# Explanatory factors of market power in the banking system[*]

*Manchester School*, forthcoming.

Juan Fernández de Guevara (Ivie)

Joaquín Maudos (Universitat de València & Ivie)

***Abstract***

The aim of the study is to analyze the explanatory factors of market power in the banking system. Using as laboratory the Spanish banking system in the period 1986-2002, results show an increase of market power from the mid-1990s. Of the set of variables that the model posits as explaining market power, those with greatest explanatory power are size, efficiency and specialization; concentration is not significant. This last result shows the limitations of the approaches, studies and decision-making rules of economic policy that uses market concentration as a proxy for the degree of competition.

Key words: market power, bank concentration

JEL classification: D40, G21

Instituto Valenciano de Investigaciones Economicas (Ivie). c/ Guardia Civil 22, Esc. 2,1º, 46020 Valencia –Spain- Fax: 34 96 319 00 55. Corresponding author: Joaquín Maudos (Email: joaquin.maudos@ivie.es)

Universitat de València. Departamento de Analisis Economico. Edificio departamental Oriental, Avda. de los Naranjos, s/n. 46022 Valencia, Spain.

[*] Authors gratefully acknowledge comments of two anonymous referees for their helpful comments. Joaquín Maudos acknowledges the financial support of the *Ministerio de Ciencia y Tecnología-FEDER* (projects SEJ2004-00110 and SEJ2005-02776). Juan Fernández de Guevara acknowledges the financial support of the Banco Herrero Foundation.

## 1. Introduction

In recent years, European banks have suffered an alteration of the competitive conditions of their markets as a consequence of various factors. The process of deregulation has created a scenario of greater competition following the implementation of measures such as the abolition of compulsory investment coefficients, the liberalization of interest rates, freedom of establishment, etc. Furthermore, the increasing level of integration of the European financial markets has also increased the intensity of competition following the adoption of various measures (most recently, the Financial Services Action Plan of the European Commission) aimed at eliminating the barriers or obstacles (legal, fiscal, institutional, etc.) that protect national markets from outside competition.

The events described above have coexisted with a process of consolidation of national markets as a consequence of a wave of mergers and acquisitions, which have increased the degree of concentration of the European banking markets. Although cross-border mergers and acquisitions can help to increase the degree of integration and competition of financial markets, the evidence shows a clear predominance of domestic mergers (with the consequent increase in the concentration of national markets), the relative importance of cross-border mergers being very low (see European Central Bank, 2000a).

The increased concentration of banking markets has given rise to various studies showing the need for evidence in respect of the analysis of competition among banks in this context of greater concentration. For this purpose the studies published use several indicators of competition that can be classified in two major categories: those that fall within the so-called "new empirical industrial organization" models (instruments derived from Monti-Klein-type banking competition models like the estimation of Lerner indexes –Prescott and McCall, 1975; Maudos and Fernandez de Guevara, 2004; Fernández de Guevara *et al.,* 2005; and Carbó *et al.,* 2006-, the estimation of the markup test of Bresnahan –Shaffer 1989 and 1993; Shaffer and Disalvo, 1994; Neven and Röller, 1999-, or the Panzar and Rosse test – Molyneux *et al.*, 1994; De Bandt and Davis, 2000; Nathan and Naeve, 1989; Bikker and Haaf, 2002) and the structural indicators of competition (the use of concentration indexes or the estimation of equations located in the structure-conduct-performance vs. efficient structure hypothesis –Berger, 1995).

In the case of the European banking system, several recent studies analyze the competition in banking markets. The studies by Bikker and Haaf (2002) and De Bandt and Davis (2000) analyze competition by applying the Panzar and Rosse test (1987).

Specifically, Bikker and Haaf (2002) analyze competition in a sample of 23 countries (European and non European) showing evidence in favour of the existence of monopolistic competition, although the results depend on the geographical scope of the markets (local, national, international). This same study shows the existence of a negative relationship between the degree of concentration (measured on a national scale) and the level of competition. In this same line of analysis, the results of the studies by De Bandt and Davis (2000) do not permit us to reject a situation of monopolistic competition in the principal banking sectors of Europe (Germany, France and Italy), the evidence even being favourable to a situation of monopoly for banks that operate in small markets.

Through the estimation of bank margins, Corvosier and Gropp (2002) analyze the explanatory factors of the margins of the European banking system in the period 1993-99. Their results show that the increase in concentration of the loans and short term deposits markets has permitted an increase in margins, while the evidence is just the opposite in the time deposit markets. Taking as their starting point the model used by these same authors, Fernández de Guevara *et al.* (2005) estimate Lerner indexes for the five most important banking sectors of the European Union (Germany, France, Italy, United Kingdom and Spain) during the period 1993-1999. The results show that, in spite of the liberalizing measures implemented, no reduction in the market power of the banks is observed. In this same line, Maudos and Fernández de Guevara (2004) show that the reduction of margins in the European banking system is compatible with a decrease in the intensity of competition.

The survey carried out, though it shows the existence of numerous studies that analyze competition in banking markets, also reveals the scarcity of studies that analyze the explanatory factors of market power. This question is especially relevant, as knowing only the degree of competition in a market is, from the point of view of the regulator, of limited utility. Only when the sources of this market power have been identified will it be possible to carry out the reforms necessary to achieve a reduction of the social inefficiency associated with the existence of market power.

The evidence available in relation to the effect of the concentration of banking markets on competition is based in most cases on studies in which the concentration is proxied at national level, implicitly assuming that it is the national market that is relevant for analyzing competition. However, although this assumption may be valid for large banks, it is clearly not acceptable for small or medium sized banks with presence in local markets.

The Spanish banking system during the period 1986-2002 is a good laboratory to analyze the determinants of market power for two reasons. Firstly, in anticipation of the expanded competition following Spain's entry into the European Union in 1986, restrictions on bank interest rates and geographical controls on branching were removed. Thus, Spanish banks saw their market open to competition and to the rivalry of both domestic and foreign firms. But, on the other hand, one of the firms' responses to this new scenario was to initiate processes of mergers and acquisitions, hence increasing the concentration of the Spanish banking sector. Consequently it is of greater interest to evaluate the market power of the Spanish banking sector and the factors which drives it. Secondly, by analyzing the Spanish case we can better proxy the local nature of banking markets. In fact, in the specific case of the Spanish banking sector, only a very small group of big banks have a presence throughout the country, so for all the other banks the relevant market is of a regional dimension. Here, we improve these papers by means of measuring market structure at lower than national level, for the fifty two provinces in which Spain is divided. For this reason, unlike Fernández de Guevara *et al.* (2005), this study starts by considering that the relevant market for the analysis of competition is sub-national, using regional indicators of variables such as concentration, market share, size and growth of markets, etc., on the basis of the information available on the regional distribution of the branch office network.

In this context, the aim of the study is to analyze the explanatory factors of the market power of the banks in Spain, using a broad panel of commercial and savings banks covering the period 1986-2002 and taking as reference the extension to the model of Corvosier and Gropp (2002) made in Fernández de Guevara *et al.* (2005). Although previous studies have also focused on the analysis of the measurement of competition, in the Spanish banking sector, none of them have analyzed the explanatory factors of market power.

The study starts by estimating Lerner indexes of market power and then, in a second stage, analyzes its determining factors. The results show that although there was a reduction in market power from the mid-1980s to the mid-1990s, from then onwards market power increased until in 2002 it was at a higher level than in 1986. With respect to the variables explaining the differences in market power among banks, the results show the importance of specialization and efficiency in explaining the differences in market power among banks. Thus, banks that are most specialized in retail banking activity and which reach highest levels of efficiency are those with higher margins. On the other hand, market concentration does not turn out to be significant in the explanation of the differences in market power, showing the

inappropriateness of using concentration as an indicator of competition as is done in some studies and even in some countries when making decisions regarding acceptance or rejection of a bank merger by the public authorities.

After this introduction, the study is structured as follows. Section 2 presents both the reference model used in the analysis of the Lerner index and its determinants, and describes the empirical approach. Section 3 analyzes the evolution of market power in the Spanish banking system from 1986 to 2002 and presents the results of the analysis of the explanatory factors of market power. Finally, section 4 concludes.

## 2. Market power and its explanatory factors

The reference model used in the analysis of the market power of banking firms and its determining factors is that of Corvosier and Gropp (2002), together with the extensions to the said model by Fernández de Guevara *et al.* (2005). The initial assumption is that the bank enjoys market power in setting the interest rates *(r)* on loans *(L)*, but is price taker in the deposits market *(D)*. The model takes into account the existence of product differentiation by assuming that each bank offers only one type of loan, "*k*", which is unique but differentiated from that of its *N-1* competitors, and whose demand function is as follows:

$$L_k = \frac{L_o}{N} - \frac{b}{N-1}\sum_{j\neq k}^{N}(r_k - r_j) - \frac{r_L B}{N} \qquad (1)$$

where *b*= elasticity in loan demand "*k"* relative to the differential of interest rates from its competitors ($r_j$), and *B*= total demand elasticity for loans w.r.t. the average interest rate $r_L$.

As Fernández de Guevara *et al.* (2005) demonstrate, the F.O.C of the maximization problem yields the following expression:

$$\frac{r_k(1-\beta_K) - \frac{r_D}{(1-\alpha)} - \frac{\partial C_k}{\partial L_k}}{r_k} = (1-\beta_k)\frac{\frac{L_0}{N} - \frac{r_k B}{N}}{r_k}\frac{1}{(b+\frac{B}{N^2})} \qquad (2)$$

where $\beta_k$ represents the default probability of loans of bank *k*, $\delta C_k / \delta L_k$ is the marginal cost, $r_D$ represents the deposit rate, $\alpha$ is the coefficient of required reserves, and $e_k$ is the elasticity of the demand for the loans of bank "*k*".

The left-hand side of expression (2) shows the quotient between the price (net of the costs of risk)-marginal cost margin relative to price, being therefore the expression

of the Lerner index of market power. The right-hand side contains the determinants of market power, which are default risk ($\beta_k$), the average size of the bank ($L_0/N$), the number of firms ($N$), the elasticity of demand for loans of type "$k$" relative to the interest rate differential from its competitors ($b$), the elasticity of the total demand for loans relative to the average interest rate ($B$), and the level of interest rates ($r_k$).

Regarding the empirical approach, as described in Maudos and Pérez (2003), the estimation of the Lerner index of market power for banks presents some problems, some of them derived from the available statistical information. Specifically, the estimation of the Lerner index through the left side of expression (2) requires information at firm level on the interest rates on bank loans and on three types of costs: the cost of risk, the cost of the funds captured and the marginal operating costs.

The balance sheet and profit and loss account supplied by the Spanish banking associations, though offering disaggregated information on loans do not offer separate information on the financial income associated only with loans, so it is not possible to estimate the average price or interest rate for loans of individual banks. Moreover, the theoretical model presented above only considers the process of intermediation between deposits and loans, not considering the growing importance of other activities that generate income other than interest (see European Central Bank, 2000b)[1].

As in other studies (Berger and Kim, 1994; Angelini and Cetorelli, 2003; Maudos and Pérez, 2003; Carbó *et al.* 2003; Maudos and Fernández de Guevara, 2004; among others; Carbó, Humphrey, Maudos and Molyneux, 2006; Carbó, Rodriguez and Udell, 2006), the above limitations oblige us to consider a broader indicator of banking activity than the mere granting of loans, total assets often being used as *proxy* of banking output. The starting assumption is that the flow of goods and services produced by the banks is proportional to total assets, generating both financial and non-financial revenues[2]. With this approximation it is possible to construct an average price or interest rate of banking production as a quotient between total revenues and total assets.

The empirical approach to the cost of risk also presents problems (for a more detailed exposition see Fernández de Guevara *et al.,* 2005). As well as the lack of information in the yearbooks on variables that could proxy the parameter $\beta$ (as the ratio non-performing loans/total loans), the allocation in time of risk is also problematical given that the cost of risk usually materializes some time after the investment is made.

[1] For the Spanish banking sector, the ratio non-interest income/total income has increased from 4.94% in 1986 to 12.11% in 2002.

[2] As Angelini and Cetorelli (2003) affirm, "the choice is valid under the assumption that the stock of total assets is a good proxy for heterogeneous flow of services supplied by banks".

In view of these problems, the effect of credit risk on the estimation of the Lerner index is not taken into account initially, though it will be taken into account as an explanatory variable of market power using the ratio loan loss provisions/loans as *proxy* variable for the risk of insolvency.

Regarding the estimation of other costs, although the model used, that of Corvosier and Gropp (2002), considers that the rate of interest on deposits is given (so the marginal financial cost is constant), in practice it is possible to relax this assumption by estimating total marginal costs on the basis of a costs function where the variable to be explained includes both financial and operating costs.

With the limitations described above, the empirical expression of the Lerner index is:

$$(p - MC)/p \tag{3}$$

where $p$ is the average price or income of a bank (proxied as the quotient between total revenues and total assets) and $MC$ is the total marginal cost calculated from the estimation of a translogarithmic costs function, where the total costs depend on the prices of three *inputs* (labor, physical capital and deposits), on the bank's volume of production (total assets) and on technical change (proxied by a *Trend*). Specifically, the costs function estimated is as follows:

$$\begin{aligned} \ln TC_i = {} & \alpha_0 + \alpha_1 \ln TA_i + \frac{1}{2}\alpha_2 \left(\ln TA_i\right)^2 + \sum_{j=1}^{3} \beta_j \ln w_{ji} + \\ & + \frac{1}{2}\sum_{j=1}^{3}\sum_{k=1}^{3} \beta_{jk} \ln w_{ji} \ln w_{ki} + \frac{1}{2}\sum_{j=1}^{3} \gamma_j \ln TA_i \ln w_{ji} + \mu_1 Trend + \mu_2 \frac{1}{2} Trend^2 + \\ & + \mu_3 Trend \ln TA_i + \sum_{j=1}^{3} \lambda_j Trend \ln w_{ji} + \ln u_i \end{aligned} \tag{4}$$

where $TC_i$ is the bank's total costs including financial and operating costs. As mentioned before, total assets ($TA_i$) are used as a proxy variable for banking output. The input prices ($w$) are defined as follows: Price of labor ($w_1$)=Personnel costs / number of employees; Price of capital ($w_2$)= Operating costs (except personnel costs) / Fixed assets; Price of deposits ($w_3$): Financial Costs / deposits. In the estimation of the costs function, fixed effects are introduced to capture the effect of possible unobserved variables specific to each bank. Symmetry and linear homogeneity in input prices restrictions are imposed.

Marginal costs are calculated from equation (4) as follows:

$$MC_i = \frac{TC}{TA}\left(\alpha_1 + \alpha_2 \ln TA_i + \frac{1}{2}\sum_{j=1}^{3}\gamma_j \ln w_{ji} + \mu_3 Trend\right) \quad (5)$$

In the case of the determinants of market power that appear on the right-hand side of expression (2), the empirical approximation is as follows:

a) Concentration as proxy for the number of competitors. Specifically, as in other studies (Maudos, 2001; Carbó, Humphrey and Rodriguez, 2003; Carbó, López and Rodríguez, 2003; among others), we consider that the relevant market for evaluating competition is the regional one (more particularly, the province), given that, in fact, many savings and commercial banks are firms with regional implantation in one or a few provinces. Since the only information available for each firm at provincial level is the distribution of its branch office network, we use this variable as *proxy* for banking output for the purposes of calculating the concentration of each province and the market shares of each bank. Specifically, the concentration of the market in which each bank operates was calculated as a weighted average of the indexes of concentration of the markets in which it has implantation, using as weightings the percentage distribution of its branch network by provinces. The indicator of concentration used is the Herfindahl-Hirschman index (HHI).

b) The average size of the bank is proxied by the logarithm of total assets. The variable is used as explanatory of market power for two reasons: 1) in case there are advantages in average costs associated with the possible existence of economies of scale; and 2) to test whether size, *per se*, confers market power. To allow for a possible non-linear relation between size and market power, we also introduce the square of the variable.

c) With country-level data, Corvosier and Gropp (2002) and Fernández de Guevara *et al.* (2005) use the banking assets/GDP and market capitalization/GDP ratios as proxy variables for the elasticity of demand to measure the extent to which the financial system is bank vs. market based. However, with data referring to regional markets, there is no information available to capture the importance of direct financing through the markets. For this reason, we use the loans/GDP ratio as a proxy variable for elasticity of total demand. Taking into account that the demand elasticity for banking products will be greater when other non-banking sources of finance are more important, a hypothesis to be tested is that the higher the loans/GDP ratio, the greater the degree of dependence on banking finance, and the higher the market power will be[3]. For each bank, the value of the variable is

[3] For the European banking sectors, Corvoisier and Gropp's (2002) results show that the larger the total assets of the banking system relative to GDP, the higher banks' margins would be expected to be.

constructed as a weighted average of the loans/GDP ratio of the provinces where the bank has branches, using as weights the relative importance of each province in terms of branches.

d) Given the fact that the coefficient of bank reserves ($\alpha$) has not been taken into account in the estimation of the Lerner index, it is explicitly included as a determinant. It is proxied through the ratio of Cash and deposits in central banks to total deposits. As the theoretical model shows (expression 2), a negative sign is to be expected for this variable, as the higher the proportion of liquid reserves (with an implicit opportunity cost as they are remunerated at an interest below the market rate), the lower the margin obtained.

e) Default risk ($\beta_k$) is proxied using the ratio of loan loss provisions to loans as an *ex-post* indicator of the cost of risk[4]. As suggested by the theoretical model used, a negative sign for this variable is to be expected, given that a higher default risk implies a lower relative margin.

Although it does not appear explicitly in the theoretical model (expression 2) as determinants of the Lerner index, other papers show the importance of introducing additional explanatory variables of market power:

f) The evidence shows the importance for market power of specialization in a particular type of banking activity (Fernández de Guevara *et al.* 2006). The literature on integration of the financial markets shows a lower degree of integration and competition in retail banking markets than in wholesale markets, as a consequence, in addition to the characteristics of the products themselves, of the greater importance of the barriers or obstacles which protect markets from outside competition (see, among others, European Commission, 2002a,b; Cabral *et al*. 2002; Hartmann *et al.* 2003; and Fernández de Guevara *et al.* 2006). For this reason, the importance of specialization in retail products is proxied through the income structure. Specifically, the proxy variable used is the ratio of non-interest income to total income. It is to be expected that the lower retail activity, and thus greater relative importance of non-interest income, will be accompanied by a lower market power.

g) Corvosier and Gropp (2002) and Fernández de Guevara *et al.* (2005) introduce the efficiency of banking firms as an explanatory variable of market power, using the

[4] A better measurement to proxy the default risk is non-performing loans/total loans ratio. Unfortunately, this information is not available at individual bank level in the statistical yearbooks of the AEB and CECA.

cost to income ratio. It was introduced to contribute evidence so as to be able to discriminate between the traditional structure-conduct-performance paradigm and the efficient structure hypothesis. In the first case, it is to be expected that concentration will affect market power positively and significantly, whereas under the efficient structure hypothesis, it is supposed that the most efficient banks are those that gain market share (so they act in more concentrated markets) and are more profitable. Therefore, it is efficiency and not concentration that determines higher banking margins. Following Berger (1995), the way to test these hypotheses is by introducing concentration, efficiency and market share as explanatory variables of the relative margin.

In our case, in order to overcome the limitations presented by the use of accounting indicators such as the cost to income ratio as indicator of efficiency, we will use frontier indicators of efficiency, under the stochastic frontier approach (see a description of this approach in Carbó *et al.* 2002). This approach modifies the standard costs function by assuming that inefficiency forms part of the error term. It also posits that the compound error term includes the effect of variables not under the control of the firm. Since inefficiency can only increase costs above the frontier, it is necessary to specify asymmetric distributions for the inefficiency term. Individual inefficiency estimates can be calculated by using the distribution of the inefficiency term conditional on the estimate of the composite error term. As is common practice, it is assumed that inefficiency is drawn from a half-normal distribution. Instead of using the cost function model based on total assets (equation 4), we specify a cost function with three outputs with the aim of considering the multi-product characteristic of the banking activity. This specification yields a more accurate measure of X-efficiency[5]. Specifically, a translogarithmic costs function is estimated, in which total costs depend on the prices of inputs (labour, physical capital and deposits), on a vector of banking output (earning assets, deposits and other operating income[6]) and on technical change. The costs function is estimated using the pool of data on savings banks and commercial banks, so that we have individual estimations of efficiency for each bank and year.

[5] As mentioned above, the lack of disaggregated information on interest rates obliges us to estimate the Lerner index for the whole banking activity using total assets as a proxy variable. Consequently, we must estimate the marginal cost of the total assets based on a costs function with only one output. However, the estimation of X-efficiency based on a cost function model with a vector of banking outputs is more accurate.

[6] Following the studies by Rogers (1998), DeYoung and Hasan (1998), Berger and DeYoung (1998), among others, "Other operating income" is introduced as a proxy variable for off-balance-sheet activities which have grown in importance in recent years.

h) As remarked above, market share is introduced as well as efficiency, to test the efficient structure hypothesis or alternatively the collusion hypothesis. The market share is calculated for the branches at province level. For each bank each province is weighted according to its importance in the branch office network.

i) Considering that Spanish banking sector includes some banks that compete at a national level, whereas others compete at a regional or provincial level, it is important to control for the reference market in each bank's area of competition (regional vs. national). For this reason, we introduce into the estimation the number of provinces in which each bank competes (proxied by the number of provinces where the bank has branches).

j) Finally, as a control variable, we introduce into the estimation the possible influence of the economic cycle, proxied by the growth of the local credit market where the firm operates. At bank level, the variable is constructed taking into account the provincial distribution of credit granted by all banks operating in the province, published by the Bank of Spain in its Statistical Bulletin, weighting each province according to the provincial distribution of the branch office network of the bank being analyzed.

## 3. Market power in Spanish banking: data and results

The sample is formed by practically all the banks and savings banks operating in Spain during the period 1986-2002. From the total of entities existing in each year, we eliminated those for which any of the variables needed for the estimation of the Lerner index and its determinants was not available, as well as some observations that we can describe as *outliers* from a statistical point of view[7]. With these criteria, the sample finally used consists of a total of 2,406 observations.

The statistical sources used were the balance sheets and profit and loss accounts of the commercial banks and savings banks published by the AEB (*Asociacion Española de Banca*) and the CECA (*Confederacion Española de Cajas de Ahorros*), respectively. To calculate the indexes of concentration and market shares we used, as mentioned above, the provincial distribution of the bank branch network, information also supplied by the AEB and the CECA. In the case of the provincial distribution of credits, the information is supplied by the Bank of Spain in its Statistical Bulletin.

[7] Specifically, we have eliminated those observations whose input prices (needed to estimate the cost function) are outside the interval of +/-2.5 the standard deviation.

Finally, the information on GDP and the population of each province comes from the National Statistical Institute (INE).

On the basis of the estimation of expression (3), Table 1 shows the evolution of the output price, the marginal cost and the Lerner index of the Spanish banking sector[8]. The average price of the banking output decreased from 10.7% in 1986 to 5.4% in 2002 as a consequence of the reduction of the money market rate. In parallel, marginal costs also decreased from 8.5% in 1986 to 4% in 2002 as a consequence of the reduction of both financial and operating costs. As a result of the joint evolution of prices and marginal costs, the value of the Lerner index rose from 0.20 in 1986 to 0.25 in 2002, market power having increased by 25% in the period considered.

The evolution of the Lerner index (see figure 1) shows three differentiated sub-periods: a brief sub-period of growth until 1988, a fall until 1994, and a practically continuous increase to 2002, reaching in this last year the highest value of the Lerner index in the period analyzed. For the periods common to those analyzed in other studies, this pattern of behaviour is similar, with growth of market power. Thus, Maudos and Pérez (2003) analyze the degree of competition in the Spanish banking system from 1992 to 2001 by the estimation of Lerner indexes and the Panzar and Rosse test. The results do not permit the rejection of the hypothesis of monopolistic competition, showing an increase in market power since 1996. Likewise, Carbó *et al.* (2003) also obtained evidence in favour of the existence of monopolistic competition in the period 1986-99, as well as an increase in market power since 1996.

The distinction between savings banks and commercial banks (figure 1) shows that the value of the Lerner index of the savings banks is higher than that of the commercial banks practically throughout the period analyzed, a gap opening up in the early 1990s that would later narrow as a consequence of the savings banks' loss of market power in the late 1990s. In the year 2002 this trend was even reversed, the savings banks presenting lower market power than the commercial banks.

One of the variables most frequently used by the public authorities to evaluate the competitive conditions of markets is market concentration. Thus, for example, in the USA, the Justice Department, the Federal Reserve and the Federal Deposit Insurance Corporation (FDIC) are concerned to prevent practices that abuse market power, authorizing or refusing a merger proposal on the grounds of its impact on the concentration of the market. Specifically, according to the screening guidelines, if the

[8] The mean values were calculated by weighting the individual bank and savings bank values according to their assets; they are therefore weighted means.

post-merger market HHI is lower than 1,800 points, and the increase in the index from the pre-merger situation is less than 200 points, the merger is presumed to have no anticompetitive effects and therefore is approved by the regulators. Thus, if the merger does not violate the 1,200/200 rule, the application is approved without further investigation (see, Cetorelli, 1999).

In the specific case of the Spanish banking system, figure 2 shows the evolution of the HH index, calculated as a weighted average of the concentrations attributed to each bank, using as weights the relative size of each bank in terms of number of branches[9]. For the total of the sample, the HHI increased from a value of 1,124 in 1986 to 1,353 in 2002, representing an increase in market concentration of 20%, mainly as a consequence of the reduction of the number of firms and of the mergers and acquisitions that had taken place (according to data of the Bank of Spain, the number of banks and savings banks fell from 217 in 1986 to 190 in 2002). By sub-periods, concentration increased until 1992 (possibly as a consequence of the mergers occurring particularly among savings banks motivated in part by the liberalization of the opening of branches in this sector in 1989[10]), decreased to 1998, and increased sharply thereafter (as a consequence of the mergers of the big banks, BBVA (*Banco Bilbao Vizcaya Argentaria*) and BSCH (*Banco de Santander Central Hispano*), and of the growth of the branch networks of the big savings banks). If we use the reference thresholds applied in the USA, the Spanish banking market is not excessively concentrated, given that the value of the HHI is well below the threshold of 1,800 points. Anyway, recent studies have also shown the inadequacy of using market concentration as an indicator of competition (Berger *et al.*, 2004; Maudos and Fernández de Guevara, 2004; Fernández de Guevara *et al.*, 2005; Claessens and Laeven, 2004; Carbó, Humphrey, Maudos and Molynuex, 2006; Carbó, Rodriguez and Udell, 2006).

The separate information for savings banks and commercial banks shows that the former operate in more concentrated markets, so the question arises as to whether this circumstance is behind the explanation of their greater market power seen before. Comparison of the evolution of the Lerner index and concentration also poses the question of whether the increase in concentration can explain the observed increase in market power.

---

[9] The HHI formula is HHI= $\sum_{i=1}^{n} MS_i^2$ , where $MS_i$ is the market share (expressed as percentage) of bank $i$ and $n$ is the number of banks in the market. By construction the HHI has an upper value of 10,000, in the case of monopolistic firm with 100 percent of the market share, and tends to zero in the case of a large number of firms with very small market shares.

[10] A more detailed analysis of mergers and acquisitions in the Spanish banking system is found in Carbó and Humphrey (2004).

Before responding to the above questions on the basis of the estimation of equation (2), table 2 gives the descriptive statistics of the variables used (both those explaining market power and those necessary for estimating the costs function). As well as the behaviour of the Lerner index and of concentration (mentioned above), note the increase of the importance of bank financing (proxied by the loans/GDP ratio). In the case of efficiency, it presents stable behaviour in the period analyzed, with an average value of 93%. Finally, the behaviour of the growth of the credit market and loan loss provisions/loans ratio is much more volatile as a consequence of the influence of the economic cycle.

Table 3 shows the results of the estimation of equation (2) using the explanatory variables[11] specified in section 2. For this purpose, given the availability of a panel of data, we introduced individual effects into the estimation with the aim of capturing the influence of other possible variables characteristic of each bank, and temporal effects[12].

Column (1) of table 3 offers the results of the estimation of equation (2). It shows that market concentration, proxied by the HHI, is not shown to be relevant in the explanation of the differences in market power, this result being in consonance with the evidence offered in Fernández de Guevara *et al.* (2005) for the European banking system[13].

The results show that bank size is a variable with a negative and significant effect on market power. However, the relation between market power and size is non-linear. Thus there exists a point beyond which an increase in size increases market power. The small and large sized banks therefore enjoy greater market power than the medium sized banks. Small banks probably enjoy greater market power because of their presence in local markets where their extensive branch network acts as an entry barrier. Larger banks may exploit market power because of their dominant position in the market.

In the case of the variable that proxies elasticity of demand (loans/GDP), no statistically significant results are obtained. The results also show that the banks more

[11] In the estimation we introduced a dummy for the institutional group (distinction between commercial bank and savings bank), which did not turn out to be significant, so finally it was omitted.

[12] As the Hausman test allows the null hypothesis of absence of correlation between individual effects and the explanatory variables to be rejected in all cases, we use the within-groups estimator (fixed effects model).

[13] As some studies have shown the existence of a non-linear relationship between concentration and market power (for example, Jackson, 1997), we have checked the results introducing additionally the square of the HHI. However, its effect is not statistically significant.

specialized in the traditional task of banking intermediation (lower value of the ratio of non-interest income to total income) enjoy greatest market power.

Regarding the coefficient of liquid reserves, results confirm the expected sign in that the banks that maintain higher liquidity will work with lower margins. Likewise, the results confirm the expected negative effect of default risk (proxied by the ratio of loan loss provisions to loans), though the parameter estimated is not statistically significant.

The effect of X-cost efficiency deserves special mention for the significance of the parameter estimated. The results show that the more efficient banks attain higher values of the Lerner index of market power. What this result indicates is that the banks with better management of their inputs can benefit from their greater efficiency and use it as a barrier to entry, enabling them to enjoy greater market power[14]. Using efficiency as a barrier to entry to possible competitors may have been a strategy of the Spanish banks in view of the intense process of liberalization and opening-up to outside competition undergone by the sector, especially during the 1990s[15].

Market share presents a negative sign, though not significant. Therefore, given that efficiency presents a positive and significant sign, the efficient structure hypothesis cannot be rejected to the detriment of the collusion hypothesis. In consequence, the firms that best manage their productive resources to reach higher production levels achieve both greater market shares and higher levels of profitability. Finally, we should mention that the growth of the market is not significant.

The evidence obtained in relation to concentration and efficiency is in line with the results of other studies (Maudos, 1998 and 2001; Carbó *et al.* 2003) in that the traditional structure-conduct-performance hypothesis is rejected for the Spanish banking system, the evidence being favourable, on the other hand, to the efficient structure hypothesis.

Nevertheless, it should be pointed out that the absence of significance of concentration in the explanation of differences in market power among Spanish banks highlights the lack of solid theoretical foundations for the well-known structure-

[14] It can be argued that more efficient firms enjoy greater market power because its lower marginal costs. But if the market were perfectly competitive, gains in efficiency will translate into lower prices as the equality between marginal costs and prices must hold. The question we posit is that if more efficient banks do not lower prices to match their marginal cost it is because of market power.

[15] DeYoung and Hasan (1998), using as reference the U.S., show that newly created banks rapidly improve their efficiency, though on average they take nine years to reach the levels of the established banks, as a consequence, among other things, of excess capacity. In consequence, the greater efficiency of the established banks may act as a barrier to entry into the sector.

conduct-performance paradigm, which is tested using market concentration as proxy of market power. The reason is that according to this paradigm, the structure of the market affects firms' conduct (making it easier to adopt collusive agreements), which determines their results. Under this hypothesis, greater concentration allows greater market power to be enjoyed, permitting firms to set prices above marginal cost and thus achieve extraordinary profits. Consequently, concentration is used as a proxy of market power, an inadequate approach in the light of the results obtained in this study[16].

From these derives an important implication for economic policy. The fact that concentration lacks significance in the explanation of differences in market power shows the inadequacy of using it as proxy for the intensity of competition, as is done in some countries to approve or reject a bank merger process.

The lower part of Table 3 shows the economic significance of the market power determinants measured by the implicit elasticities evaluated at sample means for those variables which are significant in column (1). More specifically, the table captures the effect on the Lerner index of a 1% increase in its explanatory variables. With these results, the evolution of the Lerner index responds more to variations in cost efficiency and size than to income structure and the coefficient of liquid reserves. In the particular case of cost efficiency, a 1% increase would enable the Lerner index to increase by 7%.

Finally, we now turn to present some robustness tests in order to analyse the sensitivity of the results. Specifically, two robustness tests are implemented: 1) we analyze if the results change when the non-significant variables are dropped; and 2) As marginal costs used to calculate the Lerner index are estimated from a costs function, and X-efficiency is also estimated from a frontier costs function, it can be argued that the positive effect of cost efficiency on market power could be picking up the connection between the two variables, raising an issue of endogeneity bias.

In the first case, column (2) shows that the results remain the same when the non-significant variables are dropped. In the second case, in order to deal with the issue of endogeneity bias, equation (3) was reestimated using the instrumental variables estimator. More precisely, X-efficiency was instrumented using its lagged value. As shown in column 3, results are robust (the effect of cost efficiency is positive and statistically significant)[17].

[16] This result shows is in line with other studies: Berger et al. (2004), Fernández de Guevara *et al.* (2005), Claessens and Laeven (2004) and (2005), Carbó, Rodriguez and Udell (2006), Carbó, Humphrey, Maudos and Molyneux (2006).

[17] The connection between MC (estimated from a total costs function) and X-efficiency is weaker if the frontier costs function excludes interest expenses from the dependent variable and the price of deposits

## 4. Conclusions

The European banking sectors have in recent years undergone very substantial changes as a result of the process of deregulation of the finance industry, the creation of economic and monetary union, the development of information technology and telecommunications, etc. Alongside this, the European banking industry has experienced a process of consolidation following the wave of mergers and acquisitions leading to a reduction in the number of competitors and an increase in market concentration.

Although the different deregulatory measures put in place create a climate of greater competition among financial intermediaries, the increase in concentration poses the question of the net effect of these two forces on the degree of competition, and therefore on social welfare.

On the basis of a theoretical model of banking competition, and using as laboratory the Spanish banking system in the period 1986-2002 (where market concentration has increased as a result of M&As and market structure variables can be proxied at regional level), the study analyzes the explanatory variables of market power through the construction of Lerner indexes of market power.

The results show that the market power of the Spanish banking system decreased considerably until the mid-1990s, though there has been a stage of steady growth since then, confirming the evidence found by other studies. Also, the data show that the savings banks enjoy greater market power than the commercial banks.

The analysis of the explanatory factors of market power shows the importance of specialization and of efficiency for explaining the differences in market power among banks. Thus, the banks that specialize to a greater extent in retail banking (with a lower proportion of non-interest income in their total income) and that achieve greater efficiency, achieve higher relative margins, their greater efficiency acting as a barrier to entry.

On the other hand, market concentration (approximated at regional level) is not significant in the explanation of differences in market power. This result allows us to conclude that: a) the studies and approaches that use concentration variables to proxy the degree of competition or market power lack foundation; and b) economic policy decisions to accept or refuse a bank merger process based on its effects on market

---

from the input price vector, that is, if we estimate operating cost X-efficiency. For this reason, we analyzed the sensitivity of the results using X-operating efficiency as an explanatory variable of the Lerner index. Results (not shown) are robust.

concentration are without solid foundation. Nevertheless, it should not be forgotten that these implications derive from data on the Spanish banking sector, and it is therefore necessary to obtain additional evidence referring to other countries.

**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(5), 663-684.

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

Berger, A. N. (1995): "The profit-relationship in banking –test of market-power and efficient-structure hypothesis", *Journal of Money, Credit and Ban*king, 27, pp. 405-431.

Berger, A. and R. DeYoung (1988): "Problem loans and cost efficiency in commercial bank", *Journal of Banking and Finance,* 21, pp. 849-870.

Berger, A., Demirgüç-Kunt, A., Levine, R. and J. Haubrich (2004): "Bank concentration and competition: an evolution in the making", *Journal of Money, Credit and Banking*, 36, pp. 435-451.

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

Cabral, I., Dierick, F. and J. Vesala (2002): "Banking integration in the Euro area", *Occasional Paper Series*, No. 6, December, European Central Bank.

Carbó, S., Gardener, T. and Williams, J. (2002): "Efficiency in banking: empirical evidence form the Savings bank sector", *The Manchester School* 70 (2), 204-228.

Carbó, S., Humphrey, D. and F. Rodríguez (2003): "Deregulation, Bank Competition and Regional Growth", *Regional Studies,* 37, pp. 227-237.

Carbó, S., López, R. and F. Rodríguez (2003): "Medición de la competencia en los mercados bancarios de las regiones españolas", *Revista de Economía Aplicada,* 32, pp. 5-33.

Carbó, S. and D. Humphrey (2004): "Predicted and actual costs from individual bank mergers", *Journal of Economics and Business,* 56, pp. 137-157.

Carbó, S., Humphrey, D., Maudos, J. and Molyneux, P. (2006): "Cross-country comparisons of competition and pricing power in European Banking", *Proceedings of The 42nd Annual Conference on Bank Structure & Competition*, Federal Reserve Bank of Chicago, 17-19 May, Chicago.

Carbó, S., Rodriguez, F. and Udell, G. (2006): "Bank Market Power and SME Financing Constraints", *Proceedings of The 42nd Annual Conference on Bank Structure & Competition*, Federal Reserve Bank of Chicago, 17-19 May, Chicago.

Cetorelli, N. (1999): "Competitive analysis in banking: appraisal of the methodologies", Federal Reserve of Chicago, *Economic Perspectives*, Issue Q1, 2-15.

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.

Corvosier, S. and R. Gropp (2002): "Bank concentration and retail interest rates", *Journal of Banking and Finance*, Vol. 26, pp. 2155-2189.

De Bandt, O. and E.P. Davis (2000): "Competition, contestability and market structure in European banking sectors on the eve of EMU", *Journal of Banking and Finance* Vol. 24, pp. 1045-2066.

De Young, R. and I. Hasan (1998): "The performance of the novo commercial banks: a profit efficiency approach", *Journal of Banking and Finance*, 22, pp. 565-587.

European Central Bank (2000a): *Mergers and acquisitions involving the EU banking industry –Facts and implications*, December.

European Central Bank (2000b): "EU banks´ income structure", April.

European Commission (2002a): *Report by the Economic and Financial Committee (EFC) on EU financial integration*, Directorate-General for Economic and Financial Affairs, Economic Papers No. 171, ECFIN/194/02-EN, May.

European Commission (2002b): *Study to Analyse, Compare, and Apply Alternative Indicators and Monitoring Methodologies to Measure the Evolution of Capital Market Integration in the European Union*, report for the European Commission, CSEF (Adam, K., Jappelli, T., Menichini, A., Padula, M. and Pagano, M.).

Fernández de Guevara, J., Maudos, J. and F. Pérez (2005): "Market power in European banking", *Journal of Financial Services Research,* 27 pp. 109-137,

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

Hartmann, P., Maddaloni, A. and S. Manganelli (2003): "The Euro area financial system: structure, integration and policy initiatives", *Working Paper* No. 230, May, European Central Bank.

Jackson, W. (1997): "Market structure and the speed of adjustment: evidence of non-monotonicity", *Review of Industrial Organization,* 12, pp. 37-57.

Maudos, J. (1998): "Market structure and performance in Spanish banking using a direct measure of efficiency", *Applied Financial Economics,* 8, pp. 191-200.

Maudos, J. (2001): "Rentabilidad, estructura de mercado y eficiencia en la banca", *Revista de Economía Aplicada*, Vol. IX, 25, pp. 193-207.

Maudos, J. and F. Pérez (2003): "Competencia vs. poder de mercado en la banca española", *Moneda y Crédito,* 217, pp. 139-166.

Maudos, J. and J. Fernández de Guevara (2004): "Factors explaining the interest margin in the banking sectors of the European Union", *Journal of Banking and Finance*, Vol. 28, pp. 2051-2309.

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

Nathan, A. and E. Neave (1989): "Competition and contestability in Canada´s financial system: Empirical results", *Canadian Journal of Economics*, 22, pp. 576-594.

Neven, D. and L.H. Röller (1999): "An aggregate structural model of competition in the European banking industry", *International Journal of Industrial Organization*, 17, pp. 1059-1074.

Prescott, H. and A. McCall (1975): "Market power and structure and commercial bank instalment lending", *Journal of Money, Credit and Banking,* 7, pp. 449-467.

Shaffer, S. (1989): "Competition in the US banking industry", *Economics Letters,* 29, pp. 321-323.

Shaffer, S. (1993): “A test of competition in Canadian banking”, *Journal of Money, Credit and Banking*, 25, pp. 49-61.

Shaffer, S. and J. Disalvo (1994): “Conduct in banking duopoly”, *Journal of Banking and Finance* Vol 18, pp. 1063-1082

**Table 1. Ouput price, marginal cost and Lerner Index**

| | P=price | | | | MC=marginal cost | | | | Lerner Index=(P-MC)/P | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Standard deviation | 25th percentile | 75th percentile | Mean | Standard deviation | 25th percentile | 75th percentile | Mean | Standard deviation | 25th percentile | 75th percentile |
| **1986** | 0.107 | 0.009 | 0.102 | 0.112 | 0.085 | 0.011 | 0.077 | 0.091 | 0.200 | 0.083 | 0.165 | 0.253 |
| **1987** | 0.108 | 0.010 | 0.101 | 0.115 | 0.084 | 0.011 | 0.077 | 0.086 | 0.218 | 0.070 | 0.184 | 0.267 |
| **1988** | 0.105 | 0.009 | 0.100 | 0.112 | 0.079 | 0.010 | 0.072 | 0.083 | 0.252 | 0.074 | 0.206 | 0.295 |
| **1989** | 0.110 | 0.011 | 0.101 | 0.120 | 0.086 | 0.012 | 0.079 | 0.090 | 0.223 | 0.070 | 0.200 | 0.259 |
| **1990** | 0.120 | 0.014 | 0.109 | 0.128 | 0.095 | 0.013 | 0.088 | 0.101 | 0.203 | 0.069 | 0.174 | 0.250 |
| **1991** | 0.121 | 0.011 | 0.115 | 0.124 | 0.096 | 0.012 | 0.089 | 0.098 | 0.209 | 0.070 | 0.162 | 0.258 |
| **1992** | 0.114 | 0.012 | 0.108 | 0.117 | 0.093 | 0.011 | 0.087 | 0.099 | 0.185 | 0.049 | 0.167 | 0.213 |
| **1993** | 0.113 | 0.013 | 0.104 | 0.118 | 0.090 | 0.013 | 0.081 | 0.095 | 0.206 | 0.055 | 0.190 | 0.235 |
| **1994** | 0.091 | 0.012 | 0.084 | 0.096 | 0.076 | 0.011 | 0.069 | 0.082 | 0.169 | 0.078 | 0.146 | 0.217 |
| **1995** | 0.093 | 0.013 | 0.089 | 0.099 | 0.077 | 0.011 | 0.070 | 0.082 | 0.174 | 0.072 | 0.134 | 0.211 |
| **1996** | 0.090 | 0.008 | 0.086 | 0.093 | 0.074 | 0.008 | 0.069 | 0.076 | 0.181 | 0.079 | 0.119 | 0.228 |
| **1997** | 0.074 | 0.009 | 0.069 | 0.079 | 0.060 | 0.006 | 0.055 | 0.064 | 0.186 | 0.085 | 0.128 | 0.228 |
| **1998** | 0.066 | 0.006 | 0.064 | 0.069 | 0.053 | 0.006 | 0.049 | 0.056 | 0.209 | 0.078 | 0.175 | 0.258 |
| **1999** | 0.055 | 0.006 | 0.051 | 0.057 | 0.043 | 0.006 | 0.038 | 0.048 | 0.228 | 0.083 | 0.173 | 0.287 |
| **2000** | 0.060 | 0.007 | 0.056 | 0.062 | 0.046 | 0.006 | 0.043 | 0.049 | 0.225 | 0.070 | 0.187 | 0.242 |
| **2001** | 0.061 | 0.008 | 0.057 | 0.063 | 0.047 | 0.007 | 0.042 | 0.048 | 0.236 | 0.081 | 0.204 | 0.272 |
| **2002** | 0.054 | 0.006 | 0.051 | 0.057 | 0.040 | 0.005 | 0.039 | 0.042 | 0.249 | 0.087 | 0.209 | 0.313 |

*Source: AEB, CECA and own elaboration*

**Table 2. Variable definitions and sample means**

Percentages and millions of current Spanish pesetas

| | 1986 | 1990 | 1995 | 2000 | 2002 |
|---|---|---|---|---|---|
| **Output price (Total revenue / Total assets) (%)** | 10.69 | 11.97 | 9.31 | 5.96 | 5.38 |
| **Marginal Cost (%)** | 8.53 | 9.51 | 7.60 | 4.58 | 4.01 |
| **Lerner Index(%)** | 20.25 | 20.56 | 18.08 | 22.90 | 25.27 |
| **Input prices** | | | | | |
| **- Deposits = Financial costs / Deposits (%)** | 7.28 | 8.80 | 6.73 | 3.03 | 2.74 |
| **- Labor = Personnel costs / Number of employees (Million Spanish pesetas per worker)** | 5.67 | 6.31 | 7.04 | 6.79 | 6.80 |
| **- Physical capital = Operating cost except personnel costs / Fixed assets (%)** | 53.25 | 88.06 | 78.21 | 92.08 | 106.61 |
| **Outputs** | | | | | |
| **- Earning assets** | 303,671 | 416,649 | 624,787 | 1,140,070 | 1,239,050 |
| **- Deposits** | 313,049 | 395,712 | 624,914 | 1,158,089 | 1,243,209 |
| **- Non-interest income** | 1,909 | 2,728 | 3,716 | 9,037 | 9,405 |
| **Herfindahl-Hirschman index (HHI)** | 1,124 | 1,185 | 1,150 | 1,337 | 1,353 |
| **Size: Total assets** | 361,655 | 467,762 | 689,070 | 1,341,506 | 1,443,923 |
| **Cash / Deposits (%)** | 13.42 | 3.78 | 1.99 | 2.31 | 2.18 |
| **Non-interest income / Total income (%)** | 4.94 | 4.87 | 5.79 | 11.30 | 12.11 |
| **Growth of credit market (%)** | 4.76 | 5.41 | 1.75 | 13.66 | 7.68 |
| **Loans / GDP (%)** | 48.19 | 57.04 | 61.77 | 82.70 | 91.41 |
| **Loan Loss Provisions / Loans (%)** | 1.16 | 0.75 | 0.82 | 0.36 | 0.53 |
| **Cost efficiency (Minimum cost / current cost) (%)** | 92.28 | 92.65 | 93.68 | 93.11 | 93.02 |
| **Number of provinces a bank competes** | 9.25 | 9.36 | 11.69 | 14.03 | 14.30 |
| **Number of firms** | 169 | 180 | 143 | 106 | 100 |

*Source: AEB, CECA, Bank of Spain, INE and own elaboration.*

**Table 3. Determinants of the market power. 1986-2002**

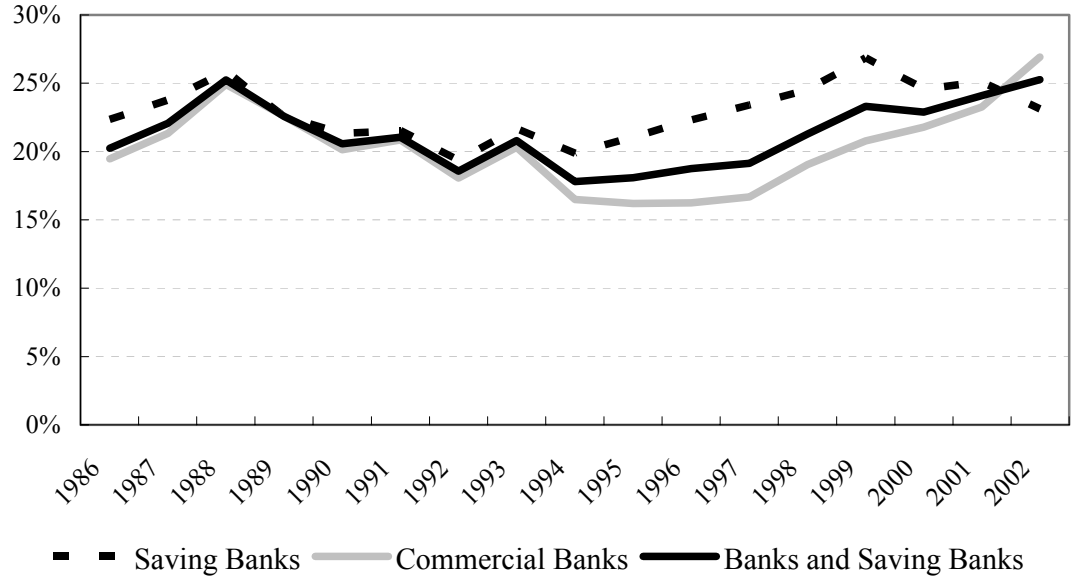
Dependent variable: Lerner Index

| | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| | **Coefficient** | **t-statistic** | **Coefficient** | **t-statistic** | **Coefficient** | **t-statistic** |
| **Market concentration (HHI)** | -0.191 | -0.48 | | | | |
| **log (Total assets)** | -0.142 | -3.94 | -0.106 | -3.39 | -0.089 | -2.54 |
| **log (Total assets)²** | 0.006 | 3.66 | 0.004 | 2.99 | 0.003 | 2.30 |
| **Loans / GDP** | -0.042 | -1.53 | | | | |
| **Provisions / Loans** | -0.121 | -0.97 | | | | |
| **Cash / Deposits** | -0.006 | -2.66 | -0.004 | -2.15 | -0.009 | -4.14 |
| **Non-interest income / Total income** | -0.215 | -3.93 | -0.225 | -4.11 | -0.209 | -3.49 |
| **Cost efficiency** | 1.675 | 14.30 | 1.714 | 14.75 | 2.234 | 6.94 |
| **Market share** | -0.656 | -1.13 | | | | |
| **Number of provinces** | -0.001 | -1.53 | | | | |
| **Growth loans market** | 0.065 | 0.18 | | | | |
| **Number of observations** | 2,359 | | 2,359 | | 2,085 | |
| **Adjusted R-squared** | 0.68 | | 0.68 | | 0.69 | |
| | **Ecomomic significance of the market power determinants** | | | | | |
| **Total assets** | -2.98 | | -2.29 | | -1.92 | |
| **Non-interest income / Total income** | -0.07 | | -0.08 | | -0.07 | |
| **Cash / Deposits** | 0.00 | | 0.00 | | 0.00 | |
| **Cost efficiency** | 7.34 | | 7.51 | | 9.78 | |

Note: The data in the lower part of the table indicate the percentage variation of the Lerner index in response to a 1% increase in its determinants, evaluated at average sample values. All estimations include fixed effects (Hausman test does not reject this especification). In column (3) cost efficiency is intrumented with its lagged value.

*Source: AEB, CECA, Bank of Spain, INE and Own elaboration*

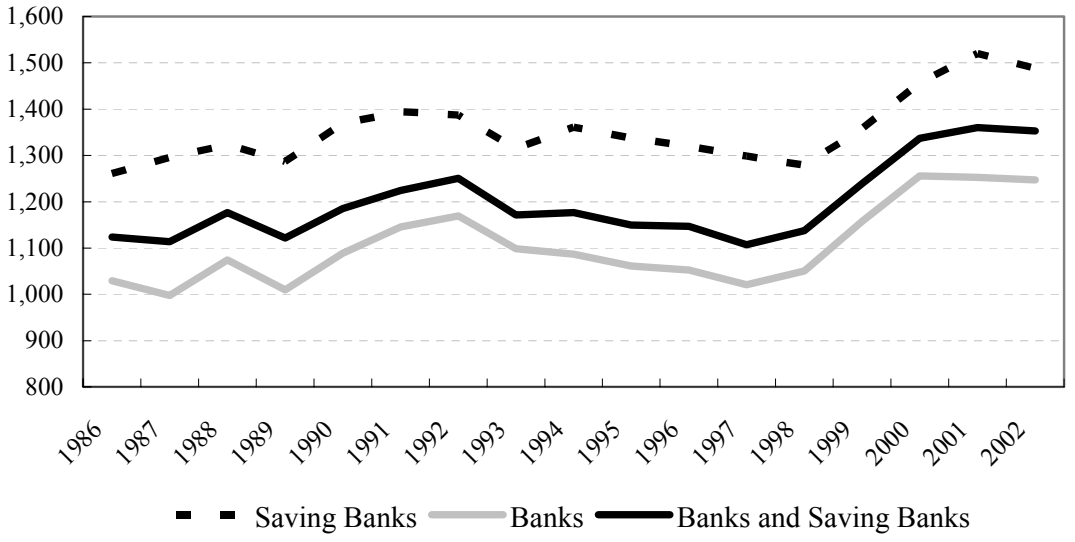
**Figure 1.** Market power in the Spanish banking sector. Lerner index




*Note* : The Lerner Index is defined as the disparity between price and marginal cost expressed as a percent of price. Prices are calculated by estimating the average price of bank production (proxied by total assets) as a quotient between total income and total assets. Marginal cost is estimated on the basis of a translog cost function.

Source: AEB, CECA and own elaboration

**Figure 2.** Market concentration. Herfindahl- Hirschman index.




Source: AEB, CECA and own elaboration