The price-competition relationship in the European leasing industry

Degl'Innocenti Marta[1]

Abstract

This paper investigates the impact of efficiency, concentration and competition on price measures in the European leasing industry between 2003 and 2006. According to Berger and Hannan (1997), we include efficiency directly into the model to test the traditional structure-conduct performance (SCP) hypothesis and the efficient-structure (EFS) hypothesis. The X-efficiency and scale efficiency measures, included in the models, are calculated using the Data Envelopment Analysis (DEA) approach. Then, we estimate the firm pricing behaviour using Panzar and Rosse statistic as non-structural indicators of competition. We do not find evidence that confirm the SCP and EFS hypothesis. However, the "quite life Hypothesis", proposed by Hicks (1935), seems to be supported. The results suggest that the H statistic is statistically related to the measures of price. This paper also investigates some variables that can explain the differences in the degree of competitiveness across Countries. Our findings indicate that efficiency is positively related to the degree of competition.

JEL classification: G21
Keywords: SCP; EFS, competition, Panzar and Rosse, leasing

[1] Phd student-University of Bologna.

I. Introduction

Over the past few decades, numerous empirical studies have extensively investigated the relationship between concentration and performance. Despite the fact that leasing industry represents a relevant long term financial source of an increasing number of companies, no studies have analyzed competition, efficiency and market structure of this. In recent years, many factors have contributed to proliferating of European leasing market. Implementation of international accounting reforms, economic growth, deregulation of financial services in the European Union, globalization have all contributed to increase of the degree of competition in the non-traditional areas of banking activities, improving the attraction of foreign investment and accelerating the growth of the leasing industry. In 2007, the new leasing volumes were 338.9 billion[2], with a 12.4% increase compared to 2006. Five Countries, Germany, UK, Spain, Italy and France, contribute to 67 per cent of new production in 2006. Recently, the new leasing production has increased also in the Eastern European region (Bulgarian, Russian, Poland).

Numerous empirical contributions have analyzed the structure-performance relationship in banking markets on the basis of the structure-conduct-performance paradigm (or so-SCP). The SCP hypothesis asserts that banks, in concentrated markets, hold high performance by applying economic commissions and lending rates and paying high interest on deposits. In contrast, the Efficiency Hypothesis assume that firms increase their size and market share in terms of their ability to generate high profits, which generally lead to high market concentration. For efficiency hypothesis (efficiency structure or EFS) the large banks that operate in concentrated systems, achieve high performance due to their greater production efficiency and technical superiority than smaller counterparts. In this case, the banks compete on price setting lending rates and commission income more favourable to consumers. In this paper, we investigate the relationship between price, concentration, efficiency and competition in the European leasing industry. Although many empirical studies have supported the SCP hypothesis for banks, the results on links between prices, concentration and efficiency are mixed. To test the efficiency hypothesis, we introduce the frontier efficiency literature. In particular the efficiency analysis of the paper is based on the Data Envelopment Analysis (DEA) model. No empirical research has applied frontier

[2] Source: Leaseurope (*The European Federation of Leasing Company Associations*). Leaseurope bring together 46 member associations in 34 European Countries representing the leasing, long term and/or short term automotive rental industries. In 2007, these associations represent more than 1500 leasing firms and 1600 short term rental companies (Leaseurope, Key Facts and Figures, 2007).

methodologies in order to examine the efficiency and productive of European leasing industry[3]. Then, we investigate firm pricing behaviour using structural and non-structural indicators of competition across five European leasing markets over 2003-2006. In particular, we use the markup test of Panzar and Rosse (1987) proposed by New Empirical industrial Organization literature to estimate directly the conduct of leasing firms[4]. These indicators are calculated at the firm-level data and are compared with a market standard structure measure of concentration (Hirschmann-Herfindahl, CR ratios). Then, following Claessens and Laeven (2004) we identify some factors that explain differences in market competition across Countries. Finally, we infer the relationship between competition and price. We do not find evidence that support the SCP and EFS hypothesis. However the H statistic seems to be statistically related to the price indicators. The results appear to confirm the "quite life Hypothesis proposed by Hicks (1935). The, our findings seems to suggest that most efficiently financial systems are also more competitive.

The remainder of the paper is organized as follows: the next section presents theoretical framework; Section 3 and 4 describe data resources, the main variables and moderators functional to our research design with the related hypothesis; Section 5 presents the results; Section 6 summarizes the conclusions.

2. Literature Review

In literature, there are two types of competition measures generally used to analyze the competitive features of the banking industry: structural and non-structural indicators. The structural approach infers the competition based on SCP paradigm and the efficiency hypothesis, as well as the formal approaches proposed by Industrial Organisation theory. Traditional industrial organization theory focused on SCP paradigm investigates the competitive features of industry based on structural characteristics that influence firm behaviour and performance (Carbò et al, 2009). The SCP hypothesis assumes that, in the case of high degree of concentration, financial institutions set price above marginal costs and achieve higher profit. Consequently prices are less favourable to consumers in more concentrated market as a result of competitive imperfections in this market (Berger, 1995).

Basically the SCP framework suggests that the level of concentration in a particular market will influence the degree of competition among firms (Shepherd, 1982). In oligopolistic markets with limited contestability, it is plausible that the few companies that control the

[3] See Torluccio, Cotugno e Degl'Innocenti for the analysis of efficiency in Italian leasing market.
[4] We use the term firms for all ownership type (also for banks).

outcomes of the market reduce the cost of "collusion" and achieve high performance by applying economic commissions and lending rates and paying high interest on deposits. However collusion is more difficult if the number of banks is large (Goldberg and Rai, 1996). Under the SCP hypothesis, the degree of competition within an industry can be explained in terms of conduct of firms, which depends on the structural characteristics of the market (number and size of firms, cost and demand conditions). Despite these empirical researches focus only on the measurement of market structure, the competitive environment may be determined not necessarily by the structure of the market. Although many empirical studies have supported the SCP hypothesis for banks, the results are mixed[5]. Berger and Hannan (1989) find evidence that support the traditional SCP hypothesis using price data rather than profit data. Similarly, Molyneux and Teppet (1993) find a support for SCP hypothesis for European Countries. Lloyd-Williams et al (1994) also find support for the SCP hypothesis for Spanish banks. On the other hand, several studies have advanced methodologies critiques to SCP paradigm. Gilbert (1984), Molyneux et al. (1996) and Bos (2002) argue that the SCP framework does not consider explicit the conduct of the banks. This analysis substantially infers only the relationship between structure-performance. The high degree of concentration does not automatically imply a low level of competition. In a market in which entry and exit into an industry is substantially free and without sunk costs, incumbent firms are pressured to behave competitively to deter entry even if the existing market is concentrated (Carbò et al, 2009). In this case, market competition is not determined by the structural features of the market, since the barrier to entry and exit lead to competitive behavior.

Berger (1995) suggest that a related theory to SCP is the relative market power hypothesis (MP), which asserts that only firm with large market shares and well-differentiated products are able to exercise market power in pricing these products and earn supernormal profits (Shepherd, 1982). However, the empirical results in literature show that concentration measures have only very weakly relationship with profitability measures when market share measures are included in the regression model (Berger et al, 2004).

In contrast to SCP and MP, the positive relationship between profit and structure relationship can be explained with the Efficiency hypothesis (EF). The efficiency hypothesis was introduced by Demsetz (1973) and Peltzman (1977). These authors have noted that differential efficiencies across firms in a competitive market could produce the same empirical effects that the SCP hypothesis generally attributes to market power.

[5] For a survey see Rhoades (1982), Gilbert (1984).

That approach assumes that firms have lower costs and therefore higher profits due to superior management or production technologies (Smirlock, 1985, Frontier and Evanoff, 1988). Therefore, high profits are attributed to increased capacity in the management of production processes. It is uncertain whether high profits of large banks are a consequence of concentrated market structure and collusion, or of superior production and management techniques that reduce costs, creating high returns (Goddard et al. 2001).

Some authors use market share as a proxy of efficiency measures under the Efficiency Hypothesis (Smirlock, 1985, Evanoff and Fortier, 1988). Instead, according to Berger (1995) and Berger and Hannan (1993), this paper includes the measures in the model of efficiency, X-efficiency and efficiency of scale. Thus it is possible to test directly the relationship between pricing and efficiency without imposing any assumption a priori. Under the scale efficiency, firms have the same quality level of management and technologies, but some of these are able to produce at more efficient scales than others and therefore have lower costs and higher unit profits (Berger, 1995). In order to estimates the efficiency measures, we apply Data Envelopment Analysis (DEA) approach.

The Theory of Industrial Organization argues that the competitiveness of an industry cannot be estimated by market structure indicator alone (Baumol, Panzar and Willing, 1982). Many equilibrium concepts, firm-specific parameters or other condition can affect the relationship between market concentrations and conduct (Shaffer, 2004). Contestable markets equilibrium under constant marginal cost may support competitive pricing, even with as few as two firms (Baumol, Panzar and Willing, 1982); while in unconcentrated markets trigger strategies can potentially sustain anticompetitive pricing (Friedman, 1977). Consequently, we conduct the analysis of market competition using, both, structural indicators with non-structural indicators. The non-structural models have been proposed by the New Empirical Industrial Organization (NEIO) literature. This approach investigates conduct directly using some form of price mark-up over a competitive benchmark (Carbò et al., 2009). These indicators, based on indicators of monopoly power developed by Lerner (1964) include i) the measure of competition in oligopoly suggested by Iwata (1934), and ii) the measures of competitive behavior in contestable markets developed by Bresnahan (1982,1987), Lau (1982), e Panzar e Rosse (1987). The two types of concentration test largely used in financial research are the model of Bresnahan and Panzar e Rosse.

The test introduced by Panzar and Rosse (1987) tipically relates input cost changes to output price changes using firm (or bank)-level data. Under perfect competition, an increase in input price will increase both marginal costs and total revenues by the same amount as the rise in

costs. Under monopoly condition, an increase in input prices will raise the marginal costs, reducing, both, equilibrium output and total revenues. This test has been firstly applied by Panzar and Rosse (1977) to estimate the market concentration for the newspaper firms in the local media markets. Then, numerous researchers have used the Panzar and Rosse H-statistic to analyze the competitive conditions, substantially finding a monopolistic competition in European financial sectors (Molyneux et al., 1994; Bikker and Groeneveld, 2000; De Bandt and Davis, 2000; Weill, 2003; Boutillier et al., 2004; Koutsomanoli-Fillipaki and Staikouras, 2004; Claessens and Laeven, 2004; Casu and Girardone, 2006; Carbò et al., 2009).

There is also an extensive literature that uses the measures suggested by Bresnahan (1982) and Lau (1982). These indicators measure how the firm's marginal revenue varies from average revenue that reflects the slope of demand curve indicating the market power of firms. This approach requires data on aggregate demand and it is particular sensitive to market definition. Specifically, the parameters of this model can provide a measure of the degree of imperfect competition, varying between perfect competition and full market power. This approach was firstly applied by Shaffer (1989) for a sample of US banks. His results reject the collusive hypothesis, but are consistent with perfect competition. The application of this method to European banking sector are numerous, both cross-country or local country: generally, the empirical research finds little evidence of market power in European markets (Neven e RÖller, 1989; Bikker and Haaf; 2002; Carbò, 2009). Finally the measure of Iwata focuses on the strategic moves of firm to changing markets share and pricing by rivals that produce homogeneous products. This indicator was applied only by Shaffer and DiSalvo (1994). In this paper we use the Panzar and Rosse approach to investigate the degree of competitiveness across five European Countries. The demand of leasing services is largely differentiated and collecting data on demand is problematic because there is few public source of information.

In the next sections we attempt to estimates the impact of concentration, competition and efficiency measures on price of leasing firms.

3. Specification of the models and tests

Firstly, we show the structural form for SCP, RMP, EFS hypotheses. Then, we investigate the impact of Panzar and Rosse H-statistic on price measures. Generally both market share and market structure are included in the model to test the efficiency hypothesis against SCP hypothesis. The premise is that if efficiency hypothesis holds, once market share variable is controlled for, overall market concentration does not explain profits (Demsetz, 1973).

Substantially market share is a proxy for both market power and efficiency. To distinguish among hypothesis, efficiency variable and market share are included in the models. The relative market power (RMP) hypothesis suggests that firms with higher market shares are able to earn high profits due to their market power. If SCP hypothesis is tested, higher profits and prices are the consequence of anti-competitive price settings in concentrated markets. Following the previous literature, we consider the EFS hypotheses both under X-efficiency hypothesis (ESX) and the scale efficiency hypothesis (ESS). In particular, the ESX hypothesis tests if firms with superior management or production processes operate at lower costs and reach higher profits. Instead, the ESS hypothesis tests if firms with similar production and management technology operate at different levels of economies of scale. In particular the scale efficiency measures the shifting from the optimal productive dimensions. We test simultaneously the three hypotheses, RMP, EFS, SCP with the following form equation:

$$P_i = f(\text{X-EFF}_i, \text{S-EFF}_i, \text{MS}_i\ \text{CONC}_m, Z_i) + e_i \quad (1)$$

where P_i is the measure of price, X-EFF_i is a measure of X-efficiency and SEFF_i is the measure of scale efficiency, CONC_m is a measure of concentration in market m, MS_i is a measure of market share, Z_i is a set of control variable, and e_i is an error variable for each i leasing firms.

The SCP paradigm suggests that prices are less favourable to consumers in more concentrated markets. Consequently, under the SCP hypothesis, the CONC variable has a positive coefficient, and the coefficients of X-EFF and of S-EFF are irrelevant in estimates of Eq. (1).

Under EFS hypothesis, we include the X-efficiency and scale efficiency measure in the model. A necessary condition for the EFS hypotheses to be true is that the efficiency is negatively related to prices and CONC is equal to zero in estimates of Eq. (1). In this case, leasing firms should be able to offer more attractive services to costumer. However it is necessary to provide evidence of the marginal contribution of the corresponding hypothesis to verify the significant and the signs of each coefficient.

Under EFS hypothesis, price and concentration are both correlated with efficiency. In fact, efficient firms will raise their market shares, being more competitive and profitable, and consequently they will cause an increase in market concentration. Demsetz (1973) argues that the high market concentration is generated by an increasing of efficiency over the time. Following Golberg and Rai (1996) and Berger (1995), we test the impact of both X-EFF, S-EFF on CONC and MS in Eq. (2 and 3):

$$MS_i = f(X\text{-}EFF_i, S\text{-}EFF_i, Z_i) + e_i \quad (2)$$

$$CONC_m = f(X\text{-}EFF_i, S\text{-}EFF_i, Z_i) + e_i \quad (3)$$

For Berger and Hannan (1993), firms with an increase of market power and concentration, can have minor incentives to reduce costs and inefficiency. In this case, inefficiency can occur not due to anti-competitive pricing behavior, but for relaxed environment, as suggested by "quite life hypothesis" (Hicks, 1935). Therefore, we infer the following relationship between CONC, MS and EFF (both X-EFF and S-EFF):

$$X\text{-}EFF_{it} = f(CONC_{it}, MS_{it}, Z_{it}) + e_{it} \quad (4)$$

$$S\text{-}EFF_{it} = f(CONC_{it}, MS_{it}, Z_{it}) + e_{it} \quad (5)$$

The SCP explains market performance as the result of an exogenously given market structure, which influence the conduct of firms in an industry. The performance is connected to changes not only to the structure of the market but also in the behavior of each firm in a Country. Thus, we stress the analysis of bank's competitive conduct directly. Following, we infer the relationship between competition (H) and measure of price:

$$P_{it} = f(H_{it}, Z_{it}) + e_i \quad (6)$$

Some control variables have been included in each equation to take account of some characteristics: the logarithm of total assets (LTA) that is considered as a proxy for firm size and aggregate demand (Coccorese, 2004); the total liabilities on total assets ratio (RISK) that represent the risk measure of the firm. Finally we distinguish firms in terms of ownership type, BANK, INDIP and CAP (bank related, independent and captive).

4. Data and variables

The data set is principally drawn from Bankscope. The Italian sample data were obtained from the "Osservatorio sugli Intermediari Finanziari non Bancari" (OSSFIN) and ASSILEA (Association of Italian leasing firms)[6]. We use data from unconsolidated accounts to avoid double counting. We delete firms for which data on one of the main variable are not available. We also exclude countries with less than 15 firms-year observations, available on public

[6] For the data obtained from "Osservatorio sugli Intermediari Finanziari non Bancari"(OSSFIN) we were supported by Cotugno Matteo, University of Bologna.

dataset. In fact we set a minimum of observations needed to get reasonably accurate H estimates for each country. The final sample consists of 482 observations between 2003 and 2006. It is an unbalanced dataset with the lower number of observations for the year 2003. A brief description of the sample is provided in Table 1.

Insert Table 1 about here

In Europe, leasing services are generally offered by Specialized Intermediaries which are companies operating principally in the leasing industry: these companies are either bank-affiliated or industrial group affiliated, or independent firms[7]. However, banks have a relevant role for the production of leasing services in some Country, as Spain. Leasing companies have diversified own investments in various sectors: real estate, instruments, cars and others. The leasing firms also offer other collateral services in addition to leasing services, such as factoring, rent and so on. The differences of fiscal regime and contractual condition may affect the level of competition in a particular market, and, therefore, the comparison among each Country. In the next section we describe the indicators that we use to measure the competition in leasing industry. These measures are largely use to infer concentration and competition in banking sector.

4.1 Measures of price and performance

The measure of prices is calculated as the ratio of Interest Income on Total Assets (IT). In addition, following Golberg and Rai (1996), we use NIM=Net Interest Margin/Total Assets as a proxy for the pricing ability of banks. This ratio captures the ability to charge higher loan rates and, at the same time, the capacity to charge lower deposit rates. Regardless of firms that are part of banking group, the rates paid on deposits received by bank may be lower than others competitors. Under the EFS hypotheses, efficiency estimates will be positively related to NIM and negative related to IT. If the SCP hypothesis reflects anti-competitive pricing, then leasing firms will be able to charge higher active rates.

[7] In European leasing markets 49% of market share is held by banks, 34% is held by the Captive firms, and finally 17% is held by "Independent firms, (non-financial companies related to banking, industrial). Sources: KPMG, “European Leasing”, 2007.

4.2 Measures of concentration and market share

In literature market structure can be measured in different way: market share, firm concentration ratio (CRN), or Herfindahl-Hirschman index (HHI). CR3 is calculated as the ratio of market share of the three largest banks in a given Country. The HERF is measured as the sum of the squared market share of all firms in each Country. The HERF and CR3 are indicators of market structure where higher value indicates more concentrated markets and potentially less competition.

Since our database does not include every leasing firm in each Country, the estimation of HERF and CR3 is not possible using Bankscope data. Since the largest thirteen European firms have almost the 50% of the market share of European market, CR3 result an appropriate measure of local market concentration. The data were obtained from Leaseurope which provide the new production of the largest firms in each Country. Here, we calculated the CR3 as the ratio of the new production of the largest three firms on total new production in each Country. As Table 2 shows, Germany, UK and Italy have a significant number of leasing firms. In order to distinguish between Countries with high and low concentrations of leasing firms, a cutoff of 0.50 for CR3 has been established. The only case which can be classified as high concentration markets is France with an average CR3 of 0.64. Instead, the UK, Germany, Spain and Italy have a lower concentration. The three largest firms in each Country are essentially bank related institution. The only border line is Germany, where independent and captive firms are ranked at the top in terms of new production in local market. Bank mergers and acquisitions have increased concentration in local market.

The market share is calculated as the ratio of total loans of each firm to the total loans of all firms in a given Country.

Insert Table 2 about here

4.3 Measures of competition

In this paper, we utilize the measure of competition proposed by Panzar and Rosse (1977, 1987). This approach is based on firm-data. The PR model provides a measure, denoted by H-statistic, of the degree of competitiveness of the industry. It is defined as the sum of the elasticity of the reduced form revenues with respect to the price of all factors used by the firm. The estimates value of the H statistic ranges between $-\infty < H \leq 1$. The value of H statistic less than 0 ($H \leq 0$), reflects monopoly or a perfectly oligopoly or homogeneous conjectural

variation. In the case of monopolistic competition H statistic is less or equal to 1 ($0 < H \leq 1$). Finally H statistic is equal to 1 (H=1) for a perfectly competitive market in long-run equilibrium or for a firm employing a constant markup pricing strategy.

A straightforward way to estimate H is by a loglinear regression in which the dependent variable is the natural logarithm of the total revenue and the explanatory variables include the logarithms of input price and control variables that are included in the model.

The regression equation assumes the following form:

$$Ln(TR_{it}) = \alpha + \beta_1 \ln W_{1,it} + \beta_2 \ln W_{2,it} + \beta_2 \ln W_{2,it} + \gamma \ln LTA_{it} + \lambda \ln TLTA_{,it} + \zeta \ln EQTA_{,it} + e_{it}$$

where TR_{it} is the operating revenue, $W_{1,it}$ is the ratio of gross interest expenses to total financial debts (proxy of input price of financial debt), $W_{2,it}$ is the ratio of personnel expenses to total assets (proxy for the input price of labor), and $W_{3,it}$ is the ratio of other operating and administrative expense to total assets (proxy for the input price of equipment and fixed capital). Some control variables are defined to estimate other characteristics of firms. In particular, we consider a logarithm of total assets as a proxy for firm size (LTA) and risk capital on total assets (EQTA) and loans on total assets (TLTA) as a proxy of the degree of risk-taking. The equations are estimated by running a panel data set of firms with fixed effects[8].

From a statistic point of view, the rejection of the $H \leq 0$ hypothesis rules excludes the monopoly model; the rejection of the $H \leq 1$ excludes all three models; and, finally, the rejection of both the $H \leq 0$ and the $H = 1$, but not the $H<1$ hypothesis suggests that only Chamberlian model are consistent with data (Panzar and Rosse, 1987). The evidences of the models of perfect and Chamberlian competition, both, depend quite crucially on the assumption that the firms are observed in long-run equilibrium (Panzar and Rosse, 1987). Consequently, we test equilibrium that is defined as sum of log input terms of input prices, where $\beta_1 + \beta_2 + \beta_3 = 0$ (H=0). Following the previous literature (Claessens and Laeven, 2004; Molyneux, Thornton and Lioyd-Williams; 1996), we test this hypothesis by using ROA as dependent variable[9] because it is not related to input prices in the case of equilibrium.

As discussed in the previous section, a relationship between concentration and degree of competition can exist, but the nature of this connection is not straightforward a priori (Bikker

[8] The Hausman test confirms the choice of fixed effects estimators versus random effects estimators.

[9] In the regression we use Ln(1+ROAit) instead of ROA to eliminate negative value.

and Groeneveld, 1998). The literature on oligopoly behavior in concentrated markets argues that firms of greater size can compete aggressively, and this can cause them to change prices (Bertrand equilibrium) and quantities (Cournot equilibrium) in response to the strategic moves of their competitors. On the other hand, high concentration can generate a reduction of the degree of competition between the largest firms (Weiss, 1974). The decreasing efficiency can raise operating expenses that may lead to a decrease of competition in a market. Hence, we investigate the impact of X-EFF on H in the eq. (7):

.

$$H_i = \alpha + \beta_1 \text{X-EFF} + \beta_2 \text{CONC} + \beta_3 \text{NRPOP} + \beta_3 \text{TLPOP} + \beta_3 \text{BO} + e \qquad (7)$$

where H_i is the H statistic for the Country i; X-EFF is a measure of X-efficiency; CONC is a measure of market structure; NRPOP is the logarithm of the number of leasing companies per million inhabitants in each Country which proxies the density of the firms; TLPOP is the ratio of total loans per million inhabitants which proxy for density of demand. In addition, we consider the ratio of leasing industry assets owned by banks, BO, as a control variable. Relating to this, we suppose that the competition will be higher for firms that have potentially the same heterogenic clients. Few studies investigated the factors that can explain the degree of competitiveness and market structure across Countries for European financial markets (Bikker and Haaf, 2002; Claessens and Laeven, 2004; Casu and Girardone, 2006; Carbò, 2009). Since we aim to test competition relating the market power with the price ability of firms, we not make further consideration on the relationship between concentration, competition and efficiency.

Insert Table 3 about here

4.4 Description of efficiency measures

The efficiency of a company can be expressed in terms of radial distance of its performance from the frontier (Debreu, 1951; Koopmans, 1951; Farrell, 1957). The firms that are on the frontier are labelled “technical efficient”. The DEA methodology has its origins in Charnes et al. (1978) (model c.d. CCR). The CCR model assumes that firms operate at the optimal scale level (Constant return to scale, CRS). Instead, the model of Banker et al, (1984), BCC, assumes that firms can operate at different levels of scale (variable return to scale, VRS). In

this case it is possible to distinguish the component of technical efficiency from scale efficiency. With DEA model, the frontier is built directly from data without any assumption on the production function as, instead, required by stochastic or parametric models. The stochastic model distinguishes the component of inefficiency from noise component, while DEA model include the noise component in the inefficiency. We prefer the DEA model, rather than stochastic methodology due to small number of observations.

This paper focuses on input-oriented measure of efficiency. In input-oriented model, the objective is to minimize the inputs at the current level of output. In particular, if N firms use a vector of inputs, X, to produce a vector of outputs, Y, the measure of efficiency of each firm is calculated as follow:

$$\min \theta_i (\theta, \lambda)$$

$$\sum_{j=1}^{n} \lambda_j x_{ji} \leq \theta x_{io} \qquad i= 1,2,...,m$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} \geq y_{io} \qquad r= 1,2,...,s$$

$$\sum_{j=1}^{n} \lambda_j = 1 \qquad j= 1,2,...,n$$

$$\lambda_j \geq 0$$

where $\theta_i<1$ represent the scalar efficiency score for i firms. If θ_i is equal to 1, firm is on the frontier surface, otherwise firm is technical inefficient. Thus, the input levels should be reduced of 1- θ_i to be on the frontier surface. For the construction of the efficient frontier is necessary to define the inputs and outputs to be included in the DEA model. Despite the extensive literature, there is not a general consensus on the variables that represent a more efficient production process in the banking sector. Specifically, the main disagreement focuses on whether deposits should be considered as inputs or outputs of the model. The intermediation approach appears to be appropriate to define the product function in leasing industry. Specifically, the input variables used in this study are the number of employees (NE), physical capital, (PC), financial capital (FC), while leasing loans (L), other loans (OL) and other earning assets (OEA) are considered as output variable. Eventually outliers are identified with the Super-efficiency techniques.

Insert Table 4 about here

---

5. Empirical results

The empirical analysis focuses on the estimation of Eqs (1)-(7). Table 5 presents the results of efficiency score for the Countries in our sample. Under the VRS hypothesis, technical efficiency is distinguished from scale efficiency. The results find that technical efficiency and scale efficiency are substantially similar over the period 2002-2006. The average overall X-efficiency for leasing firms in the most relevant European industry Countries over the whole sample period is 89.59 per cent, indicating a 10.40 per cent average potential reduction of input utilization. The average X-efficiency varies between 74.53 per cent in Germany and 98.09 per cent in Italy. The results indicate an overall marginally decrease of X-EFF and S-EFF of about 2 per cent from 2003. The general increase, with the exception of Germany, in input utilization does not seem to reflect the reduction of total new leasing growth rates of about 7[10] per cent in 2006 respect to the previous year[11] in European market. The improvement of X-EFF and S-EFF for Italy reflects substantially an increase in stability of the market over the period 2002-2006.

Insert Table 5 about here

Table 6 and Table 7 show the results of estimating reduced form Eq (1) using respectively IT and NIM as the dependent variable. Each coefficient indicates the marginal effects of each hypothesis on price. In according with previous literature (Goldberg and Rai, 1996), the results appear to be sensitive to the different dependent variable choice. In the Table 5, despite MS is statistically significant and CONC is not significant, the sign of the relationship between MS and price indicators results to be negative, indicating that firms with higher market share tend to have prices more favorable to consumer. Thus, RMP hypothesis is not supported. In the case of IT, the variable S-EFF is negative, indicating that more efficient firms have lower interest rate on total assets respect to inefficiency firms. Consequently, the price appears to be more favorable to consumers. In the case of NIM, the EFS hypothesis is not supported, because S-EFF and X-EFF efficiently firms do not seem to be able to have higher net interest margin. The concentration measure, CR3, is not statistically significant in any relationship.

[10] Source: Leaseurope, "Key Facts and Figures", 2007.
[11] New business growth in 2006 can be split into a 20% drop for real estate leasing and a 5% drop for equipment (including vehicles) leasing.

We test the marginal contribution of the corresponding hypothesis to verify the significant and the signs of each coefficient. Thus, we remove eventually effects of multicollinearity between market structure variable and efficiency variables. In the case of IT, the result shows that only LTA change the sign and became significant. This indicate that dimension of firms tend to improve the ratio of interest income on total assets. In the case of NIM, the independent dummy result to be significant only in the model without market concentration variables. The results for the control variables are mixed. The coefficient of RISK results to be negative and statistically significant respect to IT and NIM. This would suggest that higher leverage in firms is associated with higher borrowing costs. In the case of IT, the banks seem to be lower prices rather than independent firms. Thus, these are able to offer services less expensive respect to independent firms. In the case of NIM, INDIP and BANK coefficients are positive, but only the first is statistically significant[12]. The MS variables do not seems to have any influence on net interest margin.

Insert Table 6 about here

Insert Table 7 about here

In the equation (2) and (3), both MS and CONC are regressed against X-EFF and S-EFF and control variables as shown in Table 8. Under EFS hypotheses, both S-EFF and X-EFF will be positive relating to MS and CONC. The results show that S-EFF has a negative and statistically significant coefficient, when both MS and CONC are dependent variables. The LTA and BANK coefficients result to be a positively related to MS. The others coefficients are statistically insignificant and relative small. Table 8 reports also the results for Eq. (4) and (5) where X-EFF and S-EFF are regressed against the MS and CONC variables. Under RMP hypothesis, we expect to find a positive relationship between X-EFF and S-EFF and MS, because an increase in market share should determine an increase in overall efficiency (both x-efficiency and scale efficiency). The coefficient of MS is negative and statistically significant respect to X-EFF and S-EFF. The firms with larger market share result are likely to be less efficient respect to smaller firms. In addition, an increase in market concentration

[12] We have decided not to report the estimates of captive dummy, because its coefficient results to be insignificant in each econometric model. In our sample the data on captive firms are few. Thus, the result of this variable should change with a larger sample.

and market share generate respectively a reduction of S-EFF of -.011 and -.200 per cent. These results appear to confirm the “quite life Hypothesis”. Thus, the firms with larger market share seem to have less incentive to increase both, technical and scale efficiency.

Insert Table 8 about here

In order to investigate competition behaviour, the P-R model has been applied over the period 2003-2006. Table 9 reports the regression results. The average estimates H statistic in the five European Countries is .404, reflecting a monopolistic competition. The value of H statistic range between -.055 in Spain (monopoly) and 0.826 in France (strong monopolistic competition), indicating a difference degree of competitiveness across European Countries. The results confirm the evidence of the current literature that finds prevalently monopolistic competition in European Countries (Molyneux et al. 1994; De Bandt and Davis, 2000; Bikker and Haaf, 2002; Claessens and Laeven, 2004; Casu e Girardone, 2006; Carbò et al, 2009). The price of funds denotes a significant and positive coefficient for all Countries except for Spain. In according to the previous literature the impact of price of capital varies by Country and it is not important for the determination of H statistics (Molyneux et al. 1994; Bikker and Haaf, 2002; Casu e Girardone, 2006). However, the price of labour has surprisingly a low relevance for the estimation of H statistic. We find that hypothesis of equilibrium (H=0) cannot be rejected on the 95% significance level, with the exception of Spain (monopoly). The equilibrium condition is not necessary in the case of monopoly.

In the section 4.3 we have identify some variables that can explain the difference in degree of competitiveness across Countries. The X-efficiency variable has a positive and statistically significant coefficient. The results suggest that an increase of technical efficiency should raise the degree of competitiveness. The coefficient of concentration is negative, but not significant. Moreover, we find that the increase of total assets owned by banks tend to raise the competition in the leasing market. The coefficient of TLPOP is positive but statistically insignificant, while the coefficient of NRPOP is statistically significant, but very small.

Insert Table 9 about here

Insert Table 10 about here

Since H statistic is estimated, we investigate the relationship between competition and price indicators. In particular, the Table 11 shows that there is a positive connection between competition and IT. The H seems to have a negative impact on NIM. In literature, both H statistic and NIM are used for competition comparisons.

Insert Table 11 about here

If only Eq. (1) is used, the results support the EFS hypotheses for the ESS version. However, if we consider also the others test, proposed in Eq. (2) and Eq. (3), the results obtained with the Eq. (1) are invalided. Contrary to the RMS hypothesis, market share variable appears to be negative related to dependent variables, IT and NIM. Instead, the concentration ratio, CR3, seems to be generally statistically insignificant. The results seem to be sensitive to the measures used as dependent variables. The degree of competition appears to have a significant positive impact on IT, but a negative impact on NIM. Finally technical efficiency results to have a significant role in explaining differences among European Countries of our sample.

6. Conclusion

This paper tests the EFS, RMP and SCP hypothesis for European leasing firms using price indicators instead of performance measures. The data of our sample focuses on Germany, UK, Spain, Italy and France. Using data from the "Osservatorio sugli Intermediari Finanziari non Bancari" (OSSFIN) and Bankscope for the other Countries, the sample consists of 482 observations between 2003 and 2006.

In order to test the efficiency hypothesis, we include in the models a measure of X–efficiency and scale efficiency estimated with Data Envelopment Analysis (DEA) model. Then, we analyze firm pricing behaviour using structural and non-structural indicators of competition. In particular, for structural indicator, we use the three bank concentration ratio (CR3), while for non structural indicator we use the markup test of Panzar and Rosse (1987) proposed by New Empirical industrial Organization literature. The structural market concentration

measures indicate that the market concentration has in increased on average from 2003 and 2006.

If only Eq. (1) is considered, the results support the EFS hypotheses for the ESS version. However, if we applied the test suggested by Hannan and Berger (1993), the results obtained with the Eq. (1) are invalided. Contrary to the RMS hypothesis, market share variable appear to be negative related to dependent variables, IT and NIM. Instead, the concentration ratio estimates result to be generally statistically insignificant. These results show that the firms with larger market share seem to have less incentive to increase both, technical and scale efficiency. This evidence confirms the "quite life Hypothesis proposed by Hicks (1935). In according with previous studies, the results seem to be sensitive to the measures used as dependent variables.

The average estimates H statistic is .404, reflecting a monopolistic competition for the European Countries in our sample. We have also identified some variables that can explain the difference in degree of competitiveness across Countries. Technical efficiency seems to be a significant role in explaining differences among European Countries of our sample. Finally, competition variable (H) results to have a positive impact on IT, while it has a negative impact on NIM.

This study contributes to the previous literature both by extending the analysis of the relationship between competition, concentration and efficiency to a leasing industry and by investigating the determinants of leasing competition across Country. Moreover, no empirical research has applied frontier methodologies in order to examine the efficiency and productive of European leasing industry.

LITERATURE CITED

Banker R.D., Charnes S A., Cooper W. W., (1984), "Some models for estimating technical and scale inefficiency in Data Envelopment Analysis", *Management Science*, 30, 1078-1092.

Baumol W. J., Panzar J., Willig R. D., (1982), Contestable markets and the theory of industry structure, San Diego, CA, Harcourt Brace Jovanovich.

Berger A. N., Hannan T. H., (1989), The price-concentration relationship in banking, *The Review of Economics and Statistics*, 71(2), 291-299.

Berger A. N., Hannan T. H., (1993), Using efficiency measures to distinguish among alternative explanations of the structure-performance relationship in banking, *Federal Reserve Board working paper*.

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

Berger A. N., Demirguc-Kunt A., Levine R. and Haubrich J. G., (2004), Bank concentration and Competition: An evolution in the making, Journal of Money, Credit & Banking, 36(3) part 2, 433-451.

Bikker J. A., Groeneveld J., (2000), Competition and concentration n the EU banking industry, Kredit and Kapital, 33, 62-98.

Bikker J. A., Haaf K., (2002), Competition, concentration and their relationship: An empirical analysis of the banking industry.

Bos J., (2002), European banking: market power and efficiency, University Pers Maastricht.

Bresnahan T., (1982), The oligopoly solution concept is identified, *Economic Letters*, 10, 87-92.

Bresnahan T., (1989), Empirical studies in industries with market power. In: Schmelensee R., Willig R. (Eds.), Handbook of industrial organization, vol II, 1011-1058.

Boutillier M. J., Gaudin J., Grandperrin S., (2004), La situation concurrentielle des principaux secteurs bancareis Europeensentre 1993 et 2000 : Quels enseignements pour la future structure des marches financiers issue de l'uem, Fondation Banque de FranceWorking papers.

Carbò S., Humphrey D., Maudos J., Molyenux P., (2009), Cross-country comparisions of competition and pricing power in European banking, *Journal of International Money and Finance*, 28, 115-134.

Casu B., Girardone C., (2006), Bank competition, concentration and efficiency in the single European market, The Manchester School, 74(4), 441-468.

Charnes A., Cooper W.W., Rhodes E., (1978), "Measuring for efficiency of decision making units", *European Journal of Operational Research*, 2, 429-444.

Claessens S., Leaven L., (2004), "What drives bank competition? Some international evidence", *Journal of Money, Credit and Banking*, 36, Part 2, 563-584.

Coccorese P., (2004), Banking competition and macroeconomic conditions: a disaggregate analysis, Journal of International financial Markest, Institutions & Money, 14, 203-219.

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

Debreu G., (1951), The coefficient of resource utilization, *Econometrica*, 19, 273-292.

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

Evanoff D. D., Fortier D., (1988), Reevaluation of the structure-conduct-performance relationship in Banking, *Journal of Financial Services Research*, 1, 277-294

Farrell M. J., (1957), The measurement of productive efficiency, *Journal of the Royal Statistical Society*, Series A, General, 120, 253-278.

Friedman J. W., (1971), A non cooperative equilibrium for supergames, *Review of Economic Studies*, 38(1), 1-12.

Gilbert A., (1984), Studies of bank market structure and competition. A review and evaluation, Journal of Money, Credit and Banking, 16, 617-644.

Goldberg L.G., Rai A., (1996), The structure-performance relationship for European banking, *Journal of Banking and Finance*, 20,745-771.

Goddard J. A., Molyneux P. M., Wilson J. O. S., (2001), European banking: efficiency, technology and growth, Chichester, Wiley

Hicks J., (1935), The theory of monopoly, *Econometrica*, 3, 1-20.

Iwata G., (1974), Measurement of conjectural variations in oligopoly, *Econometrica*, 42, 947-966.

Koopmans T. C., (1951), An analysis of production as an efficient combination of activities, in T. C. Koopmans (ed.), Activity Analysis of Production and Allocation, Cowles Commission fo research in Economics Monograph, 13 New York, Wiley.

Koutsomanoli-Fillipaki N., Staikouras C., (2004), 6-8 September, Competition in new Europeanbanking landscape, Paper presented at the Money, Macro and Finance 36th Annual conference, Casss Business School, London.

Lau I., (1982), On identifying the degree of competitiveness from industry price and output data. *Economics Letters*, 10, 93-99.

Lloyd-Williams D.M., Molyneux P., Thornton J., (1994), Market structure and performance in Spanish banking, *Journal of Banking and Finance*, 18, 433-443.

Molyneux P., Teppet J.L., (1993), Structure-conduct-performance in EFTA banking markets, *en Financiewezen*, 3, 133-137.

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

Molyneux P., Altunbas Y., Gardener E. P. M:, (1996), Efficiency in European banking, John Wiley & Sons Ltd.

Neven D., Röller L., (1999), An aggregate structural model of competition in the European bankng industry. International Journal of Industrial Organization, 17, 1059-1074.

Rhoades S., (1982), Structure-performance studies in banking: An updated summary and evaluation, Staff study, 119, Board of Governors of the Federal Reserve System.

Rosse J. N., Panzar J. C., (1977), Chamberlin vs Robinson: An empirical study for monopoly rents. Bell Laboratories Economic Discussion Paper.

Shaffer S., (2004), Patterns of competition in banking, Journal of Economics & Business, 56, 287-313.

Shaffer S., (1989), Competition in US banking industry, *Economics letters*, 29, 321-323.

Shaffer S., DiSalvo J., (1994), Conduct in a banking duopoly, *Journal of Banking and Finance*, 18, 1063-1082.

Shepherd W. G., (1982), Economies of scale and monopoly profits, *Industrial Organization, Antitrust, and Public Policy*, edited by Craven J. V., Boston: Kluwer Nijhoff.

Smirlock M., (1995), Evidence on the non relationship between concentration and profitability in banking, *Journal of Money, Credit and Banking*, 17, 69-83.

Panzar J., Rosse J., (1987), Testing for monopoly equilibrium. *The journal of Industrial Economics*, 35, 443-456.

Peltzman S., (1997), The gains and losses from industrial concentration, *Journal of Law and Economics*, 20, 229-263.

Torluccio G., Cotugno M., Degl'Innocenti M., (2008), La misurazione della efficienza nella società di leasing: Approcci tradizionali ed evoluti a confronto, *Banche e Banchieri*, 6, 445-468.

Weill L., (2003), On the relationship between competition and efficiency in the EU banking sectors, Mimeo, LARGE Universite Robert Schumann, Strasbourg, France.

Weiss L., (1974), The concentration-profit relationship and antitrust, in Goldschimdt H. J., et al., Industrial Concentration: The new learning, Boston.

Table 1: Sample used for the empirical analysis

Country	Average number of firms (2003-2006)	Total number of firms	Per cent of total	Average size of firms, 2006
UK	20	81	17%	4,622
Germany	21	83	17%	1,772
France	34	135	28%	3,344
Spain	16	63	13%	4,947
Italy	30	120	25%	4,294
TOTAL	121	482	100%	18,979

Table 2: Concentration ratio (CR3) by Countries

Country	N	C3	C3	C3	C3	Average C3	Locat Market share
		2006	2005	2004	2003	2003-2006	2006
UK	126	0.31	0.31	0.47	0.34	0.36	95%
Germany	181	0.38	0.31	0.24	0.33	0.32	90%
France	83	0.70	0.64	0.62	0.60	0.64	98%
Spain[13]	52	0.47	0.48	0.53	0.34	0.33	99,6%
Italy	123	0.50	0.43	0.26	0.27	0.37	95%

CR3= Three-firm concentration ratio. N indicates the numbers of members of Leaseurope in 2006.

Table 3: Determinants of competitiveness

Variable	Symbol	Definition
H-statistic	H	H statistics is calculated with Panzar and Rosse approach for each Country from 2003 to 2006.
Technical efficiency	X-EFF	A measure of technical efficiency (X-EFF). It is determined by using DEA approach.
Scale efficiency	S-EFF	A measure of scale efficiency (S-EFF). It is determined by using DEA approach.
Market concentration	CONC	Value of market concentration of each local Country.
Bank-related ownership	BO	The fraction assets of leasing industry that is in banks owned (majority control).
Number of firms to population	NRPOP	The ratio of the number of leasing firms per million inhabitants in each Country.
Value of Total loans/to population	TLPOP	The ratio of total loans per million inhabitants in each Country.

[13] For Spain, we includes the new contracts of Santander and Banco Bilbao Vizcaya Argentaria SA

Table 4: Variable Definitions

Variable	Symbol	Definition
Loans	L	Value of loans in leasing activities.
Other Loans	OL	Value of other loans.
Other Earning Assets	OEA	Value of other investments, equity investments, bonds.
Number of employess	NE	Average yearly number of employees.
Physical Capital	PC	Average value of fixed tangible assets.
Financial capital	FC	Average value of financial debts.

Table 5: DEA efficiency Scores by Year and Country

Country	2006	2005	2004	2003	2002	Average 2003-2006
UK						
X-EFF	86.50	79.73	90.30	87.20	86.47	86.04
S-EFF	70.21	75.17	81.00	83.73	77.96	77.61
Germany						
X-EFF	68.34	72.38	72.76	80.42	78.78	74.53
S-EFF	79.21	85.95	85.88	75.08	77.11	80.64
France						
X-EFF	96.49	96.83	96.83	97.36	96.97	96.89
S-EFF	91.93	89.54	89.52	89.89	89.77	90.13
Spain						
X-EFF	96.49	92.03	87.91	93.94	91.73	92.42
S-EFF	96.22	93.53	84.16	97.98	92.74	92.92
Italy						
X-EFF	99.22	98.39	97.95	97.95	96.97	98.09
S-EFF	98.92	98.74	98.90	94.04	97.22	97.56
TOTAL						
X-EFF	89.40	87.87	89.15	91.37	90.18	89.59
S-EFF	87.29	88.58	87.89	88.14	86.96	87.77

Table 6: Regression of IT on concentration (CONC), market share (MS), X-efficiency (XEFF), scale efficiency (SEFF) and control variables

Variables	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
CONC	-.002	(.850)			.001	(.910)
MS	-1.70	(.000)***			-1.63	(.000)***
X-EFF	.011	(.941)	.003	(.982)		
S-EFF	-.360	(.023)**	-.296	(.064)*		
BANK	-.609	(.000)***	-.656	(.000)***	-.617	(.000)***
INDIP	.265	(.020)**	-.264	(.023)**	-.262	(.021)**
RISK	-.046	(.035)**	-.048	(.031)**	-.049	(.024)**
LTA	-.033	(.104)	.057	(.003)***	.081	(.000)***
Y2004	-.047	(.607)	.102	(.519)	.094	(.302)
Y2005	-.097	(.289)	.053	(.556)	.051	(.561)
Y2006	-.127	(.164)	-.017	(.847)	-0.21	(.811)
COST	-2.46	(.000)***	-1.15	(.069)*	-3.38	(.000)***
R(2)_adj	.173		.137		.167	
F	10.11 ***		9.45***		11.76***	

*p<0.10; ** p<0.05; *** p<0.01
Y2004, Y2005, Y2006= dummies for 2004, 2005 and 2006, with 2003 serving as the base year.
The dependent variable IT is expressed in logarithm.

Table 7: Regression of NIM on concentration (CONC), market share (MS), X-efficiency (XEFF), scale efficiency (SEFF) and control variables

Variables	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
CONC	-.021	(.362)			-.007	(.741)
MS	-.379	(.555)			-.134	(.839)
X-EFF	-.529	(.044)**	-.544	(.038)**		
S-EFF	-1.33	(.000)***	-1.29	(.000)***		
BANK	.241	(.139)	.228	(.158)	.241	(.139)
INDIP	.390	(.109)	.391	(.053)**	.390	(.109)
RISK	-.165	(.053)*	-.165	(.000)***	-.182	(.000)***
LTA	-.021	(.554)	-.028	(.396)	-.050	(.171)
Y2004	-.104	(.519)	-.115	(.474)	.128	(.441)
Y2005	-.156	(.333)	-.159	(.323)	.051	(.752)
Y2006	-.183	(.259)	-.182	(.261)	-.002	(.988)
COST	-1.15	(.069)*	-2.46	(.000)***	-2.53	(.000)***
R(2)_adj	.137		.127		.065	

*p<0.10; ** p<0.05; *** p<0.01
Y2004, Y2005, Y2006= dummies for 2004, 2005 and 2006, with 2003 serving as the base year.
The dependent variable NIM is expressed in logarithm.

Table 8: Regression of X-efficiency (XEFF), scale efficiency (SEFF) on concentration (CONC), market share (MS) and control variables - Regression of concentration (CONC), market share (MS) on X-efficiency (XEFF), scale efficiency (SEFF) and control variables

	X-EFF		S-EFF		CONC		MS	
Variables	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
S-EFF					-1.57	(.004)***	-.035	(.078)*
X-EFF					.655	(.204)	.003	(.860)
CONS	.002	(.481)	-.011	(.005)***				
MS	-.017	(.877)	-.200	(.062)*				
BANK	-0.31	(.261)	.019	(.467)	.085	(.782)	.026	(.021)**
INDIP	-0.41	(.240)	-.012	(.714)	-.067	(.863)	-.000	(.977)
RISK	.009	(.155)	.010	(.122)	-.019	(.794)	.001	(.651)
LTA	.010	(.096)*	.017	(.003)***	.046	(.465)	.017	(.000)***
Y2004	-0.21	(.444)	-.004	(.880)	.462	(.140)	.000	(.982)
Y2005	-0.29	(.293)	.001	(.959)	.084	(.787)	.002	(.838)
Y2006	-0.24	(.391)	-.002	(.411)	.079	(.799)	-.004	(.709)
COST	.624	(.000)***	.626	(.000)***	.456	(.696)	-.216	(.000)***
R(2)_adj	.166		.105		.143		.106	
F	24.50***		2.51***		19.17***		7.32***	

*p<0.10; ** p<0.05; *** p<0.01
Y2004, Y2005, Y2006= dummies for 2004, 2005 and 2006, with 2003 serving as the base year.

Table 9: H Statistic-Fixed effects

Variable	UK	Germany	France	Spain	Italy
W1 pass	. 392	.253	0.491	.049	.248
	(.000)***	(.002)***	(.000)***	.327	(.015)**
W2 pers	-.013	.025	.0272	-.166	.432
	(.921)	(.694)	(.108)	(.020)**	(.027)**
W3 imm	-.052	-.001	0.062	.062	-.033
	(.202)	(.957)	(.359)	(.011)**	(.648)
LNTA	.151	.117	-.100	-.008	.031
	(.015)**	(.370)	(.789)	(.614)	(.071)*
EQTA	-.352	.055	.428	.415	-.014
	(.000)***	(.615)	(.001)***	(.000)*	(.632)
LTA	. 661	. 836	.982	.979	.379
	(.000)***	(.000)***	(.853)	(.000)***	(.000)***
CONS	3.28	1.04	-4.98	-.680	4.88
	(.004)***	(.017)	(0.01)**	(.048)**	(.000)* **
H statistic	.326	.277	.826	-.055	.647
	.041	.005	.000	-.055	.007
H stat=0	3.06	7.71	16.30	.193	4.01
Test F	.008	.005	.006	.164	.047
H stat=1	18.79	52.44	.721	10000	33699.51
Test F	.000	.000	.392	.000	.000
Total panel obs	99	103	169	79	150

Notes=*p<0.10; ** p<0.05; *** p<0.01. Numbers in parentheses denote p-value for the parameter estimates. All Variables are expressed in logs. GLS random effect for Spain (Hausman test 7.49)

Table 10: Determinants of H statistic[14]

Variable	Coefficient	Std. Error	t	|P| > t
EFF	.035	.020	.1.70	.089*
CONC	-.001	.001	-0.74	.461
NRPOP	.000	.001	-12.78	.001***
BO	-1.88	.032	-57.61	.000***
TLPOP	.006	.006	1.04	.300
Y2004	.032	.012	2.57	.010**
Y2005	.020	.012	1.65	.099*
Y2006	.049	.012	3.95	.000***
R(2)_adjusted	.885			
F	464.73***			

*p<0.10; ** p<0.05; *** p<0.01
Y2004, Y2005, Y2006= dummies for 2004, 2005 and 2006, with 2003 serving as the base year.

[14] We apply Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Table 11: Regression of H statistic on control variables

Variable	IT	p>t	NIM	p>t
H	.990	(.000)***	-.424	(.057)*
RISK	-.055	(.008)***	-.180	(.000)***
LTA	.028	(.000)***	-.040	(.245)
BANK	-.386	(.000)***	.106	(.544)
IND	-.095	(.326)	.361	(.084)*
Y2004	-.038	(.659)	-.081	(.619)
Y2005	-.098	(.255)	-.125	(.446)
Y2006	-.101	(.242)	-.127	(.441)
Cons	-.315	(.000)***	-2.28	(.000)***
R(2)_adj	.262		.060	
F	20.96***		4.38***	

*p<0.10; ** p<0.05; *** p<0.01
Y2004, Y2005, Y2006= dummies for 2004, 2005 and 2006, with 2003 serving as the base year.
The dependent variables, NIM and IT, are expressed in logarithm.