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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 EU15 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 EU15. 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

JEL: D40, G21

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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. However, often some level of market power is accepted because it is assumed that higher profits would reduce the risk and enhance the stability of the banking system.

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 by the European Commission between 1999 and 2004 gave new impulse to the creation of a single European financial services market.

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, Bresnanhan´s mark-up test, conjectural variation parameter) with empirical applications whose purpose is to analyze competitive rivalry in banking markets[1].

In the specific case of European banking sectors, the results of the studies carried out show the existence of market power, 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 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,

[1] See a recent survey of this issue in Berger *et al*. (2003).

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) 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*., 2003; Maudos and Fernández de Guevara, 2004; Fernández de Guevera *et al*., 2005a; Claessen and Laeven, 2004; 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, and 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 Ross´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), Fernández de Guevara *et al*. (2005) and Fernández de Guevara and Maudos (2004), where Harberger´s welfare triangle is shown to be proportional to the Lerner index.

Results referring to the banking sectors of the EU15 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 EU15 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 EU15. 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.

Only a few studies have analyzed the relationship between market power and efficiency in banking. For the U.S. banking industry, Berger (1995) implements tests that distinguish among the several hypotheses that explain the profit-structure relationship in banking using direct measures of efficiency. However, the relationship between efficiency and market power is not analyzed. Also for the U.S. banking sector, Berger and Hannan (1998) examine 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.

For the European banking sectors, although studies exist that test the hypotheses that may explain the profit-structure relationship (Molyneux *et al.*, 1994, 1996 and 2004; Goldberg and Rai, 1996; Maudos, 1998; Vander Vennet, 2002), as far as we know, there is no study that analyses the relationship between market power and efficiency. Therefore, to quantify this relationship, and to estimate the social loss derived from both market power and efficiency, are the main aims of this paper.

3. Methodology

3.1 The Lerner index of market power

The model most often used to obtain the Lerner index of market power in banking is the Monti-Klein imperfect banking competition model[2]. This model examines the behavior of a monopolistic bank faced with a loan demand curve of negative slope $L(r_L)$ and a deposit supply of positive slope $D(r_D)$, the decision variables of the bank being L (volume of loans) and D (volume of deposits). For simplicity's sake the level of capital is assumed to be given and the bank is assumed to be price taker in the inter-bank market (r). As shown by Freixas and Rochet (1997), this model can be interpreted as a model of imperfect competition (Cournot) among a finite number of banks (N). Cournot's equilibrium is the set of N vectors (D^*_n, L^*_n) $n=1,\ldots,N$ which maximize the profit of bank n, considering the volume of deposits and loans of other banks to be given for each n. Thus, (D^*_n, L^*_n) is the solution of the following optimization problem:

$$\max_{(D_n, L_n)} \left\{ \left(r_L \left[L_n + \sum_{m \neq n} L_m^* \right] - r \right) L_n + \left(r - r_D \left[D_n + \sum_{m \neq n} D_m^* \right] \right) D_n - C(L, D) \right\} \qquad (1)$$

where $C(\cdot)$ are the operating costs.

In equilibrium, each bank sets $D^*_n = D^*/N$ and $L^*_n = L^*/N$. From the first order conditions, we obtain:

$$\frac{\left[r^*_L - r - mc_L \right]}{r^*_L} = \frac{1}{N \varepsilon_L (r^*_L)} \qquad \frac{\left[r - r^*_D - mc_D \right]}{r^*_D} = \frac{1}{N \varepsilon_D (r^*_D)} \qquad (2)$$

where ε_L and ε_D are the elasticities of demand for loans and deposits respectively, and on the left hand side of each of equations (2) appears the expression of the Lerner index of market power for loans and for deposits, respectively. The Lerner index of market power defines the disparity between price (interest rate) and marginal cost (mc) expressed as a percent of price, taking into account that the divergence between product price and marginal cost of production is the essence of monopoly power. Thus, the Lerner Index measures the relative markup of price over marginal cost.

It is worth noting that according to expression (2), 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

[2] Monti (1972) and Klein (1971).

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 (such as CR(n), or the Herfindahl-Hirschman index).

The measurement of the Lerner index of market power requires prices and marginal costs to be estimated separately for loans and for deposits. In the first case, yearly averages of loan (deposit) interest rates for each bank were imputed from ratios of loan revenues (financial costs) to outstanding loan (deposit) values. In the second case, and bearing in mind that one of the objectives of the study is to analyze the relationship between X-efficiency and market power, marginal operating costs are estimated from a frontier translog cost function.

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. As figure 1 shows, assuming a linear loan (deposit) demand (supply) function and constant marginal cost, the loss in the consumer's surplus due to imperfect competition with respect to the situation of perfect competition is the area *acde (fihj)*, while the gain in the producer's surplus is the area *abde (fghj)*. Thus, the net social loss associated with misallocation of resources attributable to market power is the area *abc* (*ghi*), the so-called welfare or Harberger's triangle. This triangle shows the loss due to increasing the price from the competitive level to the monopoly price. If we express this social loss per unit of revenue ($r_L L$) – or unit of cost ($r_D D$) - the welfare triangle is proportional to the Lerner index[3]:

$$\frac{\Delta abc}{r_L^* L^*} = \frac{1}{2}\frac{r_L^* - r - mc_{L^*}}{r_L^*} \qquad \frac{\Delta gih}{r_D^* D^*} = \frac{1}{2}\frac{r - r_D^* - mc_{D^*}}{r_D^*} \tag{3}$$

The total welfare loss can be expressed as a percentage of GDP:

$$\frac{Welfare\ loss}{GDP} = \frac{1}{2GDP}\left[\frac{r_L^* - r - mc_{L^*}}{r_L^*} r_L^* L^* + \frac{r - r_D^* - mc_{D^*}}{r_D^*} r_D^* D^*\right] \tag{4}$$

[3] Fernández de Guevera and Maudos (2004) adopt a different approach. They measure the welfare loss attributable to market power, adding the loss of consumer surplus.

3.3 X-Efficiency

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, *i.e.* statistical noise, measurement error, and random shocks that are external to the firm's control. The second error component (u) is a one-sided variable that captures inefficiency relative to the frontier. Following Jondrow *et al.* (1982), bank-specific estimates of inefficiency terms can be calculated by using the distribution of the inefficiency term conditional to the estimate of the composite error term. We assume that the inefficiency term is drawn from a half-normal distribution. The resulting cost efficiency ratio may be thought of as the proportion of costs or resources that are used efficiently. For example, a bank with a cost efficiency of 0.85 is 85 per cent efficient or, equivalently, wastes 15 per cent of its costs relative to a best practice bank facing the same conditions (same output).

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 cost would capture the effect of market power in the deposit market, and, since we aim to analyze the effect of market power on efficiency, it will bias our results.

We estimate a translog frontier cost function, where operating costs (c) depend on two outputs (L=loans, and D=deposits), two input prices (w_1=price of labor and w_2= price of physical capital) and technical change (Trend):

However, from a social point of view, the loss of consumer surplus is appropriated by banks in form of extraordinary profits.

$$\ln c_{it} = \sum \gamma_h \ln w_{hit} + \gamma_L \ln L_{it} + \gamma_D \ln D_{it} + \frac{1}{2}\sum\sum \gamma_{hm} \ln w_{hit} \ln w_{mit} + \gamma_{LD} \ln L_{it} \ln D_{it}$$
$$+\frac{1}{2}\gamma_{LL}(\ln L_{it})^2 + \frac{1}{2}\gamma_{DD}(\ln D_{it})^2 + \sum \gamma_{hL} \ln w_{hit} \ln L_{it} + \sum \gamma_{hD} \ln w_{hit} \ln D_{it} \qquad (5)$$
$$+\mu_1 Trend + \frac{1}{2}\mu_2 Trend^2 + \mu_L Trend \ln L_{it} + \mu_D Trend \ln D_{it}$$
$$+\sum \mu_h Trend \ln w_{hit} + v_{it} + u_{it}$$

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:

$$mc_{L_{it}} = \frac{\partial c_{it}}{\partial L_{it}} = \left[\gamma_L + \gamma_{LL} \ln L_{it} + \sum \gamma_{hL} \ln w_{hit} + \gamma_{LD} \ln D_{it} + \mu_L Trend\right]\frac{c_{it}}{L_{it}} \qquad (6)$$

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

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 equation (5) some environmental variables (macroeconomic performance, economic development, population density, and banking services) 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 ratio of the Gross Domestic Product in real terms to the number of inhabitants (GDP/POP). This variable affects numerous factors related to the demand and supply of banking services (mainly deposits and loans). Additionally, this variable is used as an overall indicator of institutional development.

-The population density is measured by the ratio of inhabitants per square kilometer (POP/Km^2). 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.

-Branches per capita (BR/POP) 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 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. Banks with missing data needed for estimating marginal costs and/or interest rates were not included. Additionally, banks with input prices and/or computed loan and deposit interest rates that were outside the interval of +/- 2.5 times the relevant standard deviation were dropped from the sample.

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 dissagregation 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 assets side and another on the liabilities. Thus, bank outputs are loans (proxied by total earning assets) and deposits (proxied by customer and short term funding). Input prices (w) are $w1$= price of labor (personnel costs / total assets[4]) and $w2$= 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

[4] As data on the number of employees are not available in BankScope database, the price of labor is measured by the ratio of personnel expenses to total assets.

volume of loans and deposits for each country needed to compute the welfare triangle (see expression 4) is taken from the European Central Bank (2004).

Bank market concentration is measured by the Herfindahl-Hirshman index (HHI). 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^2) is obtained from National Accounts (OECD) and NewCronoss (Eurostat). Table 1 contains the descriptive statistics of the variable used in the paper.

The evolution of interest rates, marginal costs and absolute margins are reported in table 2. 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).

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 2. 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 EU15) 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.

Table 3 shows the evolution of the Lerner index of market power for each of the EU15 countries, and for the EU15 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 EU15 (0.32). At the

opposite extreme are the UK and Sweden, with low levels of market power in the loans market.

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 $(r - r_D)$, which is negative in most European banking sectors. As we have mentioned above, this suggests a loss leader pricing strategy in the deposit market[5]. Furthermore, the negative margins in deposits also reflect the competition of other financial liabilities such as mutual funds. On the assets side, loans remain the principal source of finance for certain segments, especially where relationships are more important (small firms or households), being, therefore, less subject to the competition of other financial intermediaries or markets.

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 (4). Our measure comprises the loss of consumer and producer surplus occasioned by non-competitive pricing (the welfare triangle). Table 4 shows the welfare loss associated with imperfect competition as a percentage of GDP. The evolution of the EU15 average suggests that in the period between 1993 and 2002, there was a downward trend in the welfare loss attributabled 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.

[5] For the Spanish case, results are similar to those reported in Carbó *et al*. (2005), who analyse the intensity of price and non-price (branches) competition over the 1986-2002 period. Their results show that market power has increased in the loan markets while

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[6] - 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 4): the evolution of market power (Lerner index) 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.

The estimates of the welfare loss triangle are lower than the values reported by Fernández de Guevara and Maudos (2004) for the period 1993-2000. Thus, taking as reference their estimation for 2000, the loss of welfare associated with imperfect competition is 2.51% of GDP for the average of the EU15, as against the 0.27% obtained in this study. Several factors can help to explain these differences. Firstly, the welfare loss estimated in Fernández de Guevara and Maudos (2004) incorporates, as well as Harberger´s welfare triangle, the loss of consumer surplus that is appropriated by the producer in form of extra profits. Secondly, Fernández de Guevara and Maudos (2004) use a single indicator of banking activity (proxied by total assets) and, consequently, a single indicator of market power. Taking into account that the levels of market power are very different in the loan and deposit markets, the use of a single indicator of market power could bias the estimated value of welfare loss.

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falling in deposit markets. They also found that in the 1997-2002 period, margins were negative in the Spanish deposits market.

[6] According to the European Central Bank (ECB, 2004), in Luxembourg, 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.

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

In this section we present the results regarding the relationship between market power and efficiency in the European banking sectors. Having analyzed the evolution of market power in section 4, we now turn to the study of cost efficiency.

Table 5 shows the mean efficiency scores, estimated by the stochastic frontier approach. Average cost efficiency is quite stable and ranges around an average level of 85%, which is in accordance with former studies of the EU (Maudos *et al.*, 2002; Altunbas *et al*., 2001)[7]. 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 EU15 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 6 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 4) with the magnitude of welfare loss associated to banks´ cost inefficiency (table 6), we can see that, in general, the social welfare losses derived from market power are greater

[7] Averaging the results of 130 studies across five different types of frontier approaches for 21 countries suggests that average cost inefficiency in various nations' banking industries is 20% to 25%. See Berger and Humphrey (1997).

than those from X-inefficiency. Thus, in 2002, the former was 0.54% of GDP, in contrast to the 0.4% of X-inefficiency[8]. 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.*, 2003; Fernández de Guevera *et a*l. 2005a; Claessens and Laeven; 2004). Moreover, the relationship between the level of competition and concentration is not straightforward and depends on the conduct of the banks in the market. As Shaffer (2004) shows, in a concentrated market different competitive equilibria can be obtained depending on the conduct of banks in markets. 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.

[8] An exceptional case is that of France, where the high level of competition causes losses of cost efficiency being greater than those of market power.

-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 (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[9].

The regression model is the following:

$$EF_{it} = f(Market\ power_{it}, \ln(TA_{it}), S) \tag{7}$$

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 (7) the logistic functional form

$$\text{logistic}(EF_{it}) = \frac{e^{EF_{it}}}{1+e^{EF_{it}}} = \frac{e^{\beta_1 Market\ power_{it} + \beta_2 \ln(TA_{it}) + \sum_{c=1}^{4} \beta_3 S_c}}{1+e^{\beta_1 Market\ power_{it} + \beta_2 \ln(TA_{it}) + \sum_{c=1}^{4} \beta_3 S_c}} \tag{8}$$

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

$$\ln\left[\frac{\text{logistic}(EF_{it})}{1-\text{logistic}(EF_{it})}\right] = \beta_1 Market\ power_{it} + \beta_2 \ln(TA_{it}) + \sum_{c=1}^{4} \beta_{3c} S_c \tag{9}$$

Table 7 reports the results of the estimation of expression (9). 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 HHA 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 and deposit market (column 2), the

[9] S4 (other type of institutions) is the group of reference in the estimations.

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 7 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 (HHL=180.42 in Germany in 2002) to that of the most concentrated market (HHL=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 7 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).

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. There may be several reasons explaining the positive effect of market power on efficiency. Firstly, as Pertersen 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[10]. 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 (Maudos and Fernández de Guevara, 2004). Secondly, therefore, what would be the potential loss of welfare

[10] The theoretical contribution of Sussman and Zeira (1995) show that banks´ monitoring costs increase in distance.

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 7, 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 EU15 average in those banking sectors in which the value of the Lerner index is greater than this average, remaining at the current values in the other countries.

Table 8 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 EU15. 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 9. The elasticities of efficiency against changes in the Lerner index shown in table 7 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 EU15 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 tables 8 and 9 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 current Financial Services Action Plan of the European Commission, which incorporates 42 measures aiming to create a single European financial market.

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).

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.

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Table 1. Sample statistics of variables

	c	*L*	*D*	*w1*	*w2*	r_L	r_D	*r*	GDPGR	GDP/POP	BR/POP	POP/Km^2	HHIA	HHIL	HHID	LA	BANKS
									1993								
AUSTRIA	1.54	95.12	77.88	0.95	88.56	9.18	6.81	6.77	0.42	19.99	0.59	0.10	687.00	741.81	812.51	6.68	57
BELGIUM	1.46	95.77	85.98	0.92	74.99	9.57	7.34	8.09	-0.96	18.72	1.97	0.30	838.93	1,057.49	884.82	6.85	62
DENMARK	2.35	95.14	84.71	1.44	50.72	12.46	6.78	10.08	0.00	24.65	0.45	0.12	1,442.12	1,741.50	2,232.22	6.22	70
FINLAND	2.08	88.73	73.01	0.86	72.44	9.92	7.11	7.55	-1.24	17.48	0.43	0.01	1,854.48	2,489.68	2,588.74	7.08	4
FRANCE	1.68	92.86	80.71	0.95	102.49	9.66	7.17	8.28	-0.89	18.73	0.45	0.11	399.45	431.35	507.48	6.97	264
GERMANY	1.62	96.59	75.82	1.00	73.22	9.50	6.79	7.19	-1.09	20.24	0.55	0.23	197.41	213.89	172.63	6.38	1,164
GREECE	2.12	91.43	85.37	1.50	47.60	14.63	12.23	22.90	-1.60	8.71	0.11	0.08	2,142.90	3,137.13	1,797.41	6.63	17
IRELAND	2.25	95.90	88.33	1.16	40.52	12.90	6.44	8.61	2.69	14.36	-	0.05	1,787.41	2,099.22	1,862.45	6.34	5
ITALY	2.77	90.55	79.62	1.66	50.24	13.13	7.69	10.11	-0.88	16.29	0.37	0.19	455.57	309.57	356.56	6.67	222
LUXEMBOURG	0.86	96.75	88.97	0.45	72.98	9.58	8.37	8.09	4.20	33.26	0.77	0.15	291.79	359.22	303.42	6.36	72
NETHERLANDS	2.03	95.10	86.65	0.83	97.80	8.76	5.98	6.73	0.65	19.04	0.47	0.37	1,651.48	1,962.55	2,413.53	6.20	19
PORTUGAL	2.48	84.13	85.12	1.40	42.58	16.40	9.08	12.63	-2.04	8.39	0.29	0.11	916.83	700.30	846.87	6.54	28
SPAIN	2.55	92.74	88.56	1.56	35.20	14.17	7.95	11.69	-1.03	11.31	0.90	0.08	517.71	463.24	459.24	6.75	115
SWEDEN	2.25	92.85	77.29	1.02	231.61	13.26	8.41	8.50	-2.00	21.61	0.32	0.02	1,198.07	1,210.24	1,938.01	7.28	6
UK	2.27	91.99	83.01	1.26	88.25	9.79	5.69	5.71	2.33	19.92	0.20	0.24	663.83	754.90	738.82	6.99	90
									2002								
AUSTRIA	1.73	95.39	77.68	0.94	68.23	6.52	3.36	3.27	1.37	24.15	0.53	0.10	415.42	367.80	378.59	6.19	133
BELGIUM	1.50	91.48	82.18	0.76	77.81	6.10	3.56	3.30	0.70	22.40	1.08	0.31	1,601.10	1,645.31	1,678.35	7.38	34
DENMARK	1.41	86.97	67.59	0.86	90.85	6.15	3.17	3.30	1.02	30.19	0.38	0.12	1,228.52	1,111.92	2,176.85	6.64	70
FINLAND	1.55	92.89	79.86	0.75	129.09	6.39	2.61	3.21	2.27	23.83	0.25	0.02	2,604.78	2,384.40	2,867.61	7.53	4
FRANCE	1.44	90.09	72.39	0.81	107.54	6.64	5.35	3.30	1.18	22.07	0.38	0.11	498.84	489.94	486.32	7.29	199
GERMANY	1.29	96.46	76.57	0.69	90.56	6.48	4.40	3.28	0.08	22.88	0.43	0.23	199.88	180.42	188.28	6.52	1,329
GREECE	2.27	95.37	89.94	1.38	55.90	7.74	2.92	3.30	3.63	11.20	0.28	0.08	1,715.03	1,445.92	1,762.55	7.00	14
IRELAND	0.70	98.43	91.89	0.32	46.42	6.15	3.12	3.30	6.13	27.21	0.28	0.06	742.49	872.14	821.98	6.57	4
ITALY	2.21	90.00	64.39	1.22	87.19	7.82	3.51	3.30	0.36	18.93	0.51	0.19	352.20	316.73	302.56	6.57	486
LUXEMBOURG	0.80	95.16	78.18	0.41	83.63	8.03	7.96	3.30	2.47	45.72	0.62	0.17	403.07	717.46	427.56	6.78	57
NETHERLANDS	1.13	96.46	66.40	0.64	73.40	6.87	5.74	3.30	0.57	23.41	-	0.39	1,500.56	1,207.29	3,196.21	6.65	15
PORTUGAL	1.70	88.20	79.43	0.74	80.54	8.37	4.67	3.29	0.38	10.47	0.48	0.11	1,377.50	1,572.55	1,607.46	6.88	22
SPAIN	1.78	91.88	79.20	1.07	47.77	7.48	2.85	3.31	2.04	14.54	0.95	0.08	599.12	513.99	565.94	7.03	112
SWEDEN	1.58	87.87	76.31	0.83	328.52	6.91	3.53	4.12	2.10	27.66	0.21	0.02	1,078.44	1,046.96	1,600.39	6.42	91
UK	1.50	93.31	78.69	0.81	145.32	5.12	2.65	3.97	1.64	25.22	0.18	0.24	408.45	555.27	482.30	7.09	106

Banks of Ireland in 1993 and 1994 and the Netherlands in 2001 and 2002 have not been included in the sample for the estimation of the cost function because the number of branches was not available. However, they have been used to compute the Lerner index and the calculations of welfare loss using the parameters of the cost function for the rest of the sample. Consequently the sample size in the cost function is 29,694 observations.

c = Operating costs (% of total assets). *Source: BankScope (Bureau Van Dijk)*

L =Loans (total earning assets) (% of total assets). *Source: BankScope (Bureau Van Dijk)*

D =Deposits (customer and short term funding) (% of total assets). *Source: BankScope (Bureau Van Dijk)*

w1 =Price of labor (Personnel expenses / Total Assets) %. *Source: BankScope (Bureau Van Dijk)*

w2 =Price of capital (Non-personnel operating expenses / Fixed assets) %. *Source: BankScope (Bureau Van Dijk)*

r_L = Loans' interest rate (Interest income and other operating income / L) %. *Source: BankScope (Bureau Van Dijk)*

r_D =Deposits' interest rate (Interest expenses / D) %. *Source: BankScope (Bureau Van Dijk)*

r =Interbank interest rate %. *Source: Bank of Spain*

GDPGR= Growth of GDP %. *Source: National Accounts (OECD)*

GDP/POP=Per capita GDP (Thousand of constant US $). *Source: National Accounts (OECD)*

BR/POP= Branches per poplulation (Branches per thusand people). *Source: Bank Profitability and National Accounts (OECD)*

POP/Km^2=Population / Extension (Thousand people / Km2). *Source: National Accounts (OECD) and New Cronoss (Eurostat)*

HHIA= Herfindahl index in total assets (calculated at national level). *Source BankScope (Bureau Van Dijk)*

HHIL= Herfindahl index in the loan market (calculated at national level). *Source BankScope (Bureau Van Dijk)*

HHID= Herfindahl index in the deposit market (calculated at national level). *Source BankScope (Bureau Van Dijk)*

LA= Log of average total assets (in thousand of US $) in sample. *Source: BankScope (Bureau Van Dijk)*

BANKS= Number of banks in sample

Table 2. Interest rates and marginal costs

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 3. 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 4. Welfare loss associated to market power

Percentage of GDP

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
AUSTRIA	0.36	0.43	0.46	0.51	0.52	0.38	0.34	0.33	0.69	0.89
BELGIUM	0.27	0.31	0.06	0.13	0.15	0.07	0.18	0.09	0.11	0.28
DENMARK	2.12	2.04	1.54	1.41	1.11	0.92	0.68	0.82	1.13	1.14
FINLAND	0.12	0.27	0.12	0.18	0.35	0.44	0.44	0.57	0.72	0.61
FRANCE	0.18	0.36	0.25	0.35	0.27	0.19	0.20	-0.15	-0.05	0.03
GERMANY	0.41	0.78	0.73	0.80	0.54	0.67	0.60	0.29	0.29	0.57
GREECE	1.96	1.41	0.87	0.66	0.71	0.93	0.59	0.40	0.65	0.70
IRELAND	0.85	0.92	1.08	0.64	1.00	1.25	1.54	1.81	1.64	1.78
ITALY	1.05	0.79	0.88	0.48	0.34	0.47	0.66	0.66	0.92	0.79
LUXEMBOURG	-1.73	-5.66	-12.85	-15.21	-19.02	-18.86	-12.59	-14.36	-9.96	-11.39
NETHERLANDS	0.34	0.50	0.64	0.63	0.73	0.88	0.79	0.15	0.08	0.31
PORTUGAL	1.47	0.88	0.92	0.59	0.54	0.74	0.88	1.12	1.52	1.58
SPAIN	1.24	1.26	1.13	1.06	1.10	1.12	1.03	1.00	1.47	1.39
SWEDEN	1.13	0.80	0.73	0.94	0.93	0.91	0.84	0.57	0.57	0.77
UNITED KINGDOM	0.73	0.66	0.57	0.68	0.30	0.50	0.62	0.41	0.36	0.42
UE-15	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 (4)
Source: BankScope, European Central Bank and own elaboration

Table 5. Mean efficiency scores

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

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 6. Welfare loss associated to banks' cost inefficiency

Percentage of GDP

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

Source: BankScope and own elaboration

Table 7. Determinants of cost efficiency

	(1)	(2)	(3)
Lerner (loans)			0.0729 ***
			(0.01)
Lerner (deposits)			0.0301 ***
			(0.01)
HHIA (Total assets)	-0.1108		
	(0.29)		
HHIL (loans)		2.2586 ***	
		(0.35)	
HHID (deposits)		-1.8071 ***	
		(0.34)	
Size (log of total assets)	0.0842 ***	0.0905 ***	0.0862 ***
	(0.01)	(0.01)	(0.01)
S1(commercial banks)	0.0699	0.0596	0.0657
	(0.20)	(0.20)	(0.20)
S2(savings banks)	0.0734	0.0669	0.0681
	(0.22)	(0.22)	(0.22)
S3 (cooperative banks)	0.1037	0.0939	0.0996
	(0.21)	(0.21)	(0.21)
Adjusted R2	0.6669	0.6675	0.6674
Hausman Test (p-value)	52.6000	79.8000	88.7700
	(0.00)	(0.00)	(0.00)
Obervations	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			
Lerner (loans)			0.2938
Lerner (deposits)			0.0461
HHIA	-0.0489		
HHIL (loans)		0.9925	
HHID (deposits)		-0.8611	
Size (total assets)	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, ln [EF / (1-EF)], 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 8. Social welfare gains associated to a reduction in market power
Percentage of GDP

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

Table 8 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 (4)

Source: BankScope, European Central Bank and own elaboration

Table 9: Cost efficiency loss associated with a decrease in market power

Percentage of GDP

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

Source: BankScope, European Central Bank, Eurostat and own elaboration
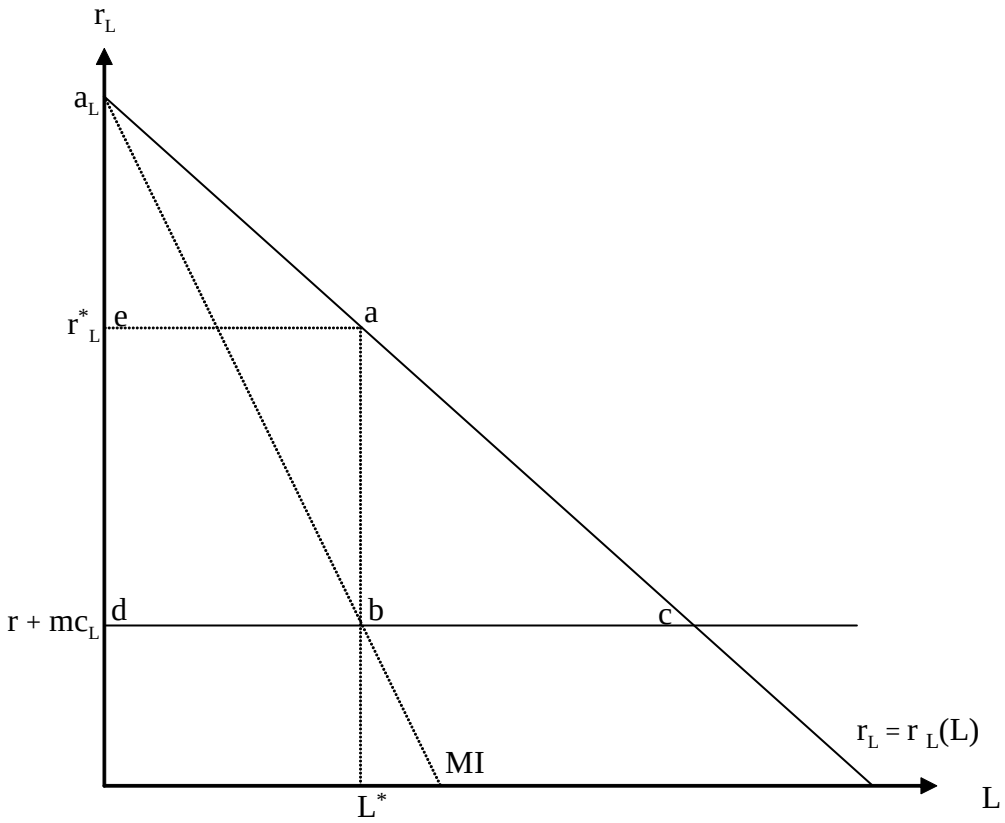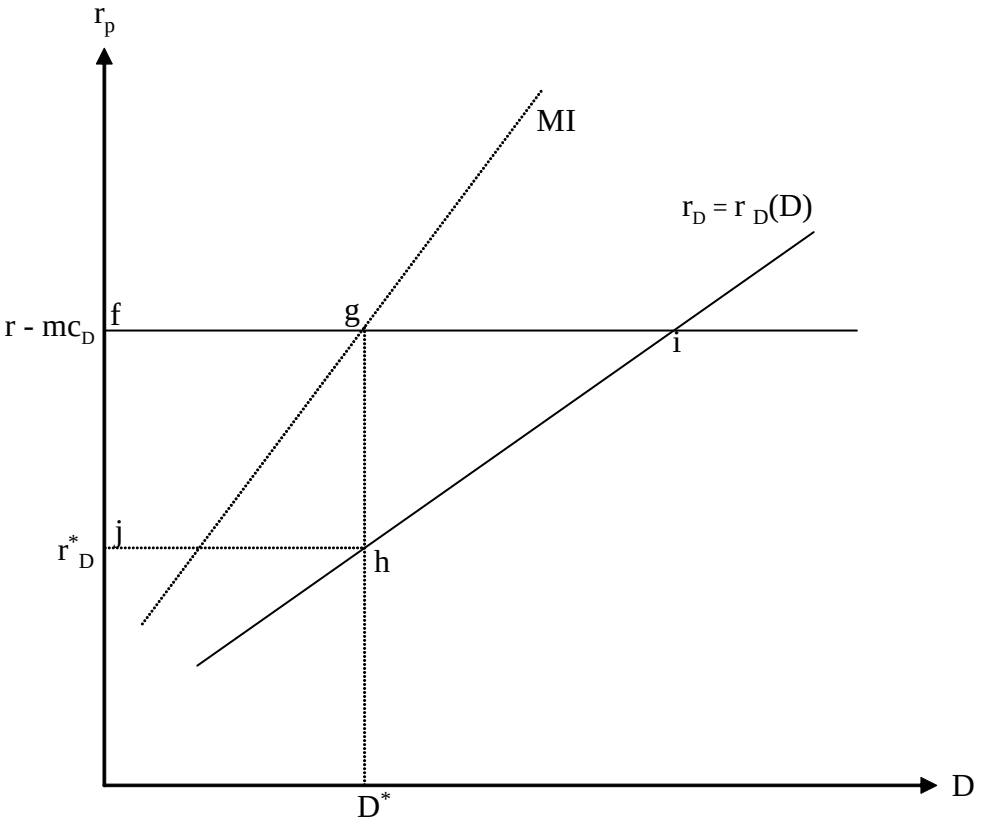
Figure 1. The Harberger´s triangle