r - mc_L]}{r_L^*} = \frac{1}{N\epsilon_L(r_L^*)} \quad \frac{[r - r_D^* - mc_D]}{r_D^*} = \frac{1}{N\epsilon_D(r_D^*)} \quad (1)$$

where  $r_L$ ,  $r_D$  and  $r$  are the interest rates of loans, deposits and interbank market, respectively,  $mc_L$  and  $mc_D$  are the marginal costs,  $\epsilon_L$  and  $\epsilon_D$  are the elasticities of demand for loans and deposits, and on the left hand side of each of equations appears the expression of the Lerner index of market power for loans and for deposits, respectively.

It is worth noting that according to expression (1), market power depends both on the elasticity of demand and on the number of firms competing in the market, which is usually proxied by measures of market concentration. Therefore, the advantage

presented by the use of the Lerner index as a market power indicator is that it captures the influence both of market concentration and of demand elasticity, being therefore preferable to the use of market concentration indicators. However, the limitation of the use of the Lerner index is that information on prices and marginal costs is required

### 3.2 The welfare triangle

As Oroz and Salas (2003) and Fernández de Guevara *et al.* (2005) demonstrate, the Lerner index offers a proxy of the welfare loss due to market power. Assuming a linear loan (deposit) demand (supply) function and constant marginal costs, the net social loss associated with misallocation of resources attributable to market power is the so-called welfare or Harberger's triangle. This social loss, expressed as a percentage of GDP, is proportional to the Lerner index:

$$\frac{\text{Welfare loss}}{\text{GDP}} = \frac{1}{2\text{GDP}} \left[ \frac{r_L^* - r - mc_L}{r_L^*} r_L^* L^* + \frac{r - r_D^* - mc_D}{r_D^*} r_D^* D^* \right] \quad (2)$$

### 3.3 X-Efficiency

Cost efficiency is measured using the concept of X-(in)efficiency and is regarded as a measure of the quality of management. The concept of cost efficiency measures the distance of a bank's cost relative to the cost of the best practice bank when both banks produce the same output under the same conditions.

We estimate X-inefficiency using the stochastic frontier approach proposed by Aigner *et al.* (1977) and Meeusen and van den Broeck (1977). This approach modifies the standard cost function by assuming that inefficiency forms part of the error term. Thus, the error term has two components. The first error component ( $v$ ) is symmetric and captures the random variation of the frontier across firms. The second error component ( $u$ ) is a one-sided variable that captures inefficiency relative to the frontier.

Under the assumption that both components of the composed error term are distributed independently, the frontier function can be estimated by maximum likelihood, with inefficiency derived from the residuals of the regression. Individual inefficiency estimates can be calculated by using the distribution of the inefficiency term conditional on the estimate of the composed error term. Thus, Jondrow *et al.* (1982) show that in the case of the half-normal distribution, the mean of this conditional distribution adopts the following expression:

$$E[u_i / v_i] = \frac{\sigma\lambda}{(1 + \lambda^2)} \left[ \frac{\phi(\varepsilon_i\lambda / \sigma)}{\varphi(-\varepsilon_i\lambda / \sigma)} - \frac{\varepsilon_i\lambda}{\sigma} \right] \quad (3)$$

Where  $\lambda = \sigma_u / \sigma_v$ ,  $\sigma^2 = \sigma_u^2 + \sigma_v^2$ ,  $\phi$  and  $\varphi$  are the standard normal distribution and the standard normal density function, respectively.

Taking into account that the aim of the paper is to analyze the quiet life hypothesis which relates market power to managers' efforts to control operating costs, the cost function we estimate excludes financial costs and, therefore, the price of deposits. Thus, the cost function, and hence the efficiencies estimated, include only operating expenses. If financial costs (and the price of deposits) were included in the cost function, efficiency scores would also capture the effect of market power in the deposit market, and, therefore, results will be biased.

We estimate a translog frontier cost function, where operating costs ( $c$ ) depend on two outputs ( $L$ =loans, and  $D$ =deposits), two input prices ( $w_l$ =price of labor and  $w_2$ = price of physical capital) and technical change (Trend):

$$\begin{aligned} \ln c_{it} = & \sum \gamma_h \ln w_{hit} + \gamma_L \ln L_{it} + \gamma_D \ln D_{it} + \frac{1}{2} \sum \sum \gamma_{hm} \ln w_{hit} \ln w_{mit} + \gamma_{LD} \ln L_{it} \ln D_{it} \\ & + \frac{1}{2} \gamma_{LL} (\ln L_{it})^2 + \frac{1}{2} \gamma_{DD} (\ln D_{it})^2 + \sum \gamma_{hL} \ln w_{hit} \ln L_{it} + \sum \gamma_{hD} \ln w_{hit} \ln D_{it} \\ & + \mu_1 Trend + \frac{1}{2} \mu_2 Trend^2 + \mu_L Trend \ln L_{it} + \mu_D Trend \ln D_{it} \\ & + \sum \mu_h Trend \ln w_{hit} + v_{it} + u_{it} \end{aligned} \quad (4)$$

Observe that a time dummy variable is specified to capture the effect of technical change. Symmetry and linear homogeneity in input prices restrictions are imposed. According to this expression, operating marginal costs for loans and deposits are given by the following equations:

$$mc_{L_{it}} = \frac{\partial c_{it}}{\partial L_{it}} = \left[ \gamma_L + \gamma_{LL} \ln L_{it} + \sum \gamma_{hL} \ln w_{hit} + \gamma_{LD} \ln D_{it} + \mu_L Trend \right] \frac{c_{it}}{L_{it}} \quad (5)$$

$$mc_{D_{it}} = \frac{\partial c_{it}}{\partial D_{it}} = \left[ \gamma_D + \gamma_{DD} \ln D_{it} + \sum \gamma_{hD} \ln w_{hit} + \gamma_{LD} \ln L_{it} + \mu_D Trend \right] \frac{c_{it}}{D_{it}}$$

Cross-country comparison of cost efficiency requires estimation of a common cost efficiency frontier for all banks of the sample used. However, as some papers argue (DeYoung, 1998; Dietsch and Lozano-Vivas, 2000; Lozano *et al.*, 2002), when analyzing bank efficiency, it is important to allow for variation in environmental conditions which are beyond the control of bank managers. With this aim, we introduce into the cost function some environmental variables that reflect how a bank's economic



environment can help to explain cost efficiency differences among countries. More precisely, we control for the influence of:

-Per capita income, defined as the Gross Domestic Product per capita at constant prices (GDP/POP). This variable affects numerous factors related to the demand and supply of banking services (mainly deposits and loans). Additionally, it is used as an overall indicator of institutional development.

-The population density is measured by the ratio of inhabitants per square kilometer (POP/Km<sup>2</sup>). It is expected to have a negative influence on operating costs since high levels of population density should make retail distribution of banking services less costly, which should improve cost efficiency.

-Bank branches per capita (BR/POP) in each national market is an indicator of banking services. High levels of BR/POP imply high costs of providing banking services, which should reduce bank efficiency.

-Real GDP growth (GDPGR) is the annual rate of growth of GDP. This variable is introduced to capture the possible effect of the business cycle.

-Additionally, dummy variables for each country are included to take into account the influence of other remaining potential variables which are specific to each banking sector (e.g. regulatory and/or institutional variables).

#### **4. Market power and welfare loss: empirical results**

Bank data were obtained from BankScope (Bureau Van Dijk) database. The sample consists of a total of 29,744 observations of non-consolidated<sup>4</sup> banking firms during the period 1993-2002. The banking sectors analyzed are those of the 15 countries of the European Union. The unbalanced panel data covers around 75% of bank assets included in the BankScope database in the European Union. It includes commercial banks, cooperative banks, savings banks and other types of institutions<sup>5</sup>. Banks with missing data needed for estimating marginal costs and/or interest rates were not included.

To estimate Lerner indices it is necessary to know the output prices that are included in the cost function. For this reason, and conditioned by the limited degree of disaggregation of the information contained in the data base used, the banking outputs considered were reduced to two broad aggregates from the balance sheet, one on the

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<sup>4</sup> The robustness of the results has been checked using consolidated statements. See footnote 11.

<sup>5</sup> An extended version of this paper, which contains a table of the descriptive statistics of the sample and variables used, is available upon request to the authors.

assets side and another on the liabilities<sup>6</sup>. Thus, bank outputs are loans (proxied by total earning assets) and deposits (proxied by customer and short term funding)<sup>7</sup>. Input prices ( $w$ ) are  $w_1$ = price of labor (personnel costs / total assets) and  $w_2$ = price of capital (operating costs except personnel costs / fixed assets). The loan interest rate ( $r_L$ ) is computed as the ratio of interest income and other operating income divided by loans. The deposit interest rate ( $r_D$ ) is computed as the ratio of interest expenses/deposits. The money market rate is proxied by the yearly average of the three month inter-bank deposit rate (reported by the Bank of Spain for the fifteen EU countries). The total volume of loans and deposits for each country needed to compute the welfare triangle (see expression 2) is taken from the European Central Bank.

Although Lerner indices are preferred to structural indicators of competition, we use bank market concentration, measured by the Herfindahl-Hirshman index (HHI), to check the robustness of our results. For each country and year, concentration is computed using bank-level data from the BankScope database. Considering that concentration is a characteristic of the market, the HHI is computed as the squared sum of the market shares of all banks existing in a country in the whole BankScope database, not only in our sample. Environmental variables come from different statistical sources: (GDP/POP) and (GDPGR) are obtained from the OECD's National Accounts; (BR/POP) comes from Bank Profitability (OECD) completed with the European Central Bank's Blue Book on payment statistics and National Accounts (OECD); (POP/Km<sup>2</sup>) is obtained from National Accounts (OECD) and NewCronoss (Eurostat).

The evolution of interest rates, marginal costs and absolute margins are reported in Table 1. Loan and deposit interest rates have decreased in all countries, in a context of reduction of inflation and nominal convergence among countries. Nominal convergence has accelerated in recent years as a consequence of the adoption of the euro in the European Monetary Union. Estimated marginal costs of loans are higher than those of deposits with relatively stable behavior in the period analyzed. Deposit marginal costs have decreased in almost all countries (with the exception of Austria, Belgium and Greece).

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<sup>6</sup> The bank outputs considered do not take into account the increasing importance of financial services offered by the bank as a result of activity in the assets management, investment banking or insurance sector. The way the literature usually deals with this issue is by introducing "non interest income" or "off-balance sheet activities" as an output in the cost function. However, the problem arises when dealing with the price of this output to calculate Lerner indices.

<sup>7</sup> The statistical information available in the database used (BankScope) does not permit the construction of prices or rates for loans and deposits. More precisely, the income statement does not disaggregate the information on "Interest income" and "Interest expenses" by type of asset or liability and, consequently, it is not possible to calculate the price of loans and deposits. For this reason, the banking outputs considered are total earning assets (all types of assets that generate interest income) and deposits (customer and short term funding).

The evolution of loan ( $r_L - r - mc_L$ ) and deposit ( $r - r_D - mc_D$ ) absolute margins are shown in the last column of Table 1. Loan margins rose over the period in the majority of countries (from 0.7% in 1993 to 2.1% in 2002 for the average of the EU-15) while deposit margins fell. This suggests that market power may have increased in loan markets while falling in deposit markets. In recent years (1997-2002), margins were negative in the deposit market, suggesting a loss leader pricing strategy: although deposits may not be profitable by themselves, they allow banks to capture customers, and banks can exercise market power in the loans market.<sup>8</sup>

Table 2 shows the evolution of the Lerner index of market power for each of the EU-15 countries, and for the EU-15 weighted average. Market power has increased in the loans market in all the European banking sectors with the exception of Sweden and the United Kingdom. In 2002, the highest values of the index correspond to Luxembourg (0.51) and Portugal (0.46), which together with France, Germany, Greece, Italy, Netherlands and Spain are situated above the average of the EU-15 (0.32). At the opposite extreme are the UK and Sweden, with low levels of market power in the loans market<sup>9</sup>.

In deposits, market power has decreased in all countries except in Finland, Sweden and the UK. Furthermore, from the mid-1990s, the Lerner index is negative in almost every country. The fact of finding negative margins in the deposit market is not driven by the level of marginal operating costs, but by the spread between the money market rate and the deposit interest rate, which is negative in most European banking sectors.<sup>10</sup>

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<sup>8</sup> Although in some countries the margin on deposits is negative and exceeds the positive margin on loans, the total margin, calculated as  $(r_L - r - mc_L)L + (r - r_D - mc_D)D$  only is negative in Luxembourg. Luxembourg is an exceptional case as, according to the European Central Bank, the ratio of deposits (from non-credit institutions) / GDP in 2002 was 9 whereas in loans (to non-credit institutions) “only” 5, thus dominating the effect of the negative Lerner index in the deposit market power over the degree of market power in the loan market.

<sup>9</sup> A proper evaluation of market power in credit markets would require us to measure risk-adjusted marginal costs. For this purpose, it would be necessary to get information on variables such as default probabilities, loss given default, etc. Unfortunately, this kind of information is not available in BankScope. As far as we know, the only paper that estimates relative margins corrected for credit risk is Martín, Salas and Saurina (2005) for the Spanish case. In this paper, the authors calculate the credit-risk-adjusted interest rate estimating probabilities of default and the loss given default for several loan classes using the Credit Register database of the Bank of Spain, which is a confidential database.

<sup>10</sup> Due to lack of information on interest rates, the computed output prices are averages instead of marginal prices. The average returns reflect the maturities of the underlying assets with biased effects on the spread between prices and money market rates. With the aim of analyzing the sensitivity of the evolution of market power, we have calculated spreads between prices and average money market rates computed for different periods (three and five years). Since market interest rates decrease in the period analysed, results show that margins are lower (higher) in the loans (deposits) market, although the pattern of the evolution of market power remains: Lerner index decreases in the deposits market and increases in the loans market.

With this estimation of the Lerner index as a base, we can compute the social loss due to misallocation of resources attributable to market power from expression (2). Table 3 shows the welfare loss associated with imperfect competition as a percentage of GDP. The evolution of the EU-15 average suggests that in the period between 1993 and 2002, there was a downward trend in the welfare loss attributable to market power broken down in the last years. Whereas in 1993 the social loss of market power was 0.54% of GDP, it decreased to a 0.27% of GDP in 2000, showing a sharp increase since then, and recovering the initial level of 0.54% of GDP in 2002. Given the differences in the evolution of market power of loans and deposits, the evolution of the welfare loss is due to the combination of market power exercised in the loan and deposits markets, counteracting the effects of the latter on the former until 2000. So, it seems that the loss leader strategy adopted by European banks by which banks set interest spreads under their marginal costs in the deposits markets -so that they can establish a relationship with the client which allows banks to exercise market power in loans-, was not only profitable for banks, but also for society as a whole given the reduction of social losses until 2000. Since then, the effects of greater market power in the loan markets have dominated generating higher social losses.

The data also show that there is substantial variability in the indicator across countries. Thus, in 2002, and apart from Luxembourg - whose high social efficiency is driven by the importance of the banking sector in the economy - countries with welfare losses over 1% of GDP such as Denmark (1.1), Spain (1.4), Portugal (1.6) and Ireland (1.8) coexist with countries with losses below 0.5% such as United Kingdom (0.4), Netherlands (0.3), Belgium (0.3) and specially France (0.03). When interpreting these results, one must note that the value and the evolution of the social inefficiency of banking intermediation depend on two factors (see expression 2): the evolution of market power and the evolution of the ratio of banking assets (loans and deposits)/GDP. Thus, in some countries the magnitude of the welfare loss is due more to the banking orientation of the financial structures in each country rather than to the market power of banks. Furthermore, it is of concern to observe a high degree of bank market power in countries that are strongly orientated towards bank financing, such as Ireland, Portugal and Spain.

## **5. The relationship between market power and efficiency: empirical results**

Table 4a shows the mean efficiency scores. Average cost efficiency is quite stable and ranges around an average level of 86%, which is in accordance with former studies of the EU (Altunbas *et al.*, 2001; Maudos *et al.*, 2002). If we take as reference the last year analyzed, Finland (93.2%), Ireland (91.9%) and the United Kingdom (89.9%) are the most efficient banking sectors, while the most inefficient are Portugal

(74%), Belgium (77.6%) and Luxembourg (80%). If we focus on the evolution over time, there are important differences among countries, efficiency cost increasing in seven of the EU-15 countries.

Just as the existence of market power implies a loss of welfare, the inefficiency of banking institutions is also a cost for society. According to Maudos and Fernández de Guevara (2004), banks establish their margins as a function of the operating costs they have to bear. Thus, these authors obtain a high elasticity of banking margins against levels of efficiency. It can thus be understood that in the final instance, it is the consumer of banking services that have to pay the costs of the operating inefficiency of banking institutions. We can, therefore, compare the social loss of market power with the costs for society represented by the inefficiency of the banks. Table 4b shows, as a percentage of GDP, the difference between the minimum costs of production that define the frontier of efficient behavior, and the effective costs incurred by European banking institutions. For the European Union as a whole, the social cost of bank inefficiency increased slightly from 0.34% in 1993 to 0.4% of GDP in 2002 as was to be expected in view of the slight downturn of cost efficiency levels during the period analyzed. By countries, it can be seen that the highest losses associated with inefficiency are found in Luxembourg (2.4%), Belgium (1.1%), Portugal (0.6%) and France (0.5%), while in 2002 the lowest losses of efficiency are observed in Ireland (0.007%), Finland (0.1%), United Kingdom (0.12%) and Sweden (0.16%).

If we compare the levels of social welfare loss derived from market power (table 3) with the magnitude of welfare loss associated to banks' cost inefficiency (table 4b), we can see that, in general, the social welfare losses derived from market power are greater than those from X-inefficiency. Thus, in 2002, the former was 0.54% of GDP, in contrast to the 0.4% of X-inefficiency. On average, over the period, social losses derived from market power are a 23% higher than that of X-inefficiency.

Once we have computed the social loss from both the level of market power and cost efficiency we focus on the relationship between them. According to the quiet life hypothesis, part of the level of inefficiency is caused by market power. To test the validity of the quiet life hypothesis for the European banks, we estimate an equation where the dependent variable is cost efficiency and the independent variables are the Lerner index and other variables that potentially influence bank efficiency. These factors include both bank and country characteristics that may be associated with managerial decisions. Specifically, the explanatory variables of cost efficiency are the following:

-Concentration: traditionally, studies use market concentration measures as proxy variables for market power. For that reason, we also use market concentration

(HHI) as a first proxy variable for competition. Since no information is available on banking activities in European local markets, our measures of concentration are calculated at a national level. Initially, the HHI is measured in terms of total assets (HHIA) to check the similarities with the results of Berger and Hannan (1998). Alternatively, taking into account the evidence offered before, and the results of Corvoisier and Gropp (2002) and Fernández de Guevara *et al.* (2005) in which the effect of concentration is different in different banking products, the HHI is used in terms of loans (HHIL) and deposits (HHID). However, some recent papers show the limitations of using concentration measures to proxy for the competition environment in banking markets (Berger *et al.*, 2004; Fernández de Guevara *et al.* 2005; Claessens and Laeven; 2004 and 2005). Moreover, the relationship between the level of competition and concentration is not straightforward and depends on the conduct of the banks in the market. Consequently, as our preferred alternative to concentration ratios, we use the Lerner index as a direct measure of competition.

-Market power: to test the effect of market power on managers' efforts to control operating costs, the Lerner index is introduced as a determinant of cost efficiency. A negative influence of cost efficiency would favor the quiet life hypothesis.

-Size: the size of each bank, measured by total assets (TA), is included to test if larger banks are able to get better management than smaller ones. Berger and Humphrey's (1997) review article concludes that there is consistent evidence that larger banks tend to be more efficient than small ones.

-Specialization (S): we distinguish four types of banking specialization: commercial bank (S1), savings bank (S2), cooperative bank (S3), and others (S4) - investment bank, medium and long-term credit bank, real estate/mortgage bank, specialized government credit institution, etc. Dummy variables (which take the value 1 when the bank adopts specialization and 0 otherwise) are used to control for the possible influence of institutional specialization on cost efficiency (S4 is the group of reference in the estimations).

The regression model is the following:

$$EF_{it} = f(\text{Market power}_{it}, \ln(TA_{it}), S) \quad (6)$$

where  $i$ =bank,  $t$ =year,  $EF$  is the level of efficiency and market power is, alternatively, the HHI concentration index or the Lerner index.

Since operating cost efficiency (our dependent variable) is a variable bounded between zero and one, it is necessary to use a non-linear specification of the functional

form  $f$ , rather than a linear regression model. Using in equation (6) the logistic functional form

$$\text{logistic}(EF_{it}) = \frac{e^{\beta_1 \text{Market power}_{it} + \beta_2 \ln(TA_{it}) + \sum_{c=1}^4 \beta_3 S_c}}{1 + e^{\beta_1 \text{Market power}_{it} + \beta_2 \ln(TA_{it}) + \sum_{c=1}^4 \beta_3 S_c}} \quad (7)$$

which can be easily linearized via the logit transformation as follows,

$$\ln \left[ \frac{\text{logistic}(EF_{it})}{1 - \text{logistic}(EF_{it})} \right] = \beta_1 \text{Market power}_{it} + \beta_2 \ln(TA_{it}) + \sum_{c=1}^4 \beta_3 S_c \quad (8)$$

Table 5 reports the results of the estimation of expression (8). This equation was estimated introducing both individual fixed effects and time effect. Column (1) shows results using market concentration in terms of total assets (HHIA) as a proxy variable for market power. The coefficient of the HHIA is negative but not statistically different from zero. The sign -although not the significance- is similar to the result of Berger and Hannan (1998) showing evidence in favor of the quiet life hypothesis. However, if we introduce the effect of concentration in the loan (HHIL) and deposit (HHID) market (column 2), the influence is positive and statistically significant in the loan market and negative in the deposit market. This result implies that operating in more concentrated markets is associated with less cost efficiency in the deposit market but with more efficiency in the loan market. As in Corvoisier and Gropp (2002) and Fernández de Guevara *et al.* (2005), this result shows the importance of distinguishing the effect of concentration by type of product, as done in this paper. Thus, the results, though they support the quiet life hypothesis in the deposit market, allow us to reject this hypothesis in the loan market, as banks in more concentrated loan markets exhibit higher (and not lower) cost efficiency. This result must be taken with caution. As we have mentioned before, concentration indices have been calculated at national level, whereas by the nature of banking services, competition takes place at a lower than national level.

Table 5 also shows the elasticities of cost efficiency w.r.t. changes in the explanatory variables. In terms of economic impact, a 100% increase in the HHI in the loan (deposit) market would cause efficiency to increase (decrease) by 0.99% (0.86%). Thus, an increase in loan market concentration from that of the least concentrated European loan market (HHIL=180.42 in Germany in 2002) to that of the most concentrated market (HHIL=2,384.4 in Finland), would increase cost efficiency by 9%. In the deposit market, an increase in market concentration from the minimum value corresponding to Germany (188.28) to the maximum of the Netherlands (3,196.2), would decrease efficiency by 12%.

Regarding the rest of the explanatory variables of cost efficiency, size has a positive and statistically significant influence on efficiency, indicating that larger banks are more cost efficient. Its economic impact is larger than that of concentration, showing an elasticity of 1.85. Thus, if a bank duplicates its size (a 100% increase), its cost efficiency would increase by 1.85%. With increasing returns to scale, greater size may increase bank efficiency through more efficient scale. The type of banking specialization does not seem to influence banks' efficiency, since none of the dummy variables representing specialization is statistically significant.

As we have mentioned above, recent studies have shown the limitation of using market concentration measures to proxy for the degree of competition in the markets. For that reason, and because it is impossible for us to calculate HHI indices at a lower than national level, column (3) of table 5 shows results using the Lerner index as proxy for competition. In this case, the results show that the coefficient of the Lerner index, in the loan market as well as in the deposit market, is statistically positive (at 1% level), which indicates the existence of a negative relationship between competition and cost efficiency in the European banking sectors. In terms of economic impact, a 100% increase in the Lerner index in the loan (deposit) market would produce an increase of 0.29% (0.05%) in cost efficiency. In respect of the influence of the rest of the explanatory variables of efficiency, the results are similar to those corresponding to column (2)<sup>11</sup>.

The difference of results obtained, in terms of the impact on efficiency, between market concentration and Lerner index, shows the existence of a low relationship between the two variables. In fact, the correlation coefficient between the Lerner index and the HH index is -0.07 in the loan market and 0.07 in the deposit market, and is not statistically significant in either case. Therefore, the absence of correlation between the Lerner index and the HH index, as well as their different influence on cost efficiency, shows the limitations of market concentration measures as proxy variables for competition.

These results permit us to reject the quiet life hypothesis in the European banking system<sup>12</sup>. There may be several reasons explaining the positive effect of market

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<sup>11</sup> Following a comment by a referee, we have checked the robustness of the results using consolidated instead of unconsolidated bank data. Results (based on a sample of 23,220 observations) show that a) Lerner indices of market power are very similar (the Pearson correlation coefficient between the Lerner index using consolidated vs. unconsolidated bank data is 0.98 for loans and 0.97 for deposits; b) cost X-inefficiency is a little higher (0.91 vs. 0.86 for the average of the period analysed); and c) the quiet life hypothesis is rejected. Therefore, the conclusions of the paper remain.

<sup>12</sup> The quiet life hypothesis is also rejected if the Lerner index is computed using average (instead of marginal) money market rates.



power on efficiency. Firstly, as Petersen and Rajan (1995) argue, banks with monopolistic power due to their location (close to the firms) have lower costs of monitoring and transacting with firms<sup>13</sup>. Secondly, banks that possess market power due to geographical or technological specialization may have cost advantages in screening certain groups of borrowers (Kaas, 2004). Thirdly, market power allows banks to enjoy greater profits, which may create incentives to behave prudently (enhancing bank stability). This more prudent behavior leads to the selection of less risky activities with lower costs of monitoring, therefore increasing cost efficiency. And fourthly, the banks that enjoy greater market power are under less pressure to increase the quality of banking services (less availability of means of payment, worse attention to customers, etc.), thus decreasing operating cost and increasing their cost efficiency.

Having reached this point, it is of interest to value the effects of economic policy measures aimed at increasing competitive rivalry in European banking markets. This poses the following questions. Firstly, what would be the gain in terms of social welfare if market power decreased in the European banking sectors where there is least competitive rivalry? But in the light of the results obtained, this hypothetical reduction of market power would generate an increase in X-inefficiency that increases the banking margins borne by the consumers of banking services. Secondly, therefore, what would be the potential loss of welfare associated with the cost inefficiency of European banks, given the positive relationship found between market power and cost efficiency?

The reduction of cost efficiency associated with a decrease of market power can be quantified using the regression coefficient of the Lerner index (table 5, column 3) and the evolution of the values of the Lerner index (table 2). Once this loss has been quantified, the second step is to compare its magnitude with the reduction of the social welfare loss associated with less market power. If the increase in social welfare is greater than the loss of cost efficiency, economic policy initiatives must be aimed at reducing the market power of the banks, as the cost of such policies in terms of loss of cost efficiency (which would be translated into higher banking margins) is lower than the gains in the social efficiency of financial intermediation.

To be able to carry out this exercise it is necessary to make some assumptions as to the evolution of market power and thus to quantify its impact on welfare and the level of efficiency. Specifically, we will assume that market power in the credit and deposit markets decreases up to the observed EU-15 average in those banking sectors in which

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<sup>13</sup> The theoretical contribution of Sussman and Zeira (1995) show that banks' monitoring costs increase in distance.

the value of the Lerner index is greater than this average, remaining at the current values in the other countries.

Table 6a shows the reduction of the welfare loss triangle associated with the assumption of reduction in market power. In the table, the social welfare gain is quantified as a percentage of the GDP for each country and year of the sample, as well as for the weighted average of the EU-15. If we focus on the last year analyzed (2002), the social welfare gain due to the decrease in market power represents 0.32% of GDP. With the exception of Luxembourg (whose high gain is explained by the high relative importance of the banking sector), the gains vary between values higher than 0.5% of GDP (0.6 in Spain, 0.8% in Portugal, and 0.9 in Ireland and United Kingdom) and values lower to 0.2% (Belgium, Denmark, Italy, Germany and France).

The cost efficiency loss associated with the reduction of market power in the banking sectors with Lerner indices above the EU average appears in table 6b. The elasticities of efficiency against changes in the Lerner index shown in table 5 are used to calculate the impact on efficiency of the variation in the level of competition in loans and deposits markets. As a percentage of GDP, the increase in cost inefficiency is only 0.0014% for the average of the EU-15 in 2002, the loss being very small in practically all European countries. The only exception is the loss of efficiency of Luxembourg (0.018%) as a consequence of the importance of banking assets.

The comparison of the results of panels a) and b) of table 6 shows that the welfare gains associated with the fall of market power are much greater than the loss of bank cost efficiency. Consequently, from a social point of view, the economic policy measures adopted by the different European institutions with banking competencies (European Commission, European Parliament, European Central Bank, national Ministries of Economy, Antitrust authorities, etc.) must be aimed at eliminating all kinds of barriers or obstacles to banking competition, given the magnitude of the potential effect of such measures on social welfare. In this respect, we might highlight the Financial Services Action Plan (which incorporates 42 measures aiming to create a single European financial market) and the recent European Commission's financial services policy priorities up to 2010 (green paper).

For the U.S. banking industry, the results of Berger and Hannan (1998) support the quiet life hypothesis: the additional operating costs attributable to market power appear to be several times larger than the social loss due to the non-competitive pricing of bank outputs, as measured by the welfare triangle. As well as the difference in the sample used (U.S. vs. European banks), there are two main reasons that may justify the discrepancy with the evidence that we have obtained in this study. Firstly, we use the Lerner index as market power indicator, given the advantages that it presents over the

use of market concentration ratios, especially when market concentration indices cannot be calculated at local level. And secondly, our empirical approach to the measurement of the welfare triangle loss does not need to make assumptions as to the proportional increase in price owing to the exercise of market power or as to demand price elasticities.

## **6. Conclusions**

This paper estimates the two paths by which market power affects social welfare. On the one hand, greater market power implies a loss of social welfare (the so-called welfare triangle). On the other hand, market power may influence the efforts of managers to control costs and, consequently, cost efficiency (quiet life hypothesis). With this aim, the paper examines the relationship between market power (proxied by the Lerner index) and cost efficiency (proxied by X-efficiency measures) in banking. Furthermore, this paper is the first one to estimate Lerner indices of market power for different banking products, namely loans and deposits, in the European Union banking sectors.

The results referring to the banking sectors of the European Union-15 over the period 1993-2002, show that while market power increased in the loan market, it decreased in the deposit market. The results also show that margins are negative in the deposit market, suggesting that banks follow a loss leader pricing strategy. The welfare loss (Harberger's triangle) from the misallocation of resources attributable to market power represented 0.54% of the GDP of the European Union in 2002, substantial variability existing across countries.

Given the limitations presented by the use of market concentration measures as proxy variables for bank competition, we tested the quiet life hypothesis by examining the relationship between cost efficiency and the Lerner index. The results show the existence of a positive relationship between market power and cost efficiency, permitting the rejection of the quiet life hypothesis. The lower pressure from competition to increase the quality of banking services, together with lower monitoring and screening costs, may explain the negative relationship between competition and efficiency.

Although a reduction in market power decreases the size of the social loss from mispricing of bank outputs, it decreases the cost efficiency of the banking system, posing the question of its net impact for society. The simulation carried out under the assumption that the degree of competition increases in the European banking sectors that enjoy a level of market power above the average for the European Union shows that the welfare gains associated with the fall of market power are much greater than the loss

of bank cost efficiency. This result shows the relevance of economic policy measures (such as the Financial Services Action Plan of the European Commission) aimed at removing the barriers or obstacles that protect national markets from outside competition (different taxation of banking products among countries, differences in regulation and supervision, entry barriers that hinder cross-border banking penetration, etc). In addition, taking into account that EU banking sector integration is low in some markets (especially in retail banking activity, that represents over 50% of total banking activity in the EU and generated in 2004 gross income of 250-275 euros billion, equivalent to approximately 2.5% of the total EU GDP) and that banks enjoy some oligopoly power, it is important to strengthen the competition policy at the EU as well as at the domestic level.

Finally, the discrepancy of our results from those obtained by Berger and Hannan (1998) for the U.S. banking industry show the need for additional empirical evidence referring to other banking sectors, because, as far as we know, there are hardly any studies that estimate the costs of market power, whether in terms of social welfare or in terms of bank cost efficiency.

## References

Aigner, A., Lovell, C.A.K. and Schmidt, S. (1977). "Formulation and estimation of stochastic production function models", *Journal of Econometrics* 86, 21-37.

Altunbas, Y., Gardener, E. P. M., Molyneux, P. and Moore, B. (2001). "Efficiency in European banking", *European Economic Review* 45(10), 1931-1955.

Bain J. (1956). *Barriers to new competition*, Cambridge. Mass. Harvard University press.

Barros, P. P., Berglöf, E., Fulghieri, P., Gual, J., Mayer, C. and Vives, X. (2005): *Integration of European Banks: The Way Forward*, London, Centre for Economic Policy Research.

Berger, A. (1995). "The profit-structure relationship in banking –test of market power and efficiency-structure hypotheses", *Journal of Money, Credit and Banking* 27(2), 404-431.

Berger, A., and Humphrey, D. (1997). "Efficiency of Financial Institutions: International Survey and Directions for Future Research", *European Journal of Operational Research* 98, 175-212.

Berger, A.N. and Hannan, T.H. (1998). "The efficiency cost of market power in the banking industry: a test of the 'quiet life' and related hypotheses", *Review of Economics and Statistics* 8(3), 454-465.

Berger, A., Demirgüç-Kunt, A., Levine, R. and Haubrich, J. (2004). "Bank concentration and competition: an evolution in the making", *Journal of Money, Credit and Banking* 36(3), 433-451.

Bikker, J.A. and Haaf, K. (2002). "Competition, concentration and their relationship: an empirical analysis of the banking industry", *Journal of Banking and Finance* 26, 2191-2214.

Claessens, S. and Laeven, L. (2004). "What drives bank competition? Some international evidence", *Journal of Money, Credit and Banking* 36(3), 563-583.

Claessens, S. and Laeven, L. (2005): "Financial dependence, banking sector competition, and economic growth", *Journal of the European Economic Association*, vol. 3 (1), 179-207.

De Bandt, O. and Davis, E. P. (2000). "Competition, contestability and market structure in European banking sectors on the eve of EMU", *Journal of Banking and Finance* 24, 1045-1066.

Demsetz, H. (1973). "Industry Structure, Market Rivalry, and Public Policy", *Journal of Law and Economics* 16, 1-9.

DeYoung, R. (1998). "X-Inefficiency and Management Quality in Commercial Banks", *Journal of Financial Services Research* 13, 5-22.

Dietsch, M. and Lozano-Vivas, A. (2000). "How the Environment Determines the Efficiency of Banks: A Comparison between French and Spanish Banking Industry" *Journal of Banking and Finance* 24, 985-1004.

Fernández de Guevara, J. and Maudos, J. (2004). "Measuring welfare loss of market power: an application to European banks"; *Applied Economics Letters* 11(13), 833-836.

Fernández de Guevara, J., Maudos, J. and Pérez, F. (2005). "Market power in European banking", *Journal of Financial Services Research* 27(2), 109-138.

Fernández de Guevara, J., Maudos, J. and Pérez, F. (2006) "Integration and competition in European financial markets", *Journal of International Money and Finance*, forthcoming.

Freixas, X. and Rochet, J-Ch. (1997). *Microfoundations of Banking*, The MIT Press.

Goddard, J., Molyneux, P., and Wilson, J. (2004). "Dynamics of growth and profitability in banking", *Journal of Money, Credit and Banking* 36(6), 1069-1090.

Goldberg, L. G. and Rai, A. (1996). "The Structure-Performance Relationship for European Banking", *Journal of Banking and Finance* 20, 745-771.

Jondrow, J., Novell, C.A.K., Materov, I.S and Schmidt, P. (1982). "On the estimation of technical inefficiency in the stochastic frontier production models", *Journal of Econometrics* 19, 233-38.

Kaas, L. (2004). "Financial market integration and loan competition. When entry deregulation is socially beneficial?" *European Central Bank*, Working Paper series No. 403, November.

Lozano-Vivas, A., Pastor, J. and Pastor, J.M. (2002). "An Efficiency Comparison of European Banking Systems Operating under Different Environmental Conditions", *Journal of Productivity Analysis* 18, 59-77.

Martín, A., Salas, V. and Saurina, J. (2005). "A test of the law of one price in retail banking", Working Paper 0530, Bank of Spain.

Maudos, J., Pastor, J.M., Pérez, F. and Quesada, J. (2002). "Cost and profit efficiency in European banks", *Journal of International Financial Markets, Institutions and Money* 12, 33-58.

Maudos, J. and Fernández de Guevara, J. (2004). "Factors explaining the interest margin in the banking sectors of the European Union", *Journal of Banking and Finance* 28(9), 2259-2281.

Meeusen, W. and van den Broeck, J. (1977). "Efficiency estimation from Cobb-Douglas production function with composed error", *Internacional Economic Review* 18, 435-44.

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

Molyneux P., Altunbas, Y. and Gardener, E. (1996). "The Structure-Performance Relationship in US and European Banking" in *Efficiency in European Banking*, John Wiley & Sons Ltd. pp. 93-136.

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.

Oroz, M. and Salas, V. (2003). "Competencia y eficiencia en la intermediación financiera en España: 1977-2001", *Moneda y Crédito* 217, 73-99

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

Shepherd, W. (1982). "Economies of scale and monopoly profits", in *Industrial Organization, Antitrust, and Public Policy*, J.V. Craven (ed.), Boston, Kulwer Nihoff.

Shepherd, W. (1986). "Tobin's q and the structure-performance relationship: reply", *American Economic Review* 76, 1205-10.

Sussman, O., and J. Zeira (1995). "Banking and Development," CEPR Discussion Paper 1127.

Vander Vennet, R. (2002). "Cost and Profit Efficiency of Financial Conglomerates and Universal Banks in Europe", *Journal of Money, Credit and Banking* 34(1), 254-282.

**Table 1. Interest rates, marginal costs and absolute margins**

**a) Loans**

	Interest rates ( $r_L$ )		marginal costs ( $mc_L$ )		Absolute margins ( $r_L - r - mc_L$ )	
	1993	2002	1993	2002	1993	2002
AUSTRIA	0.092	0.066	0.011	0.013	0.013	0.020
BELGIUM	0.096	0.061	0.009	0.010	0.005	0.018
DENMARK	0.125	0.061	0.015	0.011	0.009	0.017
FINLAND	0.099	0.064	0.016	0.011	0.008	0.020
FRANCE	0.096	0.066	0.011	0.011	0.002	0.023
GERMANY	0.095	0.065	0.011	0.010	0.012	0.023
GREECE	0.147	0.077	0.013	0.014	-0.096	0.031
IRELAND	0.129	0.062	0.015	0.005	0.028	0.024
ITALY	0.131	0.078	0.018	0.019	0.012	0.026
LUXEMBOURG	0.096	0.081	0.006	0.006	0.009	0.041
NETHERLANDS	0.088	0.069	0.014	0.010	0.006	0.026
PORTUGAL	0.165	0.084	0.016	0.013	0.023	0.039
SPAIN	0.142	0.075	0.015	0.012	0.010	0.030
SWEDEN	0.132	0.069	0.017	0.013	0.030	0.015
UNITED KINGDOM	0.098	0.051	0.015	0.011	0.026	0.000
UE-15	0.105	0.067	0.013	0.012	0.007	0.021

**b) Deposits**

	Interest rates ( $r_D$ )		marginal costs ( $mc_D$ )		Absolute margins ( $r - r_D - mc_D$ )	
	1993	2002	1993	2002	1993	2002
AUSTRIA	0.070	0.034	0.006	0.006	-0.008	-0.008
BELGIUM	0.074	0.036	0.007	0.008	0.001	-0.010
DENMARK	0.068	0.032	0.011	0.006	0.022	-0.005
FINLAND	0.071	0.026	0.009	0.006	-0.005	-0.001
FRANCE	0.072	0.054	0.008	0.007	0.003	-0.028
GERMANY	0.072	0.047	0.006	0.005	-0.007	-0.018
GREECE	0.122	0.029	0.010	0.011	0.096	-0.007
IRELAND	0.064	0.031	0.010	0.003	0.012	-0.001
ITALY	0.079	0.036	0.014	0.008	0.008	-0.011
LUXEMBOURG	0.084	0.084	0.003	0.003	-0.007	-0.053
NETHERLANDS	0.060	0.059	0.008	0.002	-0.001	-0.029
PORTUGAL	0.091	0.048	0.014	0.008	0.022	-0.023
SPAIN	0.080	0.029	0.013	0.009	0.024	-0.004
SWEDEN	0.084	0.035	0.008	0.006	-0.008	0.000
UNITED KINGDOM	0.057	0.026	0.012	0.006	-0.012	0.007
UE-15	0.073	0.043	0.009	0.006	0.001	-0.016

Source: BankScope and own elaboration

**Table 2. Lerner index of market power****a) Loans**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
AUSTRIA	0.140	0.271	0.334	0.416	0.383	0.327	0.351	0.182	0.230	0.307
BELGIUM	0.056	0.228	0.307	0.420	0.351	0.329	0.409	0.245	0.240	0.298
DENMARK	0.073	0.321	0.260	0.384	0.374	0.334	0.360	0.201	0.234	0.275
FINLAND	0.078	0.187	0.052	0.309	0.406	0.400	0.534	0.372	0.264	0.319
FRANCE	0.022	0.188	0.158	0.383	0.429	0.433	0.441	0.241	0.257	0.340
GERMANY	0.125	0.300	0.351	0.458	0.427	0.379	0.424	0.247	0.252	0.347
GREECE	-0.654	-0.479	-0.282	-0.153	-0.076	-0.156	0.013	0.144	0.379	0.397
IRELAND	0.221	0.280	0.277	0.196	0.159	0.185	0.360	0.307	0.328	0.388
ITALY	0.092	0.121	0.048	0.104	0.145	0.259	0.373	0.267	0.349	0.335
LUXEMBOURG	0.095	0.228	0.347	0.505	0.493	0.501	0.550	0.436	0.406	0.513
NETHERLANDS	0.072	0.245	0.342	0.445	0.438	0.444	0.411	0.284	0.293	0.376
PORTUGAL	0.139	-0.060	0.053	0.135	0.233	0.355	0.429	0.339	0.408	0.461
SPAIN	0.071	0.245	0.121	0.241	0.317	0.363	0.432	0.279	0.374	0.398
SWEDEN	0.227	0.190	0.154	0.284	0.300	0.332	0.370	0.278	0.217	0.213
UNITED KINGDOM	0.266	0.270	0.094	0.047	-0.151	-0.048	0.046	-0.039	0.017	0.006
UE-15	0.091	0.221	0.203	0.315	0.325	0.327	0.382	0.233	0.270	0.326

**b) Deposits**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
AUSTRIA	-0.115	-0.296	-0.395	-0.510	-0.462	-0.392	-0.436	-0.189	-0.160	-0.226
BELGIUM	0.010	-0.188	-0.349	-0.483	-0.386	-0.376	-0.463	-0.273	-0.254	-0.291
DENMARK	0.322	0.010	0.026	-0.252	-0.305	-0.286	-0.378	-0.225	-0.146	-0.154
FINLAND	-0.070	-0.125	0.015	-0.338	-0.366	-0.354	-0.625	-0.176	0.418	-0.019
FRANCE	0.040	-0.158	-0.149	-0.468	-0.554	-0.566	-0.601	-0.426	-0.415	-0.514
GERMANY	-0.094	-0.289	-0.383	-0.538	-0.524	-0.436	-0.515	-0.308	-0.314	-0.395
GREECE	0.788	0.621	0.476	0.326	0.298	0.403	0.171	-0.003	-0.192	-0.241
IRELAND	0.187	0.209	0.079	0.054	0.121	0.187	0.055	0.042	-0.105	-0.029
ITALY	0.107	0.030	0.185	-0.010	-0.100	-0.262	-0.441	-0.210	-0.306	-0.296
LUXEMBOURG	-0.078	-0.230	-0.400	-0.569	-0.586	-0.620	-0.667	-0.563	-0.521	-0.637
NETHERLANDS	-0.009	-0.233	-0.377	-0.572	-0.522	-0.530	-0.531	-0.415	-0.428	-0.485
PORTUGAL	0.240	0.329	0.225	0.050	-0.101	-0.261	-0.403	-0.266	-0.365	-0.475
SPAIN	0.302	0.088	0.221	0.002	-0.091	-0.168	-0.337	-0.054	-0.123	-0.154
SWEDEN	-0.091	-0.023	0.011	-0.217	-0.233	-0.336	-0.466	-0.352	-0.196	-0.006
UNITED KINGDOM	-0.208	-0.222	0.073	0.221	0.456	0.288	0.199	0.250	0.139	0.281
UE-15	0.014	-0.155	-0.149	-0.327	-0.375	-0.365	-0.460	-0.287	-0.310	-0.369

Source: BankScope and own elaboration



**Table 3. Welfare loss associated to market power**

Percentage of GDP

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>AUSTRIA</b>	0.36	0.43	0.46	0.51	0.52	0.38	0.34	0.33	0.69	0.89
<b>BELGIUM</b>	0.27	0.31	0.06	0.13	0.15	0.07	0.18	0.09	0.11	0.28
<b>DENMARK</b>	2.12	2.04	1.54	1.41	1.11	0.92	0.68	0.82	1.13	1.14
<b>FINLAND</b>	0.12	0.27	0.12	0.18	0.35	0.44	0.44	0.57	0.72	0.61
<b>FRANCE</b>	0.18	0.36	0.25	0.35	0.27	0.19	0.20	-0.15	-0.05	0.03
<b>GERMANY</b>	0.41	0.78	0.73	0.80	0.54	0.67	0.60	0.29	0.29	0.57
<b>GREECE</b>	1.96	1.41	0.87	0.66	0.71	0.93	0.59	0.40	0.65	0.70
<b>IRELAND</b>	0.85	0.92	1.08	0.64	1.00	1.25	1.54	1.81	1.64	1.78
<b>ITALY</b>	1.05	0.79	0.88	0.48	0.34	0.47	0.66	0.66	0.92	0.79
<b>LUXEMBOURG</b>	-1.73	-5.66	-12.85	-15.21	-19.02	-18.86	-12.59	-14.36	-9.96	-11.39
<b>NETHERLANDS</b>	0.34	0.50	0.64	0.63	0.73	0.88	0.79	0.15	0.08	0.31
<b>PORTUGAL</b>	1.47	0.88	0.92	0.59	0.54	0.74	0.88	1.12	1.52	1.58
<b>SPAIN</b>	1.24	1.26	1.13	1.06	1.10	1.12	1.03	1.00	1.47	1.39
<b>SWEDEN</b>	1.13	0.80	0.73	0.94	0.93	0.91	0.84	0.57	0.57	0.77
<b>UNITED KINGDOM</b>	0.73	0.66	0.57	0.68	0.30	0.50	0.62	0.41	0.36	0.42
<b>UE-15</b>	0.54	0.62	0.53	0.54	0.42	0.49	0.50	0.27	0.42	0.54

The table shows the welfare loss associated with market power calculated according to expression (2)

*Source: BankScope, European Central Bank and own elaboration*

**Table 4. Mean efficiency scores and welfare loss associated to bank's cost inefficiency**

**a) Mean efficiency scores**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>AUSTRIA</b>	0.870	0.868	0.867	0.866	0.864	0.867	0.880	0.832	0.822	0.821
<b>BELGIUM</b>	0.894	0.903	0.896	0.875	0.848	0.798	0.824	0.800	0.784	0.776
<b>DENMARK</b>	0.897	0.905	0.883	0.853	0.833	0.836	0.831	0.802	0.886	0.885
<b>FINLAND</b>	0.724	0.780	0.849	0.870	0.795	0.818	0.827	0.888	0.872	0.932
<b>FRANCE</b>	0.844	0.841	0.851	0.857	0.872	0.857	0.850	0.840	0.842	0.848
<b>GERMANY</b>	0.871	0.865	0.866	0.864	0.854	0.853	0.835	0.834	0.829	0.833
<b>GREECE</b>	0.905	0.910	0.909	0.899	0.891	0.906	0.874	0.878	0.874	0.880
<b>IRELAND</b>	-	-	0.897	0.903	0.889	0.913	0.761	0.852	0.845	0.919
<b>ITALY</b>	0.893	0.889	0.895	0.894	0.893	0.894	0.876	0.874	0.862	0.861
<b>LUXEMBOURG</b>	0.833	0.822	0.825	0.818	0.784	0.769	0.806	0.791	0.772	0.805
<b>NETHERLANDS</b>	0.742	0.747	0.749	0.738	0.770	0.774	0.769	0.796	-	-
<b>PORTUGAL</b>	0.828	0.836	0.881	0.854	0.852	0.848	0.838	0.825	0.766	0.740
<b>SPAIN</b>	0.864	0.872	0.881	0.884	0.886	0.884	0.877	0.873	0.872	0.881
<b>SWEDEN</b>	0.796	0.802	0.852	0.856	0.866	0.862	0.896	0.902	0.908	0.899
<b>UNITED KINGDOM</b>	0.838	0.835	0.843	0.853	0.854	0.838	0.875	0.887	0.907	0.899
<b>UE-15</b>	0.861	0.859	0.866	0.867	0.865	0.856	0.853	0.849	0.843	0.848

**b) Welfare loss associated to banks' cost inefficiency (Percentage of GDP)**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>AUSTRIA</b>	0.292	0.334	0.332	0.370	0.361	0.457	0.304	0.311	0.288	0.312
<b>BELGIUM</b>	0.318	0.309	0.310	0.425	0.709	1.444	0.778	0.995	0.979	1.107
<b>DENMARK</b>	0.200	0.193	0.287	0.341	0.371	0.407	0.389	0.497	0.259	0.284
<b>FINLAND</b>	0.319	0.349	0.234	0.281	0.741	0.702	0.555	0.323	0.079	0.109
<b>FRANCE</b>	0.512	0.561	0.530	0.512	0.476	0.561	0.590	0.697	0.648	0.587
<b>GERMANY</b>	0.300	0.371	0.380	0.386	0.448	0.479	0.532	0.495	0.529	0.473
<b>GREECE</b>	0.157	0.166	0.174	0.214	0.245	0.213	0.253	0.284	0.283	0.288
<b>IRELAND</b>	-	-	0.035	0.040	0.037	0.024	0.041	0.013	0.014	0.007
<b>ITALY</b>	0.308	0.368	0.349	0.361	0.359	0.352	0.358	0.409	0.458	0.471
<b>LUXEMBOURG</b>	1.697	2.447	2.330	2.002	2.533	3.367	2.215	2.837	2.732	2.457
<b>NETHERLANDS</b>	0.049	0.057	0.073	0.103	0.065	0.074	0.069	0.060	-	-
<b>PORTUGAL</b>	0.485	0.570	0.435	0.567	0.596	0.561	0.545	0.597	0.597	0.613
<b>SPAIN</b>	0.444	0.451	0.411	0.377	0.372	0.397	0.356	0.386	0.379	0.384
<b>SWEDEN</b>	0.265	0.290	0.271	0.271	0.255	0.276	0.186	0.187	0.184	0.160
<b>UNITED KINGDOM</b>	0.335	0.348	0.329	0.327	0.251	0.302	0.235	0.157	0.108	0.126
<b>UE-15</b>	0.345	0.388	0.372	0.378	0.388	0.444	0.417	0.423	0.422	0.402

*In Ireland (1993 and 1994) and the Netherlands (2002 and 2003) the efficiency scores have not been computed because the number of branches was not available*

*Source: BankScope and own elaboration*

**Table 5. Determinants of cost efficiency**

	(1)	(2)	(3)
<b>Lerner (loans)</b>			0.0729 *** (0.01)
<b>Lerner (deposits)</b>			0.0301 *** (0.01)
<b>HHIA (Total assets)</b>	-0.1108 (0.29)		
<b>HHIL (loans)</b>		2.2586 *** (0.35)	
<b>HHID (deposits)</b>		-1.8071 *** (0.34)	
<b>Size (log of total assets)</b>	0.0842 *** (0.01)	0.0905 *** (0.01)	0.0862 *** (0.01)
<b>S1 (commercial banks)</b>	0.0699 (0.20)	0.0596 (0.20)	0.0657 (0.20)
<b>S2 (savings banks)</b>	0.0734 (0.22)	0.0669 (0.22)	0.0681 (0.22)
<b>S3 (cooperative banks)</b>	0.1037 (0.21)	0.0939 (0.21)	0.0996 (0.21)
<b>Adjusted R2</b>	0.6669	0.6675	0.6674
<b>Hausman Test (p-value)</b>	52.6000 (0.00)	79.8000 (0.00)	88.7700 (0.00)
<b>Observations</b>	29,694	29,694	26,964

**Elasticities of efficiency to changes in the independent variables**

Percentage change in the efficiency due to a 100% change in each independent variable

<b>Lerner (loans)</b>			0.2938
<b>Lerner (deposits)</b>			0.0461
<b>HHIA</b>	-0.0489		
<b>HHIL (loans)</b>		0.9925	
<b>HHID (deposits)</b>		-0.8611	
<b>Size (total assets)</b>	1.8080	1.8589	1.8255

All models were estimated using fixed effects and time effects (the Hausman test suggests that a fixed effects model is more appropriate). As efficiency is a variable bounded between 0 and 1, the log of a logistic transformation is used to estimate the determinant of cost efficiency. The excluded dummy specialization is S4 (Other type of banks). In brackets standard deviations

The elasticities with respect to total assets have been calculated taking into account that in the estimation the variable is in log. So, the elasticity values shown reflect the change in efficiency due to the change in total assets of the bank

\*\*\* Significant at 1%, \*\* Significant at 5% and \* significant at 10%.

Source: *BankScope (Bureau Van Dijk) and own elaboration.*

**Table 6. Social welfare gain and cost efficiency loss associated to a reduction in market power**

Percentage of GDP

**a) Social welfare gain**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>AUSTRIA</b>	0.25	0.23	0.61	0.42	0.25	0.00	0.05	0.21	0.32	0.24
<b>BELGIUM</b>	0.00	0.03	0.35	0.33	0.08	0.01	0.09	0.08	0.16	0.19
<b>DENMARK</b>	1.42	1.09	0.83	0.56	0.46	0.30	0.25	0.08	0.18	0.18
<b>FINLAND</b>	0.00	0.04	0.22	0.00	0.15	0.16	0.28	0.36	0.37	0.23
<b>FRANCE</b>	0.06	0.00	0.00	0.22	0.35	0.35	0.18	0.03	0.00	0.04
<b>GERMANY</b>	0.20	0.43	0.77	0.72	0.51	0.26	0.20	0.07	0.00	0.10
<b>GREECE</b>	2.95	2.85	1.76	1.91	1.96	2.54	2.04	0.90	0.54	0.36
<b>IRELAND</b>	0.57	0.49	0.60	0.56	1.12	1.21	0.75	1.14	0.86	0.88
<b>ITALY</b>	0.37	0.58	1.08	0.93	0.53	0.16	0.02	0.21	0.31	0.11
<b>LUXEMBOURG</b>	0.10	0.17	3.70	3.89	3.62	4.56	4.28	5.57	3.75	4.44
<b>NETHERLANDS</b>	0.00	0.10	0.62	0.57	0.57	0.66	0.16	0.30	0.14	0.28
<b>PORTUGAL</b>	1.03	1.57	1.24	1.15	0.77	0.36	0.31	0.64	0.87	0.81
<b>SPAIN</b>	0.86	0.68	1.01	0.87	0.59	0.47	0.35	0.62	0.87	0.63
<b>SWEDEN</b>	0.78	0.19	0.27	0.17	0.16	0.05	0.00	0.15	0.11	0.30
<b>UNITED KINGDOM</b>	0.83	0.21	0.51	1.17	1.75	1.62	1.37	1.23	0.94	0.92
<b>UE-15</b>	0.31	0.28	0.53	0.63	0.67	0.52	0.36	0.33	0.30	0.32

**b) Cost efficiency loss**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>AUSTRIA</b>	0.0009	0.0010	0.0026	0.0022	0.0012	0.0000	0.0002	0.0006	0.0008	0.0008
<b>BELGIUM</b>	0.0000	0.0002	0.0025	0.0028	0.0010	0.0001	0.0009	0.0007	0.0008	0.0013
<b>DENMARK</b>	0.0020	0.0027	0.0025	0.0018	0.0014	0.0008	0.0006	0.0005	0.0012	0.0017
<b>FINLAND</b>	0.0000	0.0002	0.0008	0.0000	0.0024	0.0024	0.0039	0.0042	0.0015	0.0018
<b>FRANCE</b>	0.0003	0.0000	0.0000	0.0019	0.0031	0.0033	0.0019	0.0003	0.0000	0.0004
<b>GERMANY</b>	0.0006	0.0017	0.0033	0.0032	0.0025	0.0013	0.0011	0.0003	0.0000	0.0005
<b>GREECE</b>	0.0042	0.0047	0.0039	0.0045	0.0049	0.0057	0.0041	0.0022	0.0028	0.0023
<b>IRELAND</b>	-	-	0.0005	0.0005	0.0005	0.0005	0.0003	0.0001	0.0001	0.0001
<b>ITALY</b>	0.0009	0.0020	0.0036	0.0035	0.0030	0.0011	0.0002	0.0017	0.0021	0.0011
<b>LUXEMBOURG</b>	0.0003	0.0008	0.0153	0.0165	0.0156	0.0201	0.0152	0.0218	0.0129	0.0187
<b>NETHERLANDS</b>	0.0000	0.0000	0.0003	0.0004	0.0003	0.0003	0.0001	0.0001	-	-
<b>PORTUGAL</b>	0.0032	0.0055	0.0045	0.0048	0.0036	0.0021	0.0019	0.0031	0.0028	0.0025
<b>SPAIN</b>	0.0031	0.0035	0.0042	0.0035	0.0030	0.0032	0.0023	0.0034	0.0042	0.0041
<b>SWEDEN</b>	0.0014	0.0006	0.0010	0.0007	0.0009	0.0003	0.0000	0.0007	0.0007	0.0019
<b>UNITED KINGDOM</b>	0.0029	0.0008	0.0015	0.0040	0.0046	0.0040	0.0041	0.0024	0.0017	0.0027
<b>UE-15</b>	0.0011	0.0013	0.0023	0.0029	0.0029	0.0022	0.0017	0.0013	0.0011	0.0014

Table 6 shows the social welfare gains associated with market power if countries with Lerner Indices in loans and deposits above the EU level were to converge to the average EU level, calculated according to expression (2)

Source: BankScope, European Central Bank, Eurostat and own elaboration