

Analysis of the Italian Banking System Efficiency: A Stochastic Frontier Approach

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Abstract. The paper provides an analysis of some features of the Italian banking system during the decade 1998 – 2008. In particular, it focuses on the efficiency of Italian banks—in terms of parametric cost and profit functions—taking into account the dualistic structure which characterizes the Italian economy, the bank size, and the juridical form. During this period the Italian banking system has experienced a higher level of competition and significant ownership changes; these phenomena had a relevant impact on the performance of all banks. In particular, we found a reduction of differences in the efficiency between Northern and Southern banks. In addition, small banks exhibit a higher level of efficiency compared with the large ones. Finally, we observe that Mutual Banks improved in a significant way their performance compared with the banks organized as limited companies and cooperative. These results confirm the ability of local small Mutual Banks to effectively and successfully compete in the markets characterized by global operators. The reason for the continuing vitality of local banks is due to the fact that they offer a different product from large global banks and attract customers, specially small local firms, which external global banks would find difficult to serve.

Keywords: Italian Banking System, Stochastic Frontiers, Cost and Profit Efficiency JEL: D2, G21.

1 Introduction

The 1990s was a particularly intense decade for the Italian banking system, in which a reform of the credit market was launched aimed to promote competition among intermediaries through a substantial review of the old 1936 banking law and a deep reorganization of the banking system in terms of both ownership and legal structures of credit companies.

The privatization of the banking system and the liberalization of the credit market have increased the competition which individual intermediaries are subjected to, facilitating this by rationalizing the use of resources and by a thorough review of banking management. Moreover, the Italian banking industry is characterized by another dimension of territorial nature, which has no equivalent in the other European countries. It cannot be ignored that the restructuring process of the banking system

has been far from uniform in terms of territorial structure of intermediaries' activity and in terms of financing of productive activity in the weak areas of the country, with relatively less satisfying results concerning operational efficiency.

These problematic data sum up the economic crisis of Southern Italy which, throughout the first half of the 1990s, has led to the disappearance of a genuine local banking system in the South, which starting from the second half of the decade has progressively been absorbed by Northern banks. If the outcome of these processes is a strengthening of the banking system as a whole and improved performance in terms of productive and allocative efficiency, it is natural to ask after almost 20 years, if these goals have been achieved.

The aim of this paper concerns, thus, the analysis of the Italian banking system efficiency. The analysis of the proposed efficiency relies on an estimated stochastic frontier of cost and profit, taking into account the dimensional profile, the legal-organizational structure, and the territorial implications. The work is structured as follows. Section 2 will focus on the most relevant aspects of the reorganization process of the Italian banking system throughout the past 20 years, considering also into account how the banks have reacted to the global financial crisis in 2009 – 2010. Section 3 will examine some aspects of the methodological nature related to the estimate of the stochastic frontier. Section 4 provides some comments on the results of the econometric analysis on a representative sample of Italian banks between 1998 and 2008. Some final considerations, in Section 5, will conclude the paper.

2 The Italian Credit System Restructuring in the Last Decades

At the end of the 1980s the Italian banking system was highly segmented, predominantly public controlled¹, and essentially impermeable to the competition of foreign intermediaries.

The bank was seen more as an institution with a social function rather than an entrepreneurial activity; the establishment of new institutions was limited by the supervisory authorities and the banks operated in a kind of quasi-monopolistic market.

It was with the entry of the new Banking Act in 1993 that the new regulatory framework was organized into a system. The system described by this law reverses the principles that have long characterized the credit industry (specialization time, institutional pluralism, separation between bank, and industry). The banks authorized by the Bank of Italy today are all similar on a legal level and can operate across the board, without limitations in terms of operations and services offered to the customers.

The 1993 Banking Act favors the creation of a competitive environment in the banking system, designing a system based on entrepreneurship, and a free market. As a consequence, the objectives of the management exerted by the Bank of Italy have changed: efficiency and competitiveness of the financial system are added to the former objectives of stability, compliance with the rules, and a sound management.

¹ Consider that in the eighties the activity of the public controlled banks touched upon 70% of all the intermediated funds of the banking system.

The changes in the legal framework favored the reorganization of the banking system and, in particular, have reposed the problem of the operative dimension of the Italian banks compared to those of the main OECD countries.

The importance of scale economies in the banking industry has constituted an important strand of empirical literature throughout the 1980s and 1990s, but it is far from reaching unequivocal conclusions. This is even more evident in the Italian context, in which the presence of scale economies, especially for larger companies, is far from predictable; in fact, the relevance of economies of scope seems much more significant in terms of financial services diversification (Giannola and Lopes, 1996; Imbriani and Lopes, 1999).

Caution is due to the difficulties that may arise in the managing of large intermediaries that involve high quality leaders and management and appropriate corporate governance rules. In the absence of such conditions, the concentration process could exacerbate the effects of a possible corporate crisis. Moreover, the incorporation of small banks in larger bodies could lead to a lack of funding for small local firms (Avery and Samolyk, 2004).

Indeed, during the period from 1999 to 2003, Bank of Italy data show that the quota of deposits of the smaller banks has increased from 26% to 31% that the share of the medium-sized banks remains at 18%, while for the larger banks there has been a decrease from 56% to 51%. Regarding the credit, the market share of the smaller banks from 1999 to 2003 increased from 25% to 31%; the medium sized banks maintain a constant share of approximately 20%, while the larger banks have experienced a decrease from 55% to 49%; this trend tends to grow stronger during the decade.

In addition, some empirical studies (Ferri and Inzerillo, 2002) show the persistence of credit rationing phenomena regarding small- and medium-sized companies; there is reason to believe that the large universal banks have not been able to meet the demand of financial services coming from small companies; the growth prospects of the banks with strong territorial roots would be enhanced. In fact, many retain that local Mutual banks are better equipped than larger national banks to assist small and medium enterprises. In the Italian case, Mutual banks (BCC) and Cooperative banks (PB) begin and grow with a vocation to support small businesses in their local area, even more so than other local banks organized as limited companies (LC) (De Bruyn and Ferri, 2005).

It has often been observed that the widespread presence on the territory of local banks has allowed a continuous stream of finances aimed at small and medium firms, that otherwise would have suffered a severe rationing as a result of the contraction of the volume of credit supplied by large intermediaries resulting from mergers.²

The opening of a bank deposit implies an immediate knowledge of the entrusted client, which precedes any loan concession. This advantage of possessing information becomes increasingly important if it establishes a long-term contract with the client. Indeed, a continuing relationship for the bank becomes an exclusive and long lasting

² Bonaccorsi di Patti and Gobbi (2001) found that acquisition reduces the supply of credit to small companies; in addition, Sapienza (2002) showed that acquisition increases the probability that the bank will terminate credit reports, particularly with small enterprises which were previously entrusted with the acquired bank. See also Berger et al. (1998).

asset (Petersen and Rajan, 1995). If on the one hand, the exclusivity of the relationship with one bank exposes the firm to the risk of expropriation of part of its profits, on the other hand it creates the conditions for offering an implicit insurance service: the bank is ready to provide emergency credit lines when the company is facing temporary liquidity crisis or to isolate it from sudden increases in interest rates (interest rate smoothing) due, for example, to a tightening of monetary policy (Berlin and Mester, 1999).

Some of these aspects may be amplified, nevertheless, if the bank and the customer interact in the same area and if the bank has a mutual structure. This category of intermediaries tends to supply most of the credit to their members, on which there should be increased information available to the bank compared to those related to other cases. The admission of a member into the *club* of a mutual bank is based on the *liking* or *satisfaction* of the other members; they accept a new member that is considered *reliable* (Cesarini et al., 1997; Angelini et al., 1998; Cornes and Sandler, 1996; Dowd, 1994).

The mutual structure of a bank provides incentives that make entrusted members active participants in the bank life. The objective of being a successful bank is shared by the members (Varian, 1990). Such a system leads to a form of reciprocal checks—*peer monitoring*—creating the necessary incentives to encourage the members to behave in the interests of the financing bank. The problems between the bank and the members can be solved more easily in the case of the Mutual banks (Berger and Udell, 2002). Peer monitoring makes screening and monitoring of the Mutual banks more efficient, contributing positively to the reduction of constraints to which they are normally subjected (Fonteyne, 2007).

In Italy, the problems outlined above take on a particular meaning when the dualistic character (Imbriani, 2003) of the production system is considered.³ The increasing competition and the consequent removal of the constraints on the location of branches, has been particularly intense in the South.

The Southern banks in fact have been characterized from the outset for financial coefficients which are lower than those of the rest of Italy (Giannola, 2007). Due to both this aspect and the difficult environment in which they operate, relatively less satisfying results are produced in terms of operative efficiency. These problematic data added to the Southern economic crisis throughout the first half of the 1990s, has led to the disappearance of the national dimension of the Southern banks and the dissolution of a local banking system, which, starting from the second half of the decade, has been gradually absorbed by Northern banks.

With the aim of providing a quantitative indication of the property restructuring processes, where Southern local banks systematically enter into the sphere of northern external banks, it can be said that the credit system, still independently managed, is unable to control less than 30% of the Southern credit market (Butzbach and Lopes, 2006).

If the processes of reorganization and merging of the credit market in Italy represent, to a certain extent, a necessary reinforcement for competing in larger

³ There is a pronounced debate surrounding the incidents that have led to a substantial liquidation of an independent banking system in the Southern Italy with reference to Alessandrini (2001), Giannola (2002, 2007) and Bongini and Ferri (2005).

markets, it must once again be reiterated that in a dualistic context, this strategy may have negative consequences on small firms operating in the weakest areas.

The question is whether the weakening of the local banks' system, owned by local people, has increased the difficulties of credit access for Southern businesses. Some studies (Panetta, 2003) come to the conclusion that the property restructuring of the Southern banking system would not have determined these negative consequences. On the contrary, the restructuring would have improved the conditions of the Southern credit market. Moreover, such conclusions do not run parallel with the widespread perception of small Southern firms for which that access to bank credit them, is more problematic.

Various sample surveys carried out in Southern companies come to the conclusion that in the Southern Italy credit rationing is perceived as a serious problem and that, at least in part, is related to the property reorganization of the Southern banks. If it has allowed a partial recovery of operative efficiency of the banking system, it has also made access to credit more difficult (Bongini and Ferri, 2005; Butzbach and Lopes, 2006).

According to Bank of Italy, it can be seen the tendency toward downsizing the supply of credit of the larger banks. In the Centre-North such a percentage has decreased, between 1999 and 2005, from above 50% to slightly more than 45%. In the South the reduction has been more significant and has exceeded seven percentage points. At the other extreme of the scale, it can be seen that also the Southern regions have achieved a substantial alignment in the credit provided by the institutions of smaller and minimum dimensions toward the national value of 30%. Regarding the medium-sized credit companies, the South seems to diverge from the national data. In fact, while in Italy and in the Centre-North this percentage tends to exceed 20%, in the South at the end of 2004 it was approximately 15%. Similar considerations can also be carried out regarding deposits; all these trends continue in subsequent years. This result is in part due to the numerous acquisitions of smaller Southern banks by non-local groups and the substantial downsizing of the larger Southern banks.

The global financial crisis that also hit the Italian economy during the biennium 2008—2009 has affected access to credit, especially small businesses based in the South. According to the Bank of Italy, the annual growth rate of loans to Italian companies was 10.2% while for Southern firms it was 7.9% and this tendency was further strengthened during 2009.

In this regard, the Bank of Italy noted that the slowdown in lending by the major banking groups in 2008, led to the same focus into business less risky and this trend was partly offset by the behavior of small and medium banks through an increase of loans to more financially vulnerable firms. The result was a significant shift in market shares for the benefit of the smaller banks.

The phenomenon can be partially explained by the introduction of strict regulations on capital requirements (Basel II) that, by requiring banks to set aside capital proportionate to the risks undertaken and evaluated based on credit scoring mechanisms, can push the big banks—mostly adopting automated rating systems—to limit the credit toward the most opaque firms; otherwise, the small local banks rooted in the territory, by virtue of the accumulated information about its customers, including small and very small (small companies, craftsmen, traders), are able to arrive at an assessment of the creditworthiness of financial information regardless of

the balance sheet information. In conclusion, it is expected that the international financial crisis, through the loss of confidence in the banking system, results in an abrupt tightening of credit rationing for small firms more opaque and localized in the southern regions.

In the light of these issues outlined so far, the question of the recovery of efficiency, experienced by the Italian banking system throughout the last years, will now be further examined by means econometric techniques.

3 The Bank Efficiency Analysis through the Construction of Stochastic Frontiers

3.1 Econometric Technique

According to the economic theory, the degree of technical efficiency of a production unit is evaluated by observing whether a combination of given factors of production has made it possible to achieve the highest level of a product, or if the level of production observed has been achieved with the smallest possible use of productive resources. The analysis of technical efficiency is based on the identification of the production function, or the geometric points that identify the highest product level achievable for each given use of productive factors (Forsund et al., 1980). The measure of the distance of each production unit from this frontier is the most immediate way to assess its efficiency (Farrel, 1957).

The methodologies which are most frequently used in order to identify the production frontier are divided into parametric and non parametric. The former start with a specification of the production function and the parameters are estimated with econometric techniques (Stochastic Frontier Analysis). The non-parametric methodologies do not make any assumptions about the functional form behind the phenomenon to be estimated and make use of linear programming techniques (Data Envelopment Analysis).

For the present work we are limited to use only the former, which despite in some cases of being unfavorably conditioned by the arbitrary aspect of the choice of the functional form that links the production factors to the results of the production process, avoids confusion between statistical errors and real inefficiency using inferential techniques, as they allow us to evaluate how well the model can be adapted to an observed situation, and therefore the adequacy of the chosen explanatory variables, which is not possible with a non-parametric approach.

Literature developments⁴ have helped to identify other measures of efficiency that are not only linked to the technology used in production, but which identify the allocation of productive factors and therefore the ability of the firm to minimize the production costs of a determined level of production, given the prices of the factors. In this case, one talks about cost efficiency, which is analyzed by constructing a cost function:

⁴ For all the theoretical and methodological aspects of the concepts of efficiency and the measurement techniques, see Coelli et al. (1999) and Kumbhakar and Lovell (2000).

$$C = C(y, w, u_c, v_c) \quad (1)$$

Where C are the total production costs, y is the vector of the output quantity, w is the vector of the input prices, u_c is a measure of cost inefficiency and v_c is a random error that could be due to measurement errors and/or a shock suffered by the company and for which it may, temporarily, experience higher or lower costs.

Two operators can attain the same level of efficiency in terms of costs, but one of the two may be more efficient than the other concerning marketing expertise and therefore attaining a higher level of profits.

The ability of the enterprise of efficiently combining the production and the sales factors is evaluated through the specification and the estimation of parameters of the profit frontier, given the output prices:

$$\Pi = \Pi(w, p, u_\Pi, v_\Pi) \quad (2)$$

Where Π are the total profits, w is the vector of the input prices, p is the vector of the output prices, u_Π is a profit inefficiency measure and v_Π is a random error that may be due to measurement errors and/or external shock which the bank has undergone and that due to these, could temporarily experience profits which are higher or lower compared to the minimum or maximum. Regarding the profit function, several considerations in the literature suggest the adoption of alternative versions,⁵ in which the price vectors of the output p are not considered and the levels of production y are included; therefore the proposed specifications are as follows:

$$\Pi = \Pi(w, y, u_\Pi, v_\Pi) \quad (3)$$

The usual frontier stochastic models, initially proposed by Aigner et al. (1977) and Meeusen and Van Den Broeck (1977), do not include any explanatory efficiency variable in the phase of the frontier estimation. Generally, the previous type of approach found in the literature was that proposed by Pitt and Lee (1981) and Kalirajan (1981). In those papers a two stage technique is used, which aims to investigate the explanatory factors of efficiency: in the first stage, the stochastic frontier is estimated and the inefficiency component is identified; in the second one the inefficiency values are regressed on a set of variables which are supposed to be able to explain the trend.

As noted by Kumbhakar et al. (1991), Reifschneider and Stevenson (1991), and Huang and Liu (1994), the two stage approach is incorrect because in the specification of the regression model at the second stage, the hypotheses concerning the inefficiency distribution, on which the stochastic frontiers are based, contradict each other.

An alternative approach to the two stages, which does not present the aforementioned limits, is the one originally proposed by Kumbhakar et al. (1991) and then adapted for panel models by Battese and Coelli (1995).

⁵ See contributions, reported in the financial sector, of Berger and Mester (1997); Humprey and Pulley (1993 and 1997).

Considering a generic production function for panel models we have:

$$Y_{it} = \exp(x_{it}\beta + V_{it} - U_{it}) \tag{4}$$

where Y_{it} is the output produced by the unit in year t ; x_{it} is a dimension vector ($1 \times K$) referring to the input of the production function; β is a vector of parameters of the production function that must be estimated; V_{it} is the stochastic component that can be distributed as a Normal variable $iid \rightarrow N(0; \sigma_v^2)$ with average zero and variance σ_v^2 , independently distributed by the component of inefficiency U_{it} . U_{it} is a non-negative variable and it measures the real technical inefficiency; it is considered to be independently, but not identically distributed. U_{it} is therefore obtained through the cut off at zero of a normal distribution with average $z_{it}\delta$, and variance σ_u^2 ; z_{it} is a vector ($1 \times m$) of explanatory variables linked to the levels of inefficiency of the different economical units observed over time, δ is a vector ($m \times 1$) of coefficients to be estimated. The inefficiency component U_{it} , included in the equation (5), can be specified as:

$$U_{it} = z_{it}\delta + W_{it} \tag{5}$$

where the random variable W_{it} can be obtained by truncation of a normal distribution with zero mean, variance σ^2 , and truncation point equal to $-z_{it}\delta$, such that $W_{it} \geq -z_{it}\delta$. This assumption is consistent with the hypothesis that U_{it} is a non-negative variable extracted from a distribution $N^+(-z_{it}\delta, \sigma^2)$. We employed a simultaneous ML estimation of the above parameters in equations (4) and (5). The maximum likelihood function, and the partial derivatives with respect to the model parameters have been calculated by Battese and Coelli (1993), the same function is then parameterized following Battese and Corra (1977) and therefore we will have that

$$\sigma_s^2 \equiv \sigma_v^2 + \sigma^2 \text{ and } \gamma \equiv \frac{\sigma^2}{\sigma_s^2} .$$

Once we obtained the total residuals from the estimated function ($U_{it} + V_{it}$), we isolated pure inefficiency (U_{it}) following the approach suggested by Jondrow et al. (1982) and finally calculated the efficiency score using the estimator proposed by Battese and Coelli (1993). The efficiency score of the i -th unit in year t is then equal to :

$$E_{it} = \exp(-U_{it}) = \exp(-z_{it}\delta + W_{it}) \tag{6}$$

3.2 Model Specification

We assume that the bank uses three inputs: 1) collected funds (x_1); 2) deposits (x_2); 3) labor (x_3) and produces three outputs: 1) loans to ordinary customers (y_1); 2) loans to financial institutions (y_2); 3) other financial assets in portfolio (y_3); input prices are 1) cost of collected funds (w_1); 2) cost of deposits (w_2); 3) labor cost (w_3).

Total costs (TC) are calculated considering all costs incurred by the bank including interest. Total profits (Π) are derived from the difference between total revenues and total costs. In the revenues are included all interest incomes and commission incomes (including deposits).

The cost function (and profit) estimated is a Translog type (Caves and Christeensen, 1980); as already said, following Battese and Coelli (1995), in addition to outputs (**y**) and input prices (**w**), we insert the variables (**z**) describing the factors affecting the mean distribution of the inefficiency variable (U_{it}) for each bank.

$$\ln(TC_{it}) = \alpha_0 + \sum_{i=1}^3 \alpha_i \ln y_{it} + \sum_{j=1}^3 \beta_j \ln w_{jt} + t_1 T + \frac{1}{2} \left[\sum_{i=1}^3 \sum_{j=1}^3 \delta_{ij} \ln y_{it} \ln y_{jt} + \sum_{i=1}^3 \sum_{j=1}^3 \gamma_{ij} \ln w_{it} \ln w_{jt} + t_{11} T^2 \right] + \sum_{i=1}^3 \sum_{j=1}^3 \rho_{ij} \ln y_{it} \ln w_{jt} + v_{it} + u_{it} \tag{7}$$

First of all, we inserted a trend variable (T), to capture structural changes causing translation of Hicks neutral type frontier; second we added a scale variable represented by the logarithm of total assets (TA) in order to control the large variability of bank dimension.

According to Hughes and Mester (1994), if banks are not risk neutral, they do not choose the equity level exclusively in terms of cost minimization. On the contrary if banks are more risk adverse, may choose to finance their loans with a higher proportion of equity compared to debt (in other words choosing to use less indebtedness). Since the equity is a source of funding typically more expensive, this may suggest that banks more risk averse produce its output in a less efficient way. As a consequence, the assessment of efficiency would be distorted by the choice of the mix of production factors which is affected by the different risk aversion of banks involved and this diversity must be taken into account (Kwan and Eisenbeis, 1995; Shrieves and Dahl, 1992).

These considerations, concerning the different risk aversion of bank management, seem to be even more important in the Italian situation which is characterized by banks with a different legal structure, and presumably, different risk preferences. As highlighted by Giordano and Lopes (2007), the level of capital used by the Mutual banks is much higher than that used by the Cooperative banks or by limited companies; this difference portrays a higher risk aversion of the Mutual banks, granted that in the latter, the mutualistic aspect blends together the aims of the owners and of the clients (Mayers and Smith, 1988). When such diversities are not considered, a distorted estimate of the efficiency of the intermediaries who are more averse to risk could be possible. This is the reason why, in this paper, we introduce a level of capitalization—capital on total assets (FEC) of the intermediaries—as an efficiency explanatory variable⁶.

⁶ Similar considerations can be made when analysing the distribution of the same ratio – capital on total assets – according to the bank size. As predicted, it can be noted that the smaller banks report slightly higher levels of capitalisation compared to larger ones because of their increased risk aversion and because they predominantly coincide with the Mutual banks.

Another important issue that we take into account is the relationship between banks efficiency and non-performing loans (NPL). In the following analysis we assume that the different environmental and macroeconomic conditions in which banks are involved may cause a deterioration of the quality of loans and, as a consequence, the performance of banks in terms of efficiency. In other words, given the sharp dualism of the Italian economy and taking account of the historical differences in terms of percentage of bad loans between banks in different regions of the country (see table 2), the higher level of non-performing loans in Southern Italy is due to more adverse economic conditions faced by banks operating in this area. In this context, the bank management may achieve lower levels of efficiency not as a result of poor screening and monitoring activities of customers but because of tighter external constraints. Therefore, the variable which captures the quality of assets (NPL) is inserted into the vector of the explanatory variables of efficiency⁷.

Finally, we include a variable measuring the intensity of credit (IC) as a proxy of the role of the traditional credit activity; the credit intensity is calculated by the ratio between customer credits and total earning assets. In addition, we took into account the importance of institutional aspects related to the legal nature of the bank, i.e. if it is a Limited company, a Cooperative bank or a Mutual bank. The hypothesis to be tested is that the different legal structure affects corporate strategies with regard to more traditional activities connected with the supply of loans to firms and on banking efficiency; in order to do so, the (IC) variable was multiplied by dummy variables relating to Cooperative and Mutual banks.

3.3 Data and Variables

The estimates have been made on a sample of 526 banks coming from the *Bilbank* archive for the period 1998 – 2008. The banks for which the budgetary information was available for at least 10 years out of 11 were included in the sample; estimates were made using 5686 observations corresponding approximately to 76% of the total observations relating to the entire Italian banking system.

The sample is broken down to take account of firm size⁸, legal structure (Limited company, Cooperative bank, and Mutual bank), and Headquarter location (Northern, Central, and Southern Italy). The inflation has been removed from all the series using the value-added deflator for the banking sector (the base year is 1995). In Tables 1 and 2 are shown respectively, the structure of the sample and sample means of the variables in question.

⁷ In a previous paper the authors tested the exogeneity hypothesis of NPL variable using the empirical Granger Causality applied to a sample of 550 banks for the period 1993-2003, see Giordano and Lopes (2009).

⁸ The breakdown according to the dimensional criterion was made following the Bank of Italy criterion for which the dimensions are five groups: "major banks" (with total resources exceed 60 billion euro), "large banks" (26 to 60 billion euro), "medium-sized banks" (9 to 26 billion euro), "small banks" (from 1.3 to 9 billion euro) and "smaller banks" (with lower average total resources to 1.3 billion euro). Here we preferred to merge major banks with large banks and small banks with minor banks.

Table 1. Sample composition

Year	Banks	Legal Structure			Headquarter Location		
	(Total)	Limited Company (LC)	Cooperative Banks (PB)	Mutual Banks (BCC)	Northern Italy	Central Italy	Southern Italy
1998	498	102	35	361	287	103	108
1999	502	105	31	366	296	102	104
2000	518	110	33	375	301	107	110
2001	522	113	32	377	304	107	111
2002	521	114	30	377	305	106	110
2003	524	117	28	379	304	107	113
2004	524	118	27	379	307	104	113
2005	517	111	27	379	302	103	112
2006	523	119	25	379	304	105	114
2007	526	122	24	380	305	107	114
2008	511	115	24	372	296	104	111

Source: Bilbank (ABI - Italian Banking Association).

Limited company banks collect a greater amount of funds, compared to the Cooperative banks and Mutual banks; we found the same pattern with regard to all the other outputs and inputs. It is evident the dominant role of LC banks in the Italian credit industry. On the other tail of the distribution can be found Mutual banks that, despite their relative abundance, show a very small mean value of the above variables. Cooperative banks face short distance from the LC banks, replicating, in fact, the industrial features of the latter.

In addition, we observe a significant difference in the cost of funds held by banks operating in different areas of the country. Banks headquartered in the North sustain a lower cost of raised funds, compared to Central and Southern banks indicating a tightening of supply of funds raised gradually from North to South. Likewise, Cooperative banks support a lower cost for raised funds with respect to Mutual banks and Limited company banks. The cost of labor does not show substantial differences between the various institutional categories and the three geographical areas. The cost of deposits is virtually identical for the banks operating in the three main areas of the country. The cost of deposits turns out to be rather higher for LC banks compared to other types of intermediaries, due to the mutual nature of Cooperative and Mutual banks.

The variable measuring the intensity of Credit (IC) is a proxy for the productive specialization of intermediaries in traditional credit activity; it might be able to explain the paths of cost and profit efficiency of different banks with different characteristics. The data in table 2 show clearly that the traditional lending activity orientation is significantly lower for banks headquartered in the South than banks headquartered in the rest of Italy. These data provide evidence of a higher risk faced by Southern intermediaries operating in areas with problematic economic conditions. For these reasons, they may prefer to lend to other lending institutions or to invest in

financial assets, ultimately weakening the support for the growth of the local productive activities. In addition, LC banks show a higher percentage of assets represented by loans to customers, followed by Cooperative and Mutual banks. This may be due to the greater willingness for traditional lending activity of LC banks; it might also indicate the existence of a wide margin for growth in the lending activities of Mutual banks.

Table 2. Sample mean of variables

Variables	Italian Banking System	Legal Structure			Headquarter Location		
		Limited Company (LC)	Cooperative Banks (PB)	Mutual Banks (BCC)	Northern Italy	Central Italy	Southern Italy
Collected Funds (x_1)	1,13 (mld)	4,19 (mld)	2,67 (mld)	81 (mln)	1,20 (mld)	1,79 (mld)	309 (mln)
Customer Deposits (x_2)	1,09 (mld)	3,86 (mld)	2,82 (mld)	126 (mln)	1,19 (mld)	1,38 (mld)	573 (mln)
Employees	533	1.881	1.398	60	561	695	304
Wages(x_3)	31,9 (mln)	116,9 (mln)	79,6 (mln)	3,6 (mln)	33,9 (mln)	41,3 (mln)	17,7 (mln)
Loans to customers (y_1)	1,5 (mld)	5,74 (mld)	3,96 (mld)	159 (mln)	1,75 (mld)	2,24 (mld)	567 (mln)
Loans to Financial Institutions (y_2)	445 (mln)	1,75 (mld)	871 (mln)	17,4 (mln)	470 (mln)	603 (mln)	227 (mln)
Other Financial Assets (y_3)	306 (mln)	980 (mln)	939 (mln)	54,5 (mln)	303 (mln)	473 (mln)	157 (mln)
Collected Funds cost(w_1)	0,034	0,034	0,031	0,034	0,032	0,035	0,039
Deposits cost (w_2)	0,017	0,02	0,016	0,016	0,017	0,018	0,017
Labour cost (w_3)	59.782	62.157	56.973	59.279	60.434	59.441	58.338
Credit Intensity (IC)	0,63	0,67	0,63	0,62	0,681	0,628	0,5
Total assets (TA)	2,64 (mld)	9,57 (mld)	6,60 (mld)	243 (mln)	2,85 (mld)	3,72 (mld)	1,06 (mld)
Financial equity capital (FEC)	0,108	0,085	0,09	0,117	0,112	0,095	0,111
Non performing loans (NPL)	0,005	0,007	0,008	0,005	0,004	0,006	0,007

Source: Bilbank (ABI - Italian Banking Association).

We included Total assets (TA) as a scale variable affecting mean distribution of cost and profit because the Italian banking system is polarized between LC banks (medium-large size banks) with a total assets at an average of 9.57 billion euros and a

multitude of small and very small Mutual banks with total assets amounted on average to 243 million euros.

The variable FEC (financial equity capital), as already mentioned, is a proxy of risk aversion of bank management and is the ratio between equity and total assets of the bank. There is a clear difference between Mutual banks and LC banks, with the latter characterized by a percentage of the total equity equal to 11,7% compared with 8,5% of the former; while Cooperative banks fall in an intermediate position.

Finally, the variable NPL (non-performing loans) measures the asset quality of intermediaries depending on the economic environment in which banks have to operate. Data indicate a percentage of bad loans in the South much higher than in the North, with the banks headquartered Centre much closer to the dynamics of the Southern ones.

4 Econometric Results

Table 3 gives some parameters⁹ of the estimated cost and profit functions (Equations 1 and 2) following the Battese and Coelli (1995) approach. With regard to the cost function, all parameters are significant at 1%, except (α_2), which is negative and significant at 10%. The profit function parameters are all significant with the exception of (α_1) and (β_2).

The parameter ($\gamma = \sigma^2/\sigma_s^2$) is 0.96 for the cost frontier and 0.98 for profit frontier, respectively. These values confirm the importance of the inefficiency component in explaining the deviations of the observed economic units from the efficient frontier.

Table 3. Some parameters of *Translog Cost/Profit function*

Functions	α_0	α_1	α_2	α_3	β_1	β_2	β_3
Cost function	10,45	0,73	-0,16	0,95	1,25	2,05	0,104
(t-ratio)	(5,42)***	(7,56)***	(-1,90)*	(9,04)***	(8,24)***	(13,64)***	(28,58)***
Profit function	17,05	-0,067	-0,27	-0,15	0,33	-0,09	-0,009
(t-ratio)	(15,60)***	(-0,90)	(-3,88)***	(-2,24)**	(3,23)***	(-0,87)	(-4,14)***

(***)= 1% significance level, (**)= 5% significance level, (*)= 10% significance level

The Likelihood ratio test (LR) of the correct specification of the model¹⁰ is constructed by testing the null hypothesis that the parameters of the explanatory variables of efficiency are all zero ($\delta_0 = \delta_1 = \delta_2 = \dots = \delta_n = 0$). In both cases (cost and profit function) we reject it at 1%.

⁹ Note that the estimated parameters of cost or profit functions showed in table 3 are not equivalent to the elasticity of the dependent variable with respect to the quantities and prices, because of the presence of cross-products, not reported in the table. Consequently, the interpretation of the signs of the parameters must be cautious (Berger and Mester, 1987).

¹⁰The LR test is calculated as: $LR = -2\ln\{[L(H_0)/L(H_1)]\}=2\ln\{[L(H_1)]-\ln[L(H_0)]\}$, degrees of freedom equal to the imposed restrictions; finally the critical values are taken from Kodde and Palm (1986).

Table 4. Stochastic frontiers - Specification tests

Functions	sigma-squared	γ	LR	LR critical value	LR decision test
Cost function (t-ratio)	0,463 (23,82)***	0,96 (438,36)***	3755,07 -	27,133 -	Rejected -
Profit function (t-ratio)	0,6 (33,15)***	0,98 (1867,9)***	8670,77 -	27,133 -	Rejected -

(***)= 1% significant level, (**)= 5% significant level, (*)= 10% significant level

With regard to the impact of the explanatory variables¹¹ (table 5), the trend variable (T) tends to reduce the expected value of the inefficiency of cost but not profit; in other words, the learning process allows banks to improve their performance only in terms of cost reduction, whereas, on the contrary, the sign of the parameter indicates a deterioration of the capacity of intermediaries to improve performance in terms of achieving the maximum potential profit.

Similar considerations can be carried out regarding the effects of scale variable (TA). Clearly, the growth in size—which optimizes the use of inputs in the production of output—is accompanied by an excessive product standardization that has negative repercussions in terms of quality. This output deterioration prevents, to some extent, the larger banks to place the various outputs profitably in the market thereby moving away from the profit frontier.

Table 5. Sign and Significance of parameters explaining efficiency

Functions	δ_0	δ_1 (BCC)	δ_2 (PB)	δ_3 (IC)	δ_4 (T)	δ_5 (TA)	δ_6 (NPL)	δ_7 (FEC)	δ_8 (BCC*IC)	δ_9 (PB*IC)
Cost function	+	-	-	-	-	-	+	-	-	(*)
Profit function	-	+	(*)	+	+	+	+	+	-	-

(*) Not significant parameter.

With regard to the dummy variables related to the mutual banks (BCC), it is possible to observe a positive effect on cost efficiency and a negative one on profit efficiency. Therefore, BCC enjoy advantages in terms of information and relationship that allows them to offer services to customers at a price relatively cheaper than LC banks. On the contrary, the profit frontier of profits seems to get away for the BCC because their mutual nature could mitigate the management profit maximization objective.

¹¹ Therefore, the correct interpretation of the signs is as follows: the negative sign means that the variable reduces the average inefficiency (efficiency increasing), the positive sign increases the average inefficiency (efficiency reduction).

Being a cooperative bank (PB) results in a reduction of cost inefficiency relatively to LC banks, but has no effect on the efficiency of profit. Therefore, although this kind of banks do not enjoy special advantages or disadvantages compared to LC banks regarding profits, the mutual nature and their local roots (stronger than the LC banks) allow them to exhibit cost advantages like BCC banks.

These results confirm the ability of local Mutual banks to compete effectively and successfully in markets with global player operators. The enduring vitality of these local banks is due to the fact that they use more intensively intangible information during screening and monitoring activity; in addition, they offer a different product compared to the big global banks and they deal with a clientele that is not served by larger external banks (De Young et al., 2004, Carter et al., 2004, Berger et al. 2004).

As expected, the highest level of capitalization (FEC) has a negative effect on the profit efficiency, noting that a greater risk aversion management determines a sub optimal input combination compared to banks that are larger users of borrowed capital. On the contrary, the (FEC) variable has positive impact on cost efficiency; in other words, the most capitalized banks are favored in terms of cost efficiency. This result may seem counterintuitive because the more intensive use of capital should be inefficient due to the increased cost of equity compared to those of others. By the way, we should also take into account another effect that goes in the opposite direction, namely the lower cost of supply of two important inputs in the production function of banks: i) "stock funds collected" and ii) "customer deposits", because of lower risk premium required by providers of these funds toward the most highly capitalized banks (and therefore with lower risk of default). We must therefore assume that this effect (lower cost of funds raised) prevails on the other one (higher level of capitalization).

Concerning the Credit intensity (IC), we must distinguish between the effect on the entire banking system performance and the effect only on (BCC). The increase in (IC) variable increase cost efficiency and reduces profit efficiency for the system as a whole. However, this phenomenon must be appropriately interpreted in the light of multiplicative variables that attempt to separate the effect of lending to customers depending on whether it refers to different types of banks (BCC*IC). BCC banks can effectively improve their performance, both in terms of cost and profit, in increasing loans to customers. These banks, then, may continue to expand their business in traditional lending activity; in other words, they can count on competitive advantages in this market compared to the large universal LC banks. The competitive advantages of Mutual banks in the traditional banking intermediation sector are derived from the fact that the lending activity is typically based on soft information acquisition and relies on established customer relationships which play a decisive role in determining the quality of products offered and the cost to produce them.

With regard to PB banks, credit intensity appears to have no significant effect on cost inefficiency; in fact, these banks have long ago departed from traditional operational paradigm of mutual bank and have diluted the competitive advantage that still characterizes BCC banks. The credit intensity has positive effect in terms of profit efficiency. Again, the competitive advantage compared to the LC banks is in the lower organizational complexity of cooperative banks (less vertically integrated

structures) and their residual ability to offer customized products with higher added value than the standard products offered by large, impersonal LC banks.

Finally, the (NPL) variable captures the effect that the loans quality exerts on cost and profit efficiency. In other words, we are assuming that the quality of assets is primarily an exogenous variable, beyond the management control, depending crucially on the economic environment in which banks operate. The empirical evidence indicates that the increase of bad loans leads to a deterioration in the performance of both costs and profits as intermediaries have to bear higher costs for screening and monitoring activities in an environment characterized by adverse macroeconomic conditions.

We complete the results presentation showing cost and profit efficiency scores as evolved between 1998 and 2008, dividing the banks by size, legal status, and headquarter location.

With regard to the cost efficiency score according to the legal status, it should be noted in Table 6 that Mutual banks have on average a positive cost efficiency differential compared to Limited company banks and Cooperative banks. This gap between BCC and LC banks, after a decrease between 1998 and 2000, remains pretty constant up to 2004 and then falls to some extent in the next two years to return to grow over 2007 and 2008. The differential in favor of the PB Banks remains fairly stable until 2004, then declines over the next two years and grows again in the years 2007-2008.

Regarding profit efficiency score dynamics shown in Table 7, the differential in favor of BCC banks has a tendency to rise continuously until 2007 and then declines in 2008; the gap in favor of the PB Banks, although fluctuating, has remained fairly stable until 2006; growing in 2007 and declining in the following year.

Table 6. Cost Efficiency (mean values) - Legal Structure

Year	All Banking System	Limited Company Banks(LC)	Cooperative Banks (PB)	Mutual Banks (BCC)
1998	0,8238	0,6720	0,7235	0,8764
1999	0,8317	0,7283	0,7983	0,8643
2000	0,8511	0,7581	0,8287	0,8804
2001	0,8717	0,7564	0,8474	0,9083
2002	0,8802	0,7795	0,8504	0,9130
2003	0,8748	0,7674	0,8308	0,9112
2004	0,8813	0,7795	0,8455	0,9156
2005	0,8957	0,8164	0,8614	0,9213
2006	0,8880	0,8477	0,8558	0,9027
2007	0,9106	0,8587	0,8904	0,9286
2008	0,9110	0,8453	0,8954	0,9323

These results confirm that, in the Italian banking system, there is a widespread presence of Mutual banks that stand out positively from other types of banks. In other words, the process of consolidation of the Italian banking system, characterized by the adoption of the common organization of the limited company aimed to pursue higher levels of efficiency, does not seem to find strong support from this empirical evidence.

Table 7. Profit Efficiency (mean values) - Legal Structure

Year	All Banking System	Limited Company Banks(LC)	Cooperative Banks (PB)	Mutual Banks (BCC)
1998	0,9053	0,8988	0,9359	0,9042
1999	0,9279	0,9079	0,9409	0,9326
2000	0,9216	0,9021	0,9325	0,9263
2001	0,9128	0,8916	0,9203	0,9185
2002	0,9107	0,8972	0,9225	0,9138
2003	0,9196	0,8916	0,9258	0,9278
2004	0,9226	0,8944	0,9245	0,9312
2005	0,9129	0,8768	0,8932	0,9249
2006	0,9024	0,8637	0,8859	0,9156
2007	0,8694	0,8175	0,8791	0,8854
2008	0,8271	0,8007	0,8346	0,8348

An examination of Table 8 shows that small banks have a higher average level of cost efficiency than the larger ones; this gap does not seem to decrease during 1999 – 2005 period, in the following two years it becomes negative; finally, it increases again in 2008. The gap between small and medium banks is always positive; it decreases between 2003 and 2008 and increases in the last two years. Time would seem to exert a negative effect on cost efficiency. The persistent problems of costs for larger banks may depend on structural rigidities that impede a rapid decline in the unit cost or the adoption of more efficient production methods.

Regarding profit efficiency, we observe in Table 9 a gradual expansion, although marked by wide fluctuations, the gap between small and large banks until 2007 and then a significant reduction in 2008; the same pattern may be observed in the gap between medium and large banks. Finally, we observe an increasing gap between small and medium banks favorable to the former.

Table 10 shows a widening gap in terms of cost efficiency unfavorable to Southern banks during 1998 – 1999; then, this trend stops and the gap decreases until 2002, but it widens again until 2006. In 2007, there is a reduction in the gap which widens in 2008. The gap in terms of cost efficiency between Southern banks and banks

headquartered in the Central Italy fluctuates around zero until 2004 and then becomes increasingly unfavorable to the Southern ones until 2006; in 2007 there is a gap reduction which increased again in 2008. Overall, cost efficiency score dynamics shows a clear and permanent inferiority of the southern banks compared to those with local headquarters in the rest of Italy.

Table 8. Cost Efficiency (mean values) - Bank Size

Year	All Banking System	Large banks	Medium banks	Small banks
1998	0,8238	0,5427	0,6573	0,8336
1999	0,8317	0,8021	0,7957	0,8335
2000	0,8511	0,8236	0,8068	0,8534
2001	0,8717	0,8259	0,8058	0,8756
2002	0,8802	0,7958	0,8072	0,8854
2003	0,8748	0,7777	0,7926	0,8808
2004	0,8813	0,7774	0,8116	0,8869
2005	0,8957	0,8459	0,8320	0,9000
2006	0,8880	0,9160	0,8848	0,8876
2007	0,9106	0,9265	0,8859	0,9119
2008	0,9110	0,8921	0,8697	0,9136

Table 9. Profit Efficiency (Mean values) - Bank Size

Year	All Banking System	Large banks	Medium banks	Small banks
1998	0,9053	0,9028	0,8330	0,9078
1999	0,9279	0,9092	0,8633	0,9306
2000	0,9216	0,9179	0,8804	0,9233
2001	0,9128	0,8615	0,8605	0,9162
2002	0,9107	0,8763	0,8838	0,9126
2003	0,9196	0,7916	0,8809	0,9240
2004	0,9226	0,8861	0,8644	0,9263
2005	0,9129	0,7727	0,8593	0,9186
2006	0,9024	0,7919	0,8336	0,9091
2007	0,8694	0,7144	0,7893	0,8780
2008	0,8271	0,7829	0,7427	0,8327

Table 10. Cost Efficiency (mean values) - Headquarter Location

Year	All Banking System	Northern Italy	Central Italy	Southern Italy
1998	0,8238	0,8300	0,8043	0,8260
1999	0,8317	0,8442	0,8046	0,8230
2000	0,8511	0,8614	0,8325	0,8410
2001	0,8717	0,8761	0,8589	0,8721
2002	0,8802	0,8809	0,8758	0,8824
2003	0,8748	0,8790	0,8622	0,8756
2004	0,8813	0,8881	0,8697	0,8742
2005	0,8957	0,9031	0,8861	0,8842
2006	0,8880	0,9062	0,8699	0,8558
2007	0,9106	0,9191	0,8949	0,9028
2008	0,9110	0,9218	0,8933	0,8986

Table 11. Profit Efficiency (mean values) - Headquarter Location

Year	All Banking System	Northern Italy	Central Italy	Southern Italy
1998	0,9053	0,9089	0,9013	0,8995
1999	0,9279	0,9305	0,9245	0,9240
2000	0,9216	0,9226	0,9148	0,9252
2001	0,9128	0,9151	0,9077	0,9112
2002	0,9107	0,9135	0,9036	0,9095
2003	0,9196	0,9223	0,9158	0,9161
2004	0,9226	0,9249	0,9194	0,9194
2005	0,9129	0,9153	0,9082	0,9108
2006	0,9024	0,9031	0,8966	0,9057
2007	0,8694	0,8724	0,8668	0,8638
2008	0,8271	0,8273	0,8260	0,8276

Regarding profit efficiency scores reported in Table 11, the unfavorable gap between Southern and Northern banks is reduced gradually until 2000, then it tends to worsen until 2003; in the following three years there is a decrease in the difference which increases again in 2007 followed by a new reduction in 2008. What appears

clear is that the convergence between the performance of Northern and Southern banks was reached by means of a deterioration of the performance results of the former rather than an improvement of the latter.

The comparison between banks based in the South and those based in the Center is favorable to the first ones, although the gap is characterized by large fluctuations; it is good until 2006, it deteriorates significantly in 2007, and then follows a new improvement in 2008.

We may conclude that the ownership changes occurred since the late 1990s, which "stabilized" and "consolidated" Southern banks, have obtained only a partial gap reduction in terms of cost efficiency; in addition, we found a progressive alignment and convergence performance in terms of profit efficiency even though this process is achieved at lower levels.

5 Concluding Remarks

At the beginning of the 1990s the Italian banking system was conditioned by a predominantly public ownership, a low concentration, an insufficient international projection, a capital inadequacy, as well as a modest income capacity. The last 15 years have seen a significant restructuring process relative to all these aspects, which gradually lifted many structural limitations. Nevertheless, the work toward a modernized system is still far to be completed and problematic elements still occur which need further examination.

The drive toward a rationalization of the use of inputs, aimed at reducing costs, has not occurred in the terms desired by the Bank of Italy and the convergence process toward increased allocative efficiency among the various components of the banking system does not seem to have occurred yet.

One aspect that emerges more clearly is the superiority of the Mutual banks, in terms of cost and profit efficiency, compared to the rest of the system. This type of bank is aligned with the organizational structure of a mutual bank; it has strong territorial roots and it is based on relationship banking. Despite the fact that these banks take up a small share of the market (7%), there may still be prospects for them in terms of profitable expansion in the loans market. This is consistent with the hypothesis of an underlying demand for credit which does not meet with the offer of the larger banks but can be adequately met by smaller banks of decentralized structures (or rather, in the Italian situation, by Mutual banks). The empirical results are in line with a substantial amount of empirical evidence based on other credit systems (United States and Germany), which reported a performance deterioration of major banks organized as limited companies.

These results highlight also a substantial efficiency gap to the detriment of larger banks (they benefit from economies of scale, even if in the Italian case this is doubtful) and a unique process of convergence of the Cooperative banks to the lowest levels of efficiency of the banks organized in the form of limited companies. In this regard, it can be pointed out that the traditional bank has not lost its importance: in particular, smaller banks can expand their market shares and profit opportunities.

If, on one side, Mutual banks invest more in intangible information (soft information), develop more intense customer relationships and adopt a less vertical

structure, on the other side, the process of consolidation of the Italian credit market has encouraged the growth of average size intermediaries and the adoption of hierarchical models which are more rigid.

Regarding the Southern banks, the massive ownership changes through their acquisition by the other Italian banks occurred at the end of the nineties, at least in terms of modernization of Southern banking system, have not achieved the expected results; we have observed a persistent gap unfavorable to Southern banks with respect to the rest of the other Italian banks particularly evident until 2005. Since 2006 we note a gap reduction, but this result is mainly due to a sharply reduction in the overall efficiency levels in all the Italian banking system. Moreover, the poor asset quality (due to the external environment of the bank) adversely affects cost and profit efficiency. As a consequence, banks operating in more disadvantaged areas of Southern Italy get lowest levels of cost and profit efficiency.

Several warnings emerge concerning the trends in the Italian banking system and we must ask whether the significant structural changes taking place are enough to increase efficiency or rather if the future scenario, which has become more critical after the global financial crisis, will not impose the problem of availability of credit, or the problem, more generally, of the absence of a virtuous model of bank – enterprise relationship able to operate as a development factor in the Italian economy.

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