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Cristian BARRA, Roberto ZOTTI

University of Salerno - CELPE

Bank Performance, Financial Stability and Market Competition: do Cooperative and Non-Cooperative Banks Behave Differently?

Corresponding author

cbarra@unisa.it, rzotti@unisa.it

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CELPE - Centro di Ricerca Interdipartimentale di Economia del Lavoro e di Politica Economica
Università degli Studi di Salerno
Via Giovanni Paolo II, 132 - 84084 Fisciano, I- Italy
http://www.celpe.unisa.it
E-mail celpe@unisa.it

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Abstract

We explore the relationship between bank performances and financial stability of the banking system taking into account the Italian context during the period 2001-2014 and relying upon highly territorially disaggregated data taken at municipality level, in order to better capture the differences across geographical areas. The z-score is used as financial stability indicator, while the performance of financial intermediaries is measured using a parametric method recently developed (Kumbhakar et al., 2014). By focusing both on cooperative and non-cooperative banks, the role of the market power, measured through a bank specific market share based on loans, deposits and assets, on the performances-stability nexus has been analyzed. The empirical evidence shows a positive relationship between bank performance and financial stability; furthermore, we provide evidence in line with the "competition-stability" view for cooperative banks while supporting the "competition-fragility" view for non-cooperative banks. Robustness checks have been performed in order to explore whether the results change at different level of concentration of the banking system.

Keywords Management; Local banks; Market structure; Financial stability

JEL G21; G28; C14; D21

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Introduction

Representing one of the main components of the economy, the financial system allows the transfer of money between savers (and investors) and borrowers, therefore being crucial for the allocation of resources and for the financial stability, occurring when the banking system works in term of health and governance. Moreover, the recent financial crisis has triggered researchers to analyse financial institutions' performances as determinant of financial stability in different market structures and several are the reasons currently boosting this discussion. Firstly, financial intermediaries were at the center of the recent crisis. Secondly, the instability of financial system, associated to non-performing loans, has increased in the last years during the crisis, especially for vulnerable euro area countries, including Spain, Italy, Portugal, Greece, Cyprus and Slovenia (see Chart 6 at pag. 9 in ECB's Financial Stability Review Report), giving the priority to adopt new measures and regulatory instruments. Thirdly, bank's performances are an important factor that could influence the phases of the financial stability. According to the European Central Bank (ECB), financial stability represents a condition in which the financial system – intermediaries, markets and market infrastructures – can withstand shocks without major disruption in financial intermediation and in the effective allocation of savings to productive investment. In other words, the financial system can be said to be stable if it displays the following three key characteristics: it should be able to efficiently and smoothly transfer resources from savers to investors; it should comfortably absorb financial and real economic surprises and shocks; and finally, the financial risks should be assessed and priced reasonably accurately and should also be relatively well managed. The core of financial stability is represented by "banking supervisory stages". Initially, the objective of regulators (between the mid-1950s and the mid-1970s) has been to compute minimum capital levels for different category of assets in order to reduce the riskiness in the market. However, the openness of markets, the increase mobility of capitals, the growth of integration between countries and the complexity of the financial instruments make the financial markets more vulnerable to several risks. The financial markets become more complex and assets more risky then there was the necessity to intervene in order to reduce the market risk. In the European context, immediately after the United States crises and the failure of the Lehman Brothers, the regulators tried to enforce the balance sheet to make banks more reliable and to allow relationship much lasting for both firms and households. In this phase, the grant of loans offsets the stability of the system. Indeed, the banks must be cared to supply the credit, given that the firms can have a low degree of reliability and the lack of information plays a crucial role to allow the optimal functioning of the change in the banking market. Then, the themes of the recent financial crisis and financial stability are continuously discussed in the literature, especially to implement new rules (such as Basle) that have the task of avoiding financial difficulties that may affect the stability of the financial system.

Moving from these motivations, this paper aims to investigate whether banks' performances (associated to manager behaviour) influence financial stability in Italy during the period 2001-2014, paying particular attention to the role of market power and to the type of banks operating in the system. How does the performance of financial intermediaries affect financial stability? Does this relationship change when competition is higher? Does competition affect differently the stability of cooperative and non-cooperative banks? This study empirically addresses these questions. Measuring the effects of competition and market power on stability and looking at different conditions in which the banks operate could help academics and regulators to formulate effective policy to contrast financial instability; at the same time, it could also be

helpful for understanding which market conditions may make managers more efficient (reducing risk-taking), guaranteeing stability of the financial sector and preventing the proliferation of negative events that increase the probability of defaults. This paper contribution is main-fold. Firstly, to the best of our knowledge, it's the first work to investigate the effect of bank performances on financial stability paying particular attention to the role of market power in Italian framework; in order to do it, we measure bank performances through their level of both cost and profit efficiency calculated using a recent parametric technique, financial stability through the z-score (the number of standard deviations by which returns would have to fall from the mean to wipe out all equity in the bank) and the level of market power via a bank specific market share based on loans, deposits and assets. Secondly, we explore the performance-stability nexus as well as the role played by the market power relaxing the assumption that all banks are competing between each other within national boundaries; more specifically, following Carbò et al. (2003), Coccorese (2008; 2009) and Fernandez de Guevara and Maudos (2009), who suggest that especially bank competition should be measured at regional level in European Union, we rely upon a highly territorially disaggregated market share index calculated on bank specific loans, deposits and assets taken at municipality level (at SLL, Sistema Locale del Lavoro, level), being enable to better capture the differences across geographical areas. Thirdly, while the extant literature focuses on commercial banking and only few studies examine cooperative banking and investigate the competition-stability link among these credit institutions (among the few exceptions see Hesse and Cihak, 2007; Liu et al. 2012; Fiordelisi and Mare, 2014), we consider both cooperative and non-cooperative banks. Therefore, a further contribution of the paper consists in focusing the attention on cooperative banks because their mission in favour of the local community. Indeed, Italian cooperative banks are characterized by small size and a very local attitude. Their activity is mainly based in favour of members and aim at supporting the moral, cultural and economic development of the local community; moreover, they have an important role in financing households, artisans and small businesses. Specifically, we believe that due to this particularly local community focused mission, it is important to examine whether the performance-stability nexus and the link with competition differ when cooperative banks are taken into account. Finally, by using a rich database on Italian banks, we reduce the bias due to the presence of the omitted variables and heterogeneity because we can account of political, cultural and monetary homogeneity with respect to consider a large sample of international banks.

In order to anticipate our findings, the empirical evidence shows that cooperative banks generally obtain higher efficiency than non-cooperative and that banks operating in Southern regions are less cost efficient than those in Northern regions. A positive relationship between bank performances and financial stability, emphasizing the importance of managers in managing resources and reducing the risks, has been found. When the role of the market power on the performance-stability nexus has been taken into account, results seem to suggest that competition in the banking sector has a detrimental effect on financial stability. However, the characteristics and the mission of banks play an important role; indeed, the findings suggest that a higher degree of market power in the banking market is associated with lower insolvency of banks only for non-cooperative (in favour of "concentration-stability" view according to which banks may have higher profits in collusive markets); the market power is, instead, negatively related to financial stability for cooperative banks meaning that higher concentration leads to higher financial instability (in favour of the "competition-stability" according to which when competition is low, stability is also low). Robustness checks have been performed in order to explore whether the results change at different level of concentration of the banking system and whether the characteristics of market structure influence the performance-stability nexus.

This paper is organized in the following way. Section 2 overviews the literature on the relationship between banking market competition and risk-taking; Section 3 describes both the empirical approach adopted in order to study the impact of bank performance on financial stability and the empirical approach used to calculated the bank performance. Section 4 describes the data and variables for the analysis. Section 5 shows the main findings, underlying the role of market structure on the bank performance-financial stability nexus, as well as some robustness checks. Finally, Section 6 concludes.

1. Banking Market Competition and Risk-Taking: Some Evidence

The level of competition of the banking system is an important topic in the literature given its effects on financial stability (Beck et al. 2006; Schaeck et al. 2009; Wagner, 2010), even though this relationship is not clear yet and theory and empirical evidence seem to be inconclusive (Mirzaei et al., 2013), with conflicting and ambiguous results (Canoy et al. 2001; Carletti and Hartmann, 2003; Allen and Gale, 2004; Anginer et al. 2014). Indeed, higher competition might compromise the solvency of some institutions, thus hampering the stability of the banking system at aggregate level. Banks, consequently and in order to keep their profits unaltered, could take riskier policies increasing the likelihood of failure. A negative relationship between average banks' credit quality and the number of banks in the market is based on the fact that, when banks compete for deposits, interest rates increase and, due to the contraction of banks' franchise values, banks have less to lose and undertake more risk taking strategies (Marcus, 1984). On the other hand, in parallel with deposit market, banks also compete in the loan market; loan rate as a consequence might decline, raising borrowers' profits and making bankruptcy less likely. In other words, competition in the loan market lowers bank risk by reducing the risk-taking incentives of borrowers (Boyd and De Nicolò, 2005).

Two are the main lines of research which have been undertaken in the last years. Part of the literature supports the "concentration-stability" view according to which banks may have higher profits in collusive market. Indeed, in a more competitive market, banks may be induced to take more risky behaviors due to the fact that higher competition reduces the gains of both financial institutions and stakeholders (Keeley, 1990). Banks are induced to take riskier behaviors also because in more competitive markets they are more exposed to contagion as, in case of bank bankruptcy, also other banks exposed or close in business with the failed institution might also go bankrupt. In other words, banks are price-takers under perfect competition and there aren't incentives to provide liquidity to the troubled bank, helping the contagion to spread (Allen and Gale, 2004). Moreover, the presence of a high number of banks in the market increases the chance that a poor quality borrower applies for a loan. This decreases the quality of the loan portfolio of the whole banking market. In more concentrated system banks tend to be larger, (consequently) better diversified and therefore less fragile than in banking system with many small banks (i.e., more competitive systems) (see Beck et al. 2006; Allen and Gale, 2000; 2004). Fewer banks means also an easier monitoring procedure and a more effective supervision which in turn will make the risk of contagion and systematic crisis less pronounced in concentrated banking systems. Supporting this view, Allen and Gale (2000) showed that the United States banking system, with its large number of banks, has experienced greater financial instability than United Kingdom and Canada where, instead, the banking sector is characterized by fewer larger banks. Empirical evidence in favour of the concentration-stability point of view has been found according to which systemic banking crises are less likely to occur when the banking system is more concentrated (Beck et al. 2006); higher market power is related with larger solvency ratios and lower level of assets risk (Demsetz et al. 1996; Salas

and Saurina, 2003), lower bank default probability (Matutes and Vives, 1996; Fungacova and Weill, 2013) and lower perceived bankruptcy of risks (Keeley, 1990). As the number of banks in the market increases, bank's loan default rate increase (Bofondi and Gobbi, 2004) as well as overall risk measures (Besanko and Thakov, 1993; Levy-Yeyati and Micco, 2007; Berger et al. 2009). Greater bank market power improves bank stability by enhancing bank's profit efficiency (Ariss, 2010). This view has been challenged by the "concentration-fragility" view according to which, instead, a more collusive banking market increases financial fragility. Indeed, bank market power in the deposit market induces banks to increase the cost of borrowing for entrepreneurs; their default risk will increase as a consequence of the fact that entrepreneurs are hindered to undertake more risky projects. The higher defaults risk of entrepreneurs shifts on the financial institutions and weakens bank financial security (Boyd and De Nicolò, 2005). In other words, in more concentrated markets, banks will charge higher interest rates, boosting the risk-taking behaviour of borrowers, leading therefore to an increase in the probability of default. This is what Boyd and De Nicolò (2005) called "shifting effect" being a monotonic declining relationship between competition and bank risk (i.e. as the number of banks and competition increase, the level of bank risk would decline). More competition leads to lower loan rates and to lower firm default probabilities, finally improving bank risk measures. More concentrated markets are associated with higher capital ratios, higher income volatility and higher insolvency of banks, supporting the idea that even though banks detain more capital in less competitive markets, their level of capitalization is not high enough to counterbalance the impact of default risk of higher risk taking institutions (Soedarmono et al. 2013). Thus, more concentrated bank systems are associated with greater risk of bank failures (Boyd et al. 2006), especially when bank ownership is taken into account (De Nicolò and Lokoianova, 2007), and are less prone to systematic crises (Shaeck et al. 2009). In other words, bank concentration deteriorates financial stability (Uhde and Heimeshoff, 2009). Less competition can lead to less credit rationing, larger loans and higher probability of failure especially in case loans are subject to multiplicative uncertainty (Caminal and Matutes, 2002). Generally, concentrated bank systems have generally fewer banks and policy makers are more concerned about their failing. Therefore, it's more likely that those banks will receive more subsidies (i.e. too big and too important to be allowed to fail) being perverse risk taking incentives which encourage banking system instability (se for instance Boyd and Runkle, 1993; Mishkin, 1999). As a consequence of those findings, policies promoting competition among banks might be used to improve systematic stability (Schaeck et al. 2009).

Martinez-Miera and Repullo (2010) show, theoretically, a non-linear relationship between bank competition and risk taking in the loan market. More specifically, they find a U-shaped relationship between bank competition (i.e. number of banks) and the risk of bank failure. According to the authors, this result could be explained by the net effect of two forces. It is true that more competition leads to lower loan rates, lower default probabilities and better bank risk measures (i.e. shifting effect). But, on the other hand, lower loan rates should also reduce firm's interest payments and as a consequence bank revenues; this might lead to greater risks as well as to greater bank failure (they called it "margin effect"). More specifically, they show that the risk shifting effect dominates in very concentrated markets where risk taking behavior is moderated by new banks entering in the market, improving stability. However, the margin effect dominates in already competitive markets where when further banks entry in the market deteriorates loan risk, worsening financial stability. The ideal situation such as that one corresponding to the lowest level of risk is shown to be in presence of moderate levels of competition. Further empirical evidence supporting the non linearity between competition and risk taking in both loan and deposit markets has been found, although results are not robust to different banking markets and concentration values (Jimenez et al. 2013).

2. Methodology

2.1 Bank Performance - Financial Stability Nexus: Empirical Strategy

In order to analyze the relationship between bank's performance and financial stability, we specify the following dynamic panel model (for a similar approach see Fiordelisi and Mare, 2014):

$$FS_{i,j,t} = \alpha_1 FS_{i,j,t-1} + \alpha_2 FS_{i,j,t-2} + \beta_1 PERF_{i,j,t-1} + \beta_2 PERF_{i,j,t-2} + \gamma_j Z_{i,j,t-1} + GEO_j + TIME_t + \varepsilon_{i,j,t} \quad (1a)$$

$$PERF_{i,j,t} = \delta_1 FS_{i,j,t-1} + \delta_2 FS_{i,j,t-2} + \theta_1 PERF_{i,j,t-1} + \theta_2 PERF_{i,j,t-2} + \rho_j Z_{i,j,t-1} + GEO_j + TIME_t + \varepsilon_{i,j,t} \quad (1b)$$

where FS is the financial stability calculated through z-score[1] being a widespread accounting measure used to capture bank stability in the banking system (Boyd and Graham, 1986, 1988; Boyd and Runkle, 1993; Maechler et al., 2005; Laeven and Levine, 2009; Uhde and Heimeshoff, 2009; Fink et al., 2009; Demirguc-Kunt and Huizinga, 2010; Houston et al., 2010; Beck et al. 2012; Fiordelisi and Mare, 2014); $PERF$ is the performance associated to banks, i.e. cost efficiency (as robustness profit is also employed) at time t-1 and t-2 calculated using a recent parametric technique (Kumbhakar et al., 2014); Z is a vector of some controls at time t-1, such as: bank-specific (ETA: equity to total assets, as a measure of capitalization; TA: log of total assets, controlling for size of banks; LTA: loans to total assets, capturing the volume of loans market; DL: deposits to loans ratio, controlling for intermediation cost; CTA: cost-to-total assets ratio, controlling for volume of intermediation cost (the higher is the ratio, the lower is the efficiency); SI: specialisation index measured by branches to deposits and loans ratio, controlling for product specialization); since the second objective is to verify the effect of market structure or product diversification on the financial stability-performance nexus, we also include industry-specific characteristic such as market share index calculated on bank specific loans (MSL), deposits (MSD) and assets (MSA) taken at municipality level (at SLL). We also control for two dimensions: space in which financial intermediaries operate and timing of our sample. In particular, GEO is the set of area or region dummies in which bank operate (this is to control for different risks occurred in the Northern and Southern areas) and TIME is the set of time dummies included in the model in order to capture any shock as, for instance, the changes in macroeconomic variables (e.g. the lowering of interest rates) and rules (e.g. the processes of financial deregulation and privatization in Italy). Finally ε are the disturbance terms. Subscripts i, j and t refer to the unit of analysis (financial intermediaries), area where the financial intermediaries is located and time periods (years), respectively. In order to avoid distortion in

[1] As suggested by Roy (1952), the indicator of financial stability corresponds to the inverse of the probability of default and it's considered in literature as one of the main indicator to quantify the financial stability in the banking sector. In other words, it measures the probability of default for a bank or a banking system. This indicator suffers from several limitations (Cihák et al., 2012). Its uses is directly correlated to the probability of failure of a bank, occuring when the capital is less than debt. The formulation of z-score is: $z - score = \frac{ETA + ROA}{\sigma_{ROA}}$, where ETA is the level of capitalisation of the bank (i.e. Equity to Total Assets), ROA denotes the ratio between profit and total assets (i.e. Return on Assets) and finally σ_{ROA} is the standard deviation of the ROA in the period analysed. It combines banks' buffers (capital and profits) with the risks they face (measured by the standard deviation of returns). The z-score measures the number of standard deviations a return realization has to fall in order to deplete equity. A higher Z-score implies a lower probability of insolvency, providing a direct measure of stability that is superior to analyzing leverage. We use a log-transformation of the z-score because it is skewed. Obviously, the standard deviation of ROA is calculated for both cooperative and non-cooperative banks changing over time. Moreover, following the bacon algorithm proposed by Billor et al. (2000), we reduce the influence of outliers, eliminating them in the 0.01 percentile (see also Weber, 2010; Anginer et al. 2014; and Chiaramonte et al. 2015 for an application).

the estimation and to control for unobserved variables, all controls included in the model are assumed to be endogenous.
The optimal lags of FS and PERF are motivated by Akaike criterio information (AIC), confirming the choice of two lags (not reported and available on request). The lag of FS also captures capital reserves built in the previous period. Moreover, we also lagged all remaining independent continuous variables of order one because is reasonable that their effect on financial stability is not contemporaneous (see for instance Hesse and Cihák, 2007). As we are interested in capturing the elasticity of bank performance on financial stability, all independent continuous variables in the model are taken in natural logarithm and deflated (at 2005 prices) to avoid the price effect on the relationship.
Given the dynamic panel specification of the model, we use the two-step system Generalized Method of Moments (GMM) estimator with Windmeijer (2005) corrected standard error in dynamic panel specification developed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). Moreover, in order to deal with suspected endogeneity problem between financial stability and bank performance we include lagged levels and differences as instruments of $PERF$.
Finally, in order to cancel out any doubt on the direction of causality between financial stability and bank performance, the Granger causality is also tested. This test (not reported in the paper for the sake of brevity) confirms that our data follow an unique direction, in which performance Granger causes financial stability. This evidence allows us to focus directly on the impact of performance on stability.
Differently from other studies (see for instance Hesse and Cihák, 2007), we pay particular attention to the role of market structure in order to check how different contexts influence financial stability in term of performance. We are interested in studying the impact of market structure on performance-stability nexus. In particular, we build the bank specific market share (i.e. MS) based on loans, which is the main activity of financial institutions, taking a local market (SLL - Sistemi Locali del Lavoro), being a sort of municipality context, as follows:

$$MS_L = \frac{Loans_i}{(Total\ Loans)_k}$$

where (Total Loans)k refers to total bank loans grouped at k market level (in our case SLL) because it is reasonable that banks compete with other intermediaries operating in the surrounding areas as indeed might be the municipality. For robustness checks, deposits ($MS_D = Deposits_i/(Total\ Deposits)_k$) and total assets ($MS_A = Assets_i/(Total\ Assets)_k$) are also taken into account in order to capture how different bank activities influence our analysis. Moreover, we focus on the distribution of MSL (MSD and MSA) index considering the tertiles in order to deeply capture the role of different forms of market. According to our point of view, we believe that this approach allows us to better capture the relevance of market power of financial intermediaries. Overall, the evidence on “market structure” allows us to contribute to the public policy debate and help to distinguish among theoretical models by study the impact of performance on financial stability. The approach we use in order to measure competition deserves a further explanation; indeed, we basically rely on the “structure-conduct-performance” (SCP) paradigm (initially developed by Mason (1939) and Bain (1956)) which uses concentration measures as proxies for competition (see also for instance the Herfindhal-Hirschman Index) assuming that banks operating in concentrated markets have higher profits due to monopoly rents (Lloyd-Williams et al. 1994; Berger and Hannan, 1998). Differently from

the "new-empirical-industrial-organization" (NEIO) method[2], which, instead, estimates the parameters that reflect the competition level of a given market (see for instance the Panzar and Rosse (1987) model used by Coccorese (2004), Bikker et al. 2006). We follow the SCP approach also due to the fact that market competition indicators calculated through NEIO would be highly correlated with our measure of bank performances. When we investigate the impact of market structure on the performance-stability nexus, adopting the SCP paradigm that seeks to explain aspects of the conduct and performance of firms in terms of the structural characteristics of the markets in which they operate, the equations (1a-1b) become:

$$FS_{i,j,t} = \alpha_1 FS_{i,j,t-1} + \alpha_2 FS_{i,j,t-2} + \beta_1 PERF_{i,j,t-1} + \beta_2 PERF_{i,j,t-2} + c_1 MS_{L,i,j,t-1} + c_2 MS_{L,i,j,t-2} + \gamma_j Z_{i,j,t-1} + GEO_j + TIME_t + \varepsilon_{i,j,t} \quad (1c)$$

$$PERF_{i,j,t} = \delta_1 FS_{i,j,t-1} + \delta_2 FS_{i,j,t-2} + \theta_1 PERF_{i,j,t-1} + \theta_2 PERF_{i,j,t-2} + d_1 MS_{L,i,j,t-1} + d_2 MS_{L,i,j,t-2} + \rho_j Z_{i,j,t-1} + GEO_j + TIME_t + \varepsilon_{i,j,t} \quad (1d)$$

2.2 Banking Performance

In order to calculate the bank performance, we apply the recent model suggested by Kumbhakar et al. (2014) which splits the error term into four components: bank fixed effects, time-varying inefficiency, time-invariant inefficiency, and a stochastic component capturing random shocks. This model captures the fact that banks may eliminate certain sources of their short-run inefficiency over time, while other sources may have a more permanent nature. The model is represented by the following set of equations:

$$y_{it} = f_{it}(x_{it}, \beta_{it}) + \varepsilon_{it} \quad (2a)$$

$$\varepsilon_{it} = v_{it} - u_{it} + \alpha_i + E(u_{it}) + \alpha_0^* \quad (2b)$$

$$\alpha_i = \mu_i - \eta_i + E(\eta_i) \quad (2c)$$

$$\alpha_0^* = \alpha_0 - E(\eta_i) - E(u_{it}) \quad (2d)$$

$$v_{it} \sim i.i.d.N(0, \sigma_v^2) \quad (2e)$$

$$u_{it} \sim i.i.d.N^+(z_i\delta, \sigma_u^2) \quad (2f)$$

$$\mu_i \sim i.i.d.N(0, \sigma_\mu^2) \quad (2g)$$

$$\eta_i \sim i.i.d.N^+(0, \sigma_\eta^2) \quad (2h)$$

where y denotes the output of the i_{th} bank, xi represents 1xk vector of input, β is kx1 vector of unknown parameters to be estimate, η_i represents persistent inefficiency, u_{it} denotes the short-run inefficiency distributed by each unit as truncation at zero, where z is a (1 x m) vector of environmental factors associated with technical inefficiency of production of units and δ is a (m x 1) vector of unknown coefficients, μ_i captures bank effects and v_{it} is a stochastic component
This model is estimated in three steps. First, equation (2a) is estimated using standard fixed effects estimation. Second, time-varying inefficiency u_{it} is obtained. Lastly, persistent inefficiency η_i is estimated (Kumbhakar et al., 2014). This model specification is our preferred one as it does best in estimating inefficiency.
In particular, we specify a translog cost functional frontier[3] following an approach similar to Altunbas et al., (2000), with two exceptions: (i) the model follows a single stage[4] in which

[2] The New Empirical Industrial Organization (NEIO) is the alternative approach based on the assumption that the conduct of firms in the market is directly observed. The main indicators concerning this approach are: Lerner index, Panzer-Rosse index and lastly Boone indicator (see Leon 2014 for a critical review about approaches for competition measurement). Since these indicators are constructed using translog formulation and then there is a high probability that are correlated with bank performance, we prefer do not use in this paper.
[3] The translog is seen as a "second order logarithm approximation" to an arbitrary continuous transformation surface. The reasons that push us to adopt a translog functional form are: (i) to overcome the problem of multicollinearity inherent to the direct approach proposed by Schmidt (1986) and (ii) to reduce the problem related

environmental factors are incorporated directly into the inefficiency component and (ii) the definition of bank inputs and outputs follow the asset approach (Sealey and Lindley, 1997), where bank's balance-sheet captures the essential structure of banks' core business, including deposits as ordinary input.

2.3 Banking Performance: Cost Efficiency

The cost translog specification is described as follows

$$\frac{\widetilde{COST}}{\tilde{w}_1} = \sum_j \beta_j \tilde{y}_j + \sum_k \gamma_k \left(\frac{\tilde{w}_k}{\tilde{w}_1}\right) + \tau_1 T + \frac{1}{2}\left[\sum_j \sum_m \beta_{jm} \tilde{y}_j \tilde{y}_m + \sum_k \sum_n \gamma_{kn} \left(\frac{\tilde{w}_k}{\tilde{w}_1}\right) * \left(\frac{\tilde{w}_n}{\tilde{w}_1}\right) + \tau_{11} T^2\right] + \sum_j \sum_k \delta_{jk} \tilde{y}_j \left(\frac{\tilde{w}_k}{\tilde{w}_1}\right) \quad (3)$$

where $\widetilde{COST}$ is the natural logarithm of total cost, $\tilde{y}$ are (the natural logs of) output quantities, $\tilde{w}$ are (the natural logs of) input prices, and T denotes a time trend that captures changes in technology over time. The linear homogeneity in factor prices is guaranteed dividing all input prices and total cost by one input price (in our case labor cost, i.e. $\tilde{w}_1$). Moreover, the symmetry conditions are also imposed, i.e. $\beta_{jm} = \beta_{mj}$ and $\gamma_{kn} = \gamma_{nk}$.

Since they are mathematically equivalent, the choice of the normalizing variable is innocuous (Restrepo-Tobon and Kumbhakar, 2013, p. 16). The set of parameters in the translog function are estimated using maximum likelihood estimator (MLE) that allows us to get a consistent and efficient estimator as suggested by Kumbhakar and Lovell (2000). In order to measure the cost efficiency, we follow the same formulation suggested by Maudos et al., (2002), i.e.:

$$CE_{it} = \frac{C_{it}^{min}}{C_{it}} \quad (4)$$

where C^{min} and C are the minimum costs necessary for producing the output vector if the banks were efficient (i.e. u=0) and the observed costs, respectively. Because of the special regulations (i.e. devote at least 70% of annual net profit to legal reserve, pay a share of annual net profits to mutual funds for the promotion and development of cooperation in an amount equal to 3%, devote the remaining share of profits to purposes of charity or mutual aid) cooperative banks cannot maximize profits by choosing an optimal combination of outputs and for this reason they cannot be properly compared with other banks profit-efficiency wise. It has also to be considered that employees of cooperative banks are often cooperative members as well, having effect on the bank's allocative efficiency (see Pestieu and Tulkens, 1993). While previous studies of this type focus on profit efficiency (Berger and Bonaccorsi di Patti, 2006), in light of what we have argued and following the main part of the literature (see also Berger and DeYoung, 1997; Williams, 2004; Altunbas et al., 2007) we decide to use cost efficiency as benchmark for our analysis. We do, also, robustness checks with a profit efficiency measure as each of these measures can have a different link with bank risk and capital levels.

Since unobserved heterogeneity is one of the main sources that causes bias in the efficiency estimates, in one stage stochastic frontier (i.e. parameterizing the inefficiency component), we control for geographically and financial characteristics of cooperative, commercial and popular banks, such as banking size measured by the natural logarithm of total assets (TA), branches diversification on the territory measuring branches density (BD), macro areas such as South,

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with heterogeneous data sets with respect to use Fourier functional form (see Altunbas and Chakravarty, 2001), even if the difference in the efficiency scores is not greater than 1% (Berger and Mester, 1997).

[4] This approach is specified in many works (e.g. see also Kumbhakar et al., 1991; Reifschneider and Stevenson, 1991; Huang and Liu, 1994; Battese and Coelli, 1995), where either mean or variance of inefficiency error component is assumed to be a function of the explanatory variables. We use this methodology because the "two-stage" estimation procedure, where the inefficiencies are estimated in the first stage, and estimated inefficiencies are regressed against a vector of explanatory variables in a second stage (e.g. Pitt and Lee, 1981), could lead to inconsistent estimation about the independence assumption between inefficiency and stochastic component.

North-West and North-East while Centre is the benchmark group (MACRO), typology of banks such as cooperative and commercial banks while popular is used as benchmark group (TYPE) and different dimension of bank such as large, medium, small and minor while major is used as benchmark group (DYM) in order to determine the bank inefficiency. Finally, a time trend is also included. We reduce the heterogeneity in our estimation because our analysis is based on a single country, accounting on cultural, geographical, political and monetary homogeneity.

2.4 Banking Performance: Profit Efficiency

In order to verify whether our findings change, an alternative measurement of efficiency, such as profit5, is calculated. As done for the cost function, the linear homogeneity in factor prices is guaranteed dividing all input prices and total profit by one input price (i.e. labor cost, $\widetilde{w}_1$). Following the formulation proposed by Maudos et al., (2002), we measure the profit efficiency in the following way:

$$PE_{it} = \frac{\Pi_{it}}{\Pi_{it}^{max}} \quad (5)$$

in which Π and Π^{max} describe the profit obtained by a bank and the maximum that it could achieve if it were efficient, respectively. The presence of negative values that correspond to the losses (negative profits) incurred by banks represents a potential problem with the use of the translog function. Since the log of negative numbers is not defined, we deal with this problem through the censoring approach proposed by Bos and Koetter (2011)[6]. This approach yields more precise estimates of the profit efficiency scores with respect to alternative procedures (truncation, i.e. eliminating observations with negative profits; or rescaling, i.e. adding the sample minimum plus one to the negative value of profits).

3. Sample Selection

3.1 Data

The data were collected from BilBank 2000 database distributed by ABI (Associazione Bancaria Italiana) because it has a large time extension and it's rich of information on bank balance sheets over the 2001-2014 period (see Table 1 for more details on the definition of the variables)[7]. We focus on the Italian context being a promising field of analysis, especially in the European landscape, due to the territorially highly disaggregated data availability, the financial reforms (privatization and Second Banking Directive) occurred after 1990 and the integration of markets.

[5] The total profit is the difference between revenue and cost, where revenue is composed of: interest and similar income on loans to costumers, interest and similar income on debt securities and services (administrative) or non-traditional activities, i.e. commission income and other operating income and services, while total cost is composed of: personnel expenses, other administrative expenses, value adjustments to tangible and intangible assets and other operating expenses and interest expenses and similar charges and commission expenses.

[6] Before taking logs, a value of 1 is assigned to negative profits and an additional negative profit indicator is specified, taking value 1 if profits are positive and absolute value of negative profits. The negative profit indicator (NPI) is taken in log and included in the profit function, but also in the inefficiency component in order to achieve a better fit of the model.

[7] Unfortunately, we do not have information on some of the variables used in the analysis for years before 2001 and after 2014. For this reason, we base our analysis on the 2001-2014 time span. Furthermore, the ABI-dataset is compared with Bankscope-dataset. The debate is in favour of the first because it has some valuable information, such as number of branches and number of workers, necessary to evaluate the efficiency scores for each bank.

The sample of banks consists on cooperative, commercial and popular banks8, a less than other branches of banks located abroad. In particular, we use a sample of Italian banks classified by the Bank of Italy as: major (average funds intermediated more than 65 billion euro), large (average funds intermediated between 27 and 65 billion euro), medium (average funds intermediated between 9 and 27 billion euro), small (average funds intermediated between 1.3 and 9 billion euro) and minor (average funds intermediated less than 1.3 billion euro). Table 2 describes the sample used in the analysis by year and geographical location, emphasizing the importance of the cooperative banks in the Italian banking scene; indeed, these banks are present for 60% in our sample, making them very important players/actors in the Italian financial environment. Moreover, it's easy to detect that the number of banks was reduced from 2001 to 2014.

Variables	Symbol	Description
Performance and Financial Stability		
Cost efficiency	CE	Estimated using stochastic frontier analysis
Profit efficiency	PE	Estimated using stochastic frontier analysis
Financial Stability	FS	Capitalisation plus return on assets over standard deviation of return on assets.[a]
Determinants of inefficiency		
Size of banks	TA	Log of total assets.[a]
Branch density	BD	Number of branches per square kilometre. [b,c]
Macro area	MACRO	South, North-West and North-East dummies; Centre as benchmark group
Type of banks	TYPE	Cooperative (CB) and commercial (COM) banks dummies; popular (POP) used as benchmark group
Dimension of banks	DYM	Large, medium, small and minor dummies; major used as benchmark group
GMM		
Capitalisation	ETA	Equity to total assets.[a]
Dimension of bank	TA	Log of total assets. [a]
Volume of credit market	LTA	Bank loans to total assets ratio. [a]
Volume of intermediation cost	CTA	Bank cost to total assets ratio. [a]
Specialisation Index	SI	Number of branches over territorial aggregate deposits and loans. [b,c]
Intermediation cost	DL	Bank deposit to total loans ratio. [a]
Geographical space	GEO	Set of region dummies
Timing	TIME	Set of time dummies
Market structure		
Market share index	MS_L	Market share index based on bank specific loans to total loans at SLL level. [a]
Market share index	MS_D	Market share index based on bank specific deposits to total deposits at SLL level.
Market share index	MS_A	Market share index based on bank specific assets to total assets at SLL level. [a]

Table 1 Description of the variables

Notes Our elaboration

Source (a) Own calculations upon BilBank 2000 database from ABI
(b) ISTAT (2005)
(c) Bank of Italy (Bollettino Statistico)

[8] The "local" feature of Italian banking market is captured especially considering the cooperative banks (CB's) that operate purely at the local level than other financial institutions. This allows them to take advantage of the close relationship with customers (banking relationship), thus having more information on the degree of insolvency.

	Northen regions (N)					Centre-Southern regions (S)					Whole Italy				
	All	CB's		NO-CB's		All	CB's		NO-CB's		All	CB's		NO-CB's	
	(n)	(n)	(%)	(n)	(%)		(n)	(%)	(n)	(%)	(n)	(n)	(%)	(n)	(%)
2001	400	262	65.5	138	34.50	294	203	69.04	91	30.95	694	465	67.00	229	32.99
2002	385	251	65.19	134	34.80	292	196	67.12	96	32.87	677	447	66.02	230	33.97
2003	362	245	67.67	117	32.32	271	190	70.11	81	29.88	633	435	68.72	198	31.27
2004	375	241	64.26	134	35.73	284	192	67.60	92	32.39	659	433	65.70	226	34.20
2005	355	239	67.32	116	32.67	263	183	69.58	80	30.41	618	422	68.28	196	31.71
2006	360	238	66.11	122	33.88	271	190	70.11	81	29.88	631	428	67.82	203	32.17
2007	368	238	64.67	130	35.32	286	195	68.18	91	31.81	654	433	66.20	221	33.79
2008	364	234	64.28	130	35.71	279	184	65.94	95	34.05	643	418	65.00	225	34.99
2009	372	228	61.29	144	38.70	280	187	66.78	93	33.21	652	415	63.65	237	36.34
2010	355	225	63.38	130	36.61	263	175	66.53	88	33.46	618	400	64.72	218	35.27
2011	342	220	64.32	122	35.67	258	175	67.82	83	32.17	600	395	65.83	205	34.16
2012	266	158	59.39	108	40.60	244	162	66.39	82	33.60	510	320	62.74	190	37.25
2013	259	153	59.07	106	40.92	229	153	66.81	76	33.18	488	306	62.70	182	37.29
2014	246	149	60.56	97	39.43	204	135	66.17	69	33.82	450	284	63.11	166	36.88
Total	4809	3081	64.06	1728	35.93	3718	2520	67.77	1198	32.22	8527	5601	65.68	2926	34.31

Table 2 Description of Sample used in the Analysis

Notes: Own elaboration

3.2 Variables

According to the calculation of the bank performance, our production set follows the asset model (Sealey and Lindley, 1997), where the output vector (y) is composed by: customer loans (y1), services (administrative) or non – traditional activities (y2), i.e. commission income and other operating income, and securities (y3), i.e. bank loans, Treasury bills and similar securities, bonds and other debt less bonds and debt securities held by banks and other financial institutions. Since non-traditional activities play an important role in the banking output, we include a proxy to capture the effect of these activities, as the commission income and other operating income, on bank performance (e.g. Casu et al., 2004; Tortosa - Ausina et al., 2008). Instead, the input vector (x) consists of the following items: number of workers (x1), number of branches (x2) and fundraising (x3), i.e. total liabilities to customers, amounts owed to banks and debt securities (bonds, certificates of deposit and other securities). The cost vector (w) incurred by the credit institutions is composed by: labour cost (w1) obtained as the ratio of personnel expenses (wages and salaries, social charges, indemnities working, treatment pensions and similar) and number of employees; cost of physical capital (w2), i.e. ratio of other administrative expenses, value adjustments to tangible and intangible assets and other operating expenses to number of branches and cost of financial capital (w3), consisting of interest expenses and similar charges and commission expenses over total liabilities (see Table 3 for more details on descriptive statistics on input, input prices and output). On the output side, CB's have a higher value of customer loans (y1), being, instead, the level of services (y2) and of other loans (y3) higher for NO-CB's. Considering the geographic location, banks located in the Northern regions have a high level of customer loans (y1), of services (y2) and of other loans (y3). The cost of labour (w1), of the physical (w2) and financial (w3) is higher for NO-CB's as well as for banks operating in the Northern regions. NO-CB's have a higher number of workers (x1) and branches (x2) while CB's have a higher level of fundraising (x3). Considering the dimension, Major banks have a higher cost of labour (w1), Medium banks have a higher cost of physical capital (w2), while the cost of financial capital is quite stables across all banks. As expected, Major banks have also a higher number of workers (x1) and of

branches (x2) as well as have a high level of customer loans (y1), of services (y2) and of other loans (y3).

	(y_1)	(y_2)	(y_3)	(x_1)	(x_2)	(x_3)	(w_1)	(w_2)	(w_3)
Type									
CB's	2082244.2	93674.86	3336.841	69.607	9.267	264535.7	60.199	364.78	0.020
	(278119.3)	(154210.4)	(4589.659)	(141.290)	(10.073)	(376940.5)	(13.812)	(240.53)	(0.010)
NO-CB's	6373327	2976610	172639.3	1939.85	175.94	1939.85	64.927	3889.08	0.027
	(2.21e+07)	(1.23e+07)	(537450.7)	(6766.964)	(516.14)	(6766.964)	(22.719)	(17309)	(0.029)
Geo									
N	2927563	1413483	79258.48	875.390	82.599	3864480	62.949	1963.257	0.024
	1.60e+07	(9255343)	(391582)	(4942.7)	(378.94)	(2.09e+07)	(18.897)	(10714.94)	(0.030)
S	1542787	655404.1	38375	499.22	45.591	1980500	60.364	1070.822	0.020
	(8459526)	(3491705)	(207056.8)	(2488.497)	(194.00)	(1.04e+07)	(15.474)	(9659.996)	(0.015)
Italy	2323764	1082940	61432.2	711.372	66.463	3043014	61.822	1574.13	0.022
	(1.33e+07)	(7332320)	(324917.8)	(4063.411)	(312.61)	(1.72e+07)	(17.533)	(10277.24)	(0.025)
Dimension									
Major	9.14e+07	4.74e+07	2139094	26506.19	2073.17	1.22e+08	70.424	7414.92	0.025
	(7.24e+07)	(4.48e+07)	(1737912)	(23908.93)	(1677.31)	(9.03e+07)	(25.966)	(20406.97)	(0.016)
Large	2.56e+07	9223410	601913	7539.158	737.14	3.21e+07	63.817	1684.301	0.023
	(1.08e+07)	(5187081)	(340650.5)	(3557.142)	(353.66)	(1.17e+07)	(16.736)	(10001.79)	(0.015)
Medium	1.00e+07	4191043	270765.8	2980.896	301.54	1.30e+07	68.647	8394.276	0.024
	(4760963)	(4278867)	(175916.1)	(1642.468)	(184.43)	(5046346)	(29.943)	(25208.59)	(0.015)
Small	2161208	968842.1	88386.88	765.98	81.938	2864908	61.135	4153.161	0.023
	(1703370)	(1220164)	(188535.2)	(638.99)	(72.164)	(1882329)	(17.700)	(20596.55)	(0.019)
Minor	202842.7	96939.4	4718.318	74.496	9.567	262808.1	61.464	664.880	0.022
	(215066.4)	(120319)	(9718.436)	(87.022)	(9.556)	(259573)	(16.431)	(3184.478)	(0.026)

Table 3 Descriptive Statistics for the inputs, inputs prices and outputs used in the Production Function

Source own calculations upon BilBank 2000 database from ABI (values on average).

Notes Customer loans (y_1), services or non-traditional activities (y_2), securities and other loans (y_3)
Number of workers (x_1), number of branches (x_2), fundraising (x_3)
Labour cost (w_1), cost of physical capital (w_2), cost of financial capital (w_3)
All variables averaged between 2001 and 2014
All monetary aggregates are in thousands of Euros (at 2005 prices)
Northern regions (N), Centre-Southern regions (S). Standard deviation in parentheses

The inclusion of some environmental variables in one stage stochastic frontier is strongly approved in the recent literature (Lozano-Vivas et al., (2002), Hasan et al., (2009) and Destefanis et al., (2014). In order to control for geographical location of branches, we include branch density (BD), taken at SLL level, being the number of branches per square kilometre. Moreover, we control for geographically and financial characteristics of cooperative, commercial and popular banks, such as banking size measured by the natural logarithm of total assets (TA), macro areas (South, North-West and North-East; Centre as benchmark group), typology (cooperative and commercial banks; popular used as benchmark group) and different bank dimension (large, medium, small and minor; major used as benchmark group) determine the bank inefficiency (for more details on the composition and size of sample, as well as some descriptive statistics of the environmental variables, see Tables 1 and 2). Finally, a time trend is also included in order to accounting for inefficiency change.

Differently from other works, we can account on a better spatial stratification than enables us to capture the differences between geographical areas, obtaining more accurate estimates.

Specifically BD is not measured at the national or regional level as in previous studies, but at the local level (SLL). For comparison check, notice that there are nowadays in Italy 110 province (the NUTS3 category) while 686 SLLs have been identified by the Italian Statistical Office (ISTAT, 2005) highlighting remarkable differences in economic performance across the Italian territory. SLL-level data for branches, deposits and loans (used to construct BD and SI) are from the Bank of Italy dataset (Bollettino Statistico). The other variables useful for our analysis, such as FS, TA, LTA, CTA, and DL are from BilBank 2000 database distributed by ABI (Associazione Bancaria Italiana). All monetary aggregates are in thousands of deflated 2005 Euros. Our sample begins in 2001, because SLL-level data are not available before that year. SFA and GMM regressions are carried out with STATA 13.1, respectively.

	FS	ETA	LTA	TA	DL	CTA	SI	BD
Type								
CB's	40.498	0.128	0.582	359719.1	0.957	0.042	0.034	0.184
NO-CB's	19.438	0.125	0.554	1.16e+07	28.472	0.054	0.018	0.423
Geo								
N	33.404	0.130	0.609	5437926	17.442	0.046	0.025	0.345
S	33.101	0.124	0.524	2630068	1.290	0.045	0.033	0.163
Italy	33.272	0.127	0.572	4213625	10.399	0.046	0.028	0.266
Dimension								
Major	16.298	0.103	0.554	1.77e+08	0.675	0.039	0.014	0.528
Large	20.166	0.103	0.633	4.07e+07	0.873	0.043	0.017	0.460
Medium	15.246	0.094	0.605	1.71e+07	1.388	0.043	0.016	0.510
Small	19.438	0.102	0.571	3908441	1.613	0.044	0.018	0.366
Minor	37.260	0.134	0.570	350170.6	12.828	0.046	0.032	0.228

Table 4 Descriptive Statistics of Variables used in the Analysis

Source See Table 1 for more details

Notes See Table 1 for more details about the description and construction of variables included in the regression
Northern regions (N), Centre-Southern regions (S)
All variables averaged between 2001 and 2014
All monetary aggregates are in thousands of Euros (at 2005 prices)

The CB's are more stable (FS=40.5), more capitalized (ETA=0.128) than the NO-CB's (FS=19.44, ETA=0.125). Geographically, Northern regions (N) is the area more stable (FS = 33.4) and capitalized (ETA = 0.13) with respect to Centre-Southern (S) regions (FS = 33.1 and ETA = 0.124). Minor banks have a higher degree of financial stability (FS=37.3) as well as a higher level of capitalization (ETA=0.134). The volume of the credit market is higher for CB's (LTA=0.582) and for banks located in the Northern regions (LTA=0.609) with respect to NO-CB's (LTA=0.554) and Southern regions (LTA=0.520), respectively. NO-CB's and banks located in the Northern regions have a higher dimension considering their value of total assets (TA). NO-CB's have also a higher volume of intermediation cost (CTA=0.054), which is, instead, quite stable when geographic location and dimension of banks has been taken into account. Banks located in the Northern regions have also a higher ratio of bank deposit to total loans (DL=17.44) as well as a higher number of branches per square kilometre (BD=0.345). Banks located in the Southern regions and CB's banks have a higher index of specializations (SI=0.033 and SI=0.034, respectively).
Table 5 summarize how the variables used in our analysis are correlated between them.

	FS	CE	PE	MS_L	MS_D	MS_A	ETA	LTA	TA	DL	CTA	SI	BD
FS	1.0000												
CE	0.0892 (0.0000)	1.0000											
PE	0.2772 (0.0000)	0.0.0295 (0.0064)	1.0000										
MS_L	-0.0150 (0.1650)	0.0149 (0.1689)	0.0916 (0.0000)	1.0000									
MS_D	-0.0112 (0.3032)	0.0097 (0.3705)	0.0875 (0.0000)	0.9918 (0.0000)	1.0000								
MS_A	-0.0132 (0.2237)	0.0072 (0.5083)	0.0897 (0.0000)	0.9962 (0.0000)	0.9957 (0.0000)	1.0000							
ETA	0.5341 (0.0000)	-0.2739 (0.0000)	-0.0786 (0.0000)	-0.0819 (0.0000)	-0.0792 (0.0000)	-0.0802 (0.0000)	1.0000						
LTA	-0.2152 (0.0000)	0.2648 (0.0000)	-0.2747 (0.0000)	0.0502 (0.2127)	0.0262 (0.0155)	0.0263 (0.0153)	-0.0990 (0.0000)	1.0000					
TA	-0.1342 (0.0000)	-0.0403 (0.0002)	0.0131 (0.2253)	0.0759 (0.8602)	0.0729 (0.0000)	0.0763 (0.0000)	-0.0495 (0.0000)	-0.0162 (0.1340)	1.0000				
DL	0.0174 (01089)	-0.0407 (0.0002)	-0.0725 (0.0000)	-0.0517 (0.0000)	-0.0516 (0.0000)	-0.0517 (0.0000)	0.1580 (0.0000)	-0.1279 (0.0000)	-0.0074 (0.4958)	1.0000			
CTA	-01805 (0.0000)	-0.2972 (0.0000)	-0.4040 (0.0000)	-0.1059 (0.6504)	-0.1047 (0.0000)	-0.1043 (0.0000)	0.2030 (0.0000)	0.1811 (0.0000)	-0.0326 (0.0026)	0.0743 (0.0000)	1.0000		
SI	0.1261 (0.0000)	0.0684 (0.0000)	-0.1185 (0.0000)	0.2848 (0.0000)	0.2864 (0.0000)	0.2864 (0.0000)	0.0719 (0.0000)	0.0988 (0.0000)	-0.0845 (0.0000)	-0.0306 (0.0055)	0.0449 (0.0000)	1.0000	
BD	-0.2047 (0.0000)	-0.1747 (0.0000)	-0.0591 (0.0000)	-0.3967 (0.0000)	-0.3990 (0.0000)	-0.3989 (0.0000)	0.0107 (0.3239)	-0.2316 (0.0000)	0.1179 (0.0000)	0.0781 (0.0000)	0.1694 (0.0000)	-0.3954 (0.0000)	1.0000

Table 5 Correlation between variables (2001-2014), Whole sample

Notes Own elaboration; p-value in parenthesis;

4. Empirical Evidence

4.1 Performances of the Banking Sector

The performances of the financial institutions, measured using a recent parametric method that allows to split the error term into four components (Kumbhakar et al., 2014) as described in equations (2a-2h), are summarized in Table 6, where the cost and profit efficiency scores are reported for the whole sample of banks (Columns 1 and 2), for cooperative (Columns 3 and 4) and non-cooperative (Columns 5 and 6) banks. First of all, the empirical evidence shows that cooperative banks generally obtain higher efficiency than non-cooperative banks within the 2001-2014 time-span; this finding is customary for the literature on Italian banks (see, e.g., Girardone et al., 2004). When the geographic stratification of the Italian territory has been taken into account, results show that banks located in Centre-Southern regions are less cost efficient than those located in Northern regions confirming again what has already been found for the Italian banking system (see e.g. Destefanis et al., 2014). The stratification of banks by dimension has also been taken into account showing that minor banks have higher cost efficiency than other banks; this results is mainly driven by the fact the a high proportion of minor banks is composed by cooperative banks. We also consider the degree of competition of the banking system according to a market share (MS) index (see Section 3.1. for more details related to the construction of such index) by defining a low (H1), medium (H2) and high (H3) level of concentration associated to bank specific loans (L), deposits (D) and assets (A). The empirical evidence shows that banks characterized by a medium level of concentration have higher cost efficiency while those banks characterized by a high degree of concentration have higher profit efficiency (holding also when cooperative and non-cooperative banks are separately considered).

	(1)	(2)	(3)	(4)	(5)	(6)
	All banks		**CB's**		**NO-CB's**	
	PERF=Cost efficiency	**PERF=Profit efficiency**	**PERF=Cost efficiency**	**PERF=Profit efficiency**	**PERF=Cost efficiency**	**PERF=Profit efficiency**
Macro Area						
N	0.926	0.602	0.948	0.618	0.887	0.573
	(0.075)	(0.249)	(0.023)	(0.240)	(0.112)	(0.263)
S	0.896	0.638	0.917	0.633	0.852	0.649
	(0.086)	(0.251)	(0.057)	(0.248)	((0.114)	(0.256)
Italy	0913	0.618	0.934	0.625	0.873	0.604
	(0.081)	(0.250)	(0.045)	(0.243)	(0.114)	(0.263)
Dimension						
Major	0.873	0.596	//	//	0.873	0.596
	(0.106)	(0.205)	(//)	(//)	(0.106)	(0.205)
Large	0.890	0.576	//	//	0.890	0.576
	(0.086)	(0.253)	(//)	(//)	(0.086)	(0.253)
Medium	0.887	0.641	//	//	0.887	0.641
	(0.084)	(0.223)	(//)	(//)	(0.084)	(0.223)
Small	0.888	0.652	0.945	0.774	0.879	0.634
	(0.096)	(0.243)	(0.036)	(0.097)	(0.100)	(0.253)
Minor	0.920	0.611	0.934	0.620	0.862	0.572
	(0.076)	(0.253)	(0.045)	(0.245)	(0.133)	(0.281)
Market Structure						
MS_L - H_1	0.904	0.588	0.936	0.623	0.845	0.524
	(0.111)	(0.260)	(0.049)	(0.244)	(0.159)	(0.275)
MS_L - H_2	0.925	0.620	0.939	0.612	0.889	0.638
	(0.056)	(0.242)	(0.028)	(0.243)	(0.085)	(0.239)
MS_L - H_3	0.910	0.645	0.926	0.641	0.886	0.652
	(0.064)	(0.246)	(0.053)	(0.242)	(0.071)	(0.250)

Table 6 Efficiency Scores calculated in the Analysis using a Parametric Approach (SFA)

Notes Northern regions (N), Centre-Southern regions (S), Standard deviation in parentheses.

The coefficients of translog and the determinants of the bank's inefficiency are, instead, described in Table 7. Regarding the influence of some determinants on bank's inefficiency, our results confirm that total assets (TA) have a positive and statistical impact on efficiency, while the number of branches per squared kilometer (BD) has a detrimental influence. In other words, the empirical evidence confirms the presence of economies of scale (related to TA) since the increased size reduces costs (increasing the cost efficiency) and increases profits (increasing the profit efficiency). Concerning the effect of BD, results show that, on the cost side, the higher density of branches means more maintenance expenses weighting negatively upon efficiency (even though the coefficient of BD is positive but not statistically significant); on the profit side, instead, the positive and statistically significant higher density of branches means meeting more customers and more operations that bring more profits, burdening a positive effect on profit. Large, Medium, Small and Minor banks are found to decrease the inefficiency, the same for financial institutions situated in Northern regions. Cooperative banks reduce cost inefficiency.

	(a)		(b)	
	Translog			
	Cost		Profit	
	Coefficients	Std. Err.	Coefficients	Std. Err.
y_1	0.458***	0.005	0.424***	0.018
y_2	0.215***	0.003	0.273***	0.011
y_3	0.264***	0.005	0.264***	0.018
w_2	-0.068	0.052	0.403**	0.173
w_3	0.813***	0.048	0.008	0.165
w_{22}	0.099***	0.014	0.257***	0.047
w_{33}	0.198***	0.020	0.388***	0.042
w_{23}	-0.319***	0.032	-0.524***	0.075
y_{11}	0.068***	0.002	0.095***	0.009
y_{22}	0.088***	0.004	0.132***	0.015
y_{33}	0.010	0.011	0.077***	0.019
y_{12}	-0.113***	0.011	-0.218***	0.021
y_{13}	0.027**	0.011	0.077***	0.021
y_{23}	-0.074***	0.015	-0.153***	0.029
y_1w_2	0.027***	0.006	0.051**	0.021
y_1w_3	0.007	0.005	-0.025	0.016
y_2w_2	0.060***	0.006	-0.004	0.020
y_2w_3	-0.065***	0.005	-0.016	0.016
y_3w_2	-0.069***	0.007	-0.057**	0.023
y_3w_3	0.052***	0.007	0.123***	0.019
T	0.056***	0.001	0.428***	0.024
T^2	-0.008***	0.0002	-0.048***	0.002
NPI	//	//	-0.918***	0.006
Inefficiency effects δ				
CB	-7.767**	3.632	-0.295	0.666
COM	1.972**	0.919	2.670**	1.202
LARGE	-3.617**	1.742	0.076	1.254
MEDIUM	-7.120***	2.629	-3.946**	1.817
SMALL	-1.022***	2.951	3.878**	1.730
MINOR	-1.566***	4.562	-4.789**	2.020
SOUTH	0.655	0.470	0.800	0.488
N-EAST	-1.473*	0.884	0.765	0.491
N-WEST	-5.085**	2.207	1.174**	0.544
ln(TA)	-2.582***	0.776	-1.169***	0.443
BD	0.614	0.649	2.052**	0.864
T	-0.193	0.124	-1.646***	0.399
Log Likelihood		4068.5268		-7517.4845
Wald-Statistic		485114.50		112417.00
Obs.		8530		8530

Table 7 Parameters' estimation, baseline model

Notes Own elaboration

4.2 Bank Performance - Financial Stability Nexus

Following equation (1a), where z-score is used as dependent variable in order to capture the role of financial stability (FS), Table 8 shows the results regarding the relationship between bank performances and financial stability. The empirical evidence shows that an increase in bank performance, both for cost (Table 8, Column 1) and profit (Table 8, Column 4) efficiency, predicts an increase in the financial stability of the banking system. For instance, if a bank achieves a high level of profit, the manager can allocate part of it in screening and monitoring processes in order to reduce the percentage of bad loans or credit risk hold by agents that invest in risky projects. This allows the banks to reduce the probability of default, increasing the system financial stability. The evidence that improvements in bank efficiency is related to a higher financial stability of the bank system is confirmed when the analysis is performed only on cooperative banks, but only when cost efficiency is taken into account (Table 8, Column 2). The controls included in the regression play an important role in explaining the performance-stability nexus.

The level of capitalisation (ETA) is positively and statistically significant only when cost efficiency is taken into account and the analysis is performed on cooperative banks (Table 8, Column 2); this suggests that for cooperative banks the higher is the level of capitalisation of the financial intermediaries, the higher is the financial stability of the system. In other words, the level of capitalisation produces a positive effect on stability, increasing survival probability of (cooperative) banks (see e.g. Repullo 2004). The capital can be used as buffer in order to avoid the incidence of negative shocks, such as financial crisis, on the survival probability of financial institutions.

Then the capitalisation is an important tool making financial intermediaries less vulnerable to negative events. This finding is consistent with the argument that higher capitalization contributes to alleviating agency problems between managers and shareholders (Mester 1996), reducing problem loans. According to bank size (TA), the empirical evidence shows that the higher is the bank size the lower is the level of stability of the financial sector, both when cost (Table 8, Columns 1) and profit (Table 8, Column 4) are taken into account.

The relationship between bank size and stability turns out to be, instead, positive when cooperative banks and profit efficiency are taken into account (Table 8, Column 5). The specialisation index (SI) is positively and statistically significant on financial stability, both when cost (Table 8, Columns 1) and profit (Table 8, Column 4) are taken into account. LTA is found, instead, to be negatively and statistically significant; interestingly, when cooperative and non-cooperative banks are separated, results show that the level of volume of the credit market is positively and statistically significant on financial stability only for cooperative banks, meaning that the share of bank loans to total assets ratio increase the level of financial stability. The ratio of bank cost to total assets (CTA) is found to be negative and statistically significant, meaning that the higher is the volume of intermediation cost the lower is the financial stability of the banking system. Finally, the ratio of bank deposit to total loans (DL) is negative and weakly statistically significant when the whole sample of banks is taken into account (Table 8, Column 1) while it is positive and statistically significant when cooperative banks are taken into account, both for cost (Table 8, Column 2) and profit (Table 8, Column 5) efficiency. The rest of exogenous effects are captured including a set of time and geographical dummies.

	(1) WHOLE SAMPLE; PERF=Cost efficiency	(2) ONLY CB'S PERF=Cost efficiency	(3) ONLY NO CB's PERF=Cost efficiency	(4) WHOLE SAMPLE; PERF=Profit efficiency	(5) ONLY CB's PERF=Profit efficiency	(6) ONLY NO CB's PERF=Profit efficiency
FS_{T-1}	0.645***	0.136	0.784***	0.663***	0.580***	0.803***
FS_{T-2}	0.131***	0.042	0.067**	0.108***	-0.005	0.058
FS_{TOT}	0.776***	0.178	0.851***	0.771***	0.575***	0.861***
$PERF_{T-1}$	0.273***	0.191	0.041	0.060***	-0.010	-0.002
$PERF_{T-2}$	0.060	0.321***	0.074	-0.012**	0.003	-0.010
$PERF_{TOT}$	**0.333****	**0.512*****	0.115	**0.048*****	-0.007	-0.012
ETA_{T-1}	0.017	0.603***	-0.109	-0.005	0.207	-0.117
LTA_{T-1}	-0.084**	0.137**	-0.030	-0.047	0.184***	-0.037
TA_{T-1}	-0.039***	0.007	-0.0001	-0.048***	0.035**	0.010
DL_{T-1}	-0.054*	0.103***	-0.026	-0.047	0.144***	-0.023
CTA_{T-1}	-0.111**	-0.079	0.006	-0.136***	-0.104*	-0.006
SI_{T-1}	0.175***	0.020	0.005	0.164***	0.042**	0.006
AR(2)	0.279	0.991	0.802	0.792	0.357	0.974
Hansen	0.321	1.000	1.000	0.325	1.000	1.000
GEO	Yes	Yes	Yes	Yes	Yes	Yes
TIME	Yes	Yes	Yes	Yes	Yes	Yes
PERIOD	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014
N	6364	4310	2054	6364	4310	2054

Table 8 GMM Regressions to estimate the relationship between banking performance and financial stability

*Notes * p < 0.10, ** p < 0.05, *** p < 0.01*

4.3 Does the Market Power Affect Performance-Stability Nexus?

We now take into account the role played by the market structure in our analysis. More specifically, we want to explore whether the level of concentration of the banking market affects the risk of bank failure boosting the stability of the financial system. Furthermore, we want to investigate whether banks' performances contribute to make the financial system more stable and more resilient to shocks, paying attention to the degree of concentration of the market structure.

In order to measure the level of market concentration, we rely on three different measures of market structure (MS) being MSL a market share index corresponding to the ratio of banks specific loans to total loans at SLL level (measuring competition in the loan market), MSD a market share index corresponding to the ratio of bank specific deposit to total deposits at SLL level (measuring competition in the deposit market) and finally MSA a market share index corresponding to the ratio of bank specific assets to total assets at SLL level (measuring competition in the asset market). The higher is the market index the higher is the level of concentration of the market itself. The data, described in Table 9, show that the market share index in the Italian banking system is around 0.44 for all the markets considered. This means that the banking market is moderately concentrated. On the other hand, there are some relevant differences for macro areas, having the Centre-Southern regions a higher degree of concentration than Northern regions.

	N	S	Major	Large	Medium	Small	Minor	All
MS_L	0.343	0.580	0.657	0.679	0.466	0.536	0.421	0.446
	(0.362)	(0.410)	(0.274)	(0.336)	(0.347)	(0.396)	(0.403)	(0.401)
MS_D	0.343	0.580	0.648	0.672	0.472	0.536	0.421	0.446
	(0.359)	(0.409)	(0.284)	(0.335)	(0.344)	(0.399)	(0.400)	(0.399)
MS_A	0.343	0.580	0.665	0.672	0.465	0.538	0.421	0.446
	(0.360)	(0.408)	(0.240)	(0.341)	(0.339)	(0.394)	(0.401)	(0.399)

Table 9 Market share index by macro area (period: 2001-2014)

Notes Own elaboration; Northern regions (N), Centre-Southern regions (S); standard deviation in parenthesis;

Table 10 shows the results when the level of competition in measured in the loans markets, as benchmark models. We, then, repeat the analysis also taking into consideration the level of competition measured in the deposit and asset markets (Tables 11 and 12). First of all, results still show a positive and significant relationship between bank efficiency and financial stability (considering both cost and profit bank efficiency), confirming that an increase in the efficiency of banks predicts an improvement of the financial system stability (Table 10, Columns 1 and 4). Turning to the market share measure, the empirical evidence shows that it is positive and statistically significant when both the bank cost and profit efficiency are taken into account (Table 10, Columns 1 and 4), suggesting that more concentrated markets boost financial stability. In other words, results seem to suggest that competition in the banking sector has a detrimental effect on financial stability, supporting the "concentration-stability" view according to which banks may have higher profits in collusive markets (Keeley, 1990; Allen and Gale, 2000, 2004; Beck et al. 2006; Matsuoka, 2013).

This result could be explained by the fact that the fewer is the number of banks in a market, the lower is the probability of attract poor quality borrowers applying for loans, therefore improving the loan portfolio of the whole banking system. However, in the literature, there is empirical evidence showing that cooperative banks are more stable than commercial banks (Hesse and Cihak, 2007; Ayady et al. 2010) due to the fact that, as underlined by Fiordelisi and Mare (2014), "they have a great deal of soft information on creditworthiness of members and are therefore less likely to make lending mistakes". Therefore, in order to examine whether the findings provided so far depends in some way from the type of financial institutions operating in the banking system, we repeat the analysis separately on cooperative banks and non-cooperative banks, respectively. Interestingly, the results suggest a different interpretation. Firstly, the coefficient associated to the bank performances keeps being positive and statistically significant only for cooperative banks (Table 10, Column 2); moreover, the empirical evidence shows that the measure of market competition is negative and statistically significant when cooperative banks are taken into account (Table 10, Columns 2 and 5) while is positive and statistically significant when, instead, the non-cooperative banks are considered (Table 10, Columns 3 and 6).

This suggests that a higher degree of market power in the banking market is associated with lower insolvency of banks, when non-cooperative banks are taken into account, supporting the "concentration-stability" view (Allen and Gale, 2000, 2004; Zhao et al. 2009; Jimenez et al. 2013; Turk-Ariss, 2010); on the other hand, when instead cooperative banks are considered, the opposite has been found meaning the banks operating in more competitive markets have lower overall risk measures, supporting the "competition-stability" view (Boot and Thakor, 2000; Boyd and Nicolò, 2005; Boyd et al. 2006; De Nicolò and Loukoianova, 2007; De Nicolò and Lucchetta, 2009; Uhde and Hermeshoff, 2009).

	(1) WHOLE SAMPLE; PERF=Cost efficiency	(2) ONLY CB'S PERF=Cost efficiency	(3) ONLY NO CB'S PERF=Cost efficiency	(4) WHOLE SAMPLE; PERF=Profit efficiency	(5) ONLY CB'S PERF=Profit efficiency	(6) ONLY NO CB'S PERF=Profit efficiency
FS_{T-1}	0.640***	0.172	0.777***	0.648***	0.572***	0.763***
FS_{T-2}	0.136***	0.044	0.060*	0.123***	0.0003	0.060
FS_{TOT}	0.776***	0.216	0.837***	0.771***	0.5723***	0.823***
$PERF_{T-1}$	0.263***	0.197	-0.001	0.058***	-0.009	0.003
$PERF_{T-2}$	0.0322	0.304***	0.036	-0.012**	0.002	-0.009
$PERF_{TOT}$	**0.295****	**0.501*****	0.035	**0.046*****	-0.007	-0.003
MSL_{T-1}	0.011	-0.022*	0.012	0.009	-0.032***	0.018
MSL_{T-2}	0.023***	0.003	0.017	0.033***	0.012	0.018*
MSL_{TOT}	**0.034*****	**-0.019****	**0.029****	**0.042*****	**-0.020*****	**0.036****
ETA_{T-1}	0.0133	0.568***	-0.103	-0.003	0.202	-0.093
LTA_{T-1}	-0.113***	0.127**	-0.060	-0.087	0.181***	-0.069
TA_{T-1}	-0.065***	0.015	-0.028*	-0.079***	0.036**	-0.029*
DL_{T-1}	-0.060**	0.098***	-0.036	-0.055*	0.138***	-0.031
CTA_{T-1}	-0.096**	-0.081	0.005	-0.119***	-0.118**	0.010
SI_{T-1}	0.078**	0.047**	-0.052	0.033	0.061***	-0.069
AR(2)	0.278	0.988	0.888	0.648	0.343	0.899
Hansen	0.917	1.000	1.000	0.925	1.000	1.000
GEO	Yes	Yes	Yes	Yes	Yes	Yes
TIME	Yes	Yes	Yes	Yes	Yes	Yes
PERIOD	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014
N	6364	4310	2054	6364	4310	2054

Table 10 *GMM Regressions to estimate the relationship between banking performance and financial stability. The role of loan market structure*

Notes ** p < 0.10, ** p < 0.05, *** p < 0.01*

As before, the controls included in the regression play an important role in explaining the performance-stability nexus. Again, the level of capitalization (ETA) is positively and statistically significant when cost efficiency and cooperative banks are taken into account (Table 10, Column 2). A negative relationship is still present between bank size (TA) and financial stability suggesting that the higher is the bank size the lower is the level of stability of the financial sector, both when cost (Table 10, Columns 1) and profit (Table 10, Column 4) are taken into account. The specialization index (SI) is positively and statistically significant on financial stability, both when cost (Table 10, Columns 1) and profit (Table 10, Column 4) are taken into account. Results confirm that the ratio of banks loans to total assets (LTA) is found to be negatively and statistically significant for the whole sample of banks (Table 10, Column 1), while, when cooperative and non-cooperative banks are separately considered, results show that the level of volume of the credit market is positively and statistically significant on financial stability only for cooperative banks (Table 10, Columns 2 and 5), meaning that the share of bank loans to total assets ratio increase their level of financial stability. Again, the higher is the volume of intermediation cost (CTA) the lower is the financial stability of the banking system. The findings also confirm that the ratio of bank deposit to total loans (DL) is negative and weakly statistically significant when the whole sample of banks is taken into account (Table 10, Columns 1 and 4) while it is positive and statistically significant when cooperative banks are taken into account, both for cost and profit efficiency (Table 10, Columns 2 and 5). Importantly, this results hold when the competition also in the deposit and asset market has been taken into account (Tables 11 and 12).

	(1) WHOLE SAMPLE; PERF=Cost efficiency	(2) ONLY CB'S PERF=Cost efficiency	(3) ONLY NO CB'S PERF=Cost efficiency	(4) WHOLE SAMPLE; PERF=Profit efficiency	(5) ONLY CB'S PERF=Profit efficiency	(6) ONLY NO CB'S PERF=Profit efficiency
FS_{T-1}	0.635***	0.162	0.745***	0.648***	0.582***	0.739***
FS_{T-2}	0.140***	0.046	0.071**	0.127***	0.001	0.082**
FS_{TOT}	0.775***	0.208	0.816***	0.775***	0.583***	0.821***
$PERF_{T-1}$	0.272***	0.225	0.034	0.053***	-0.010	0.001
$PERF_{T-2}$	0.024	0.297***	0.024	-0.011**	0.003	-0.010
$PERF_{TOT}$	**0.296****	**0.522*****	0.058	**0.042*****	-0.007	-0.009
MSD_{T-1}	-0.004	-0.026**	-0.005	0.002	-0.036***	0.003
MSD_{T-2}	0.043***	0.009	0.036***	0.045***	0.016	0.038***
MSD_{TOT}	**0.039*****	**-0.017****	**0.031*****	**0.047*****	**-0.020*****	**0.041*****
ETA_{T-1}	0.012	0.575***	-0.083	-0.005	0.196	-0.087
LTA_{T-1}	-0.106***	0.134**	-0.062	-0.085*	0.177***	-0.077*
TA_{T-1}	-0.065***	0.015	-0.024*	-0.078***	0.041**	-0.022
DL_{T-1}	-0.077**	0.115***	-0.056**	-0.083**	0.153***	-0.063**
CTA_{T-1}	-0.103**	-0.081	0.012	-0.126***	-0.111**	0.0094
SI_{T-1}	0.080**	0.046**	-0.057	0.045	0.065***	-0.071
AR(2)	0.299	0.996	0.767	0.635	0.341	0.685
Hansen	0.922	1.000	1.000	0.936	1.000	1.000
GEO	Yes	Yes	Yes	Yes	Yes	Yes
TIME	Yes	Yes	Yes	Yes	Yes	Yes
PERIOD	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014
N	6364	4310	2054	6364	4310	2054

Table 11 *GMM Regressions to estimate the relationship between banking performance and financial stability. The role of deposit market structure*

Notes ** p < 0.10, ** p < 0.05, *** p < 0.01*

	(1) WHOLE SAMPLE; PERF=Cost efficiency	(2) ONLY CB'S PERF=Cost efficiency	(3) ONLY NO CB'S PERF=Cost efficiency	(4) WHOLE SAMPLE; PERF=Profit efficiency	(5) ONLY CB'S PERF=Profit efficiency	(6) ONLY NO CB'S PERF=Profit efficiency
FS_{T-1}	0.636***	0.161	0.750***	0.651***	0.563***	0.750***
FS_{T-2}	0.144*	0.046	0.076**	0.125***	0.0007	0.075*
FS_{TOT}	0.780***	0.207	0.826***	0.776***	0.5637***	0.825***
$PERF_{T-1}$	0.263	0.207	0.009	0.055***	-0.010	-0.001
$PERF_{T-2}$	0.050	0.302***	0.050	-0.012**	0.003	-0.009
$PERF_{TOT}$	0.313	**0.509*****	0.059	**0.043*****	-0.007	-0.01
MSA_{T-1}	-0.009	-0.027**	-0.001	-0.005	-0.037***	0.005
MSA_{T-2}	0.042	0.012	0.035**	0.046***	0.018*	0.039**
MSA_{TOT}	0.033	**-0.015****	**0.033****	**0.041*****	**-0.019*****	**0.044****
ETA_{T-1}	0.00967	0.576***	-0.0931	-0.008	0.209	-0.0809
LTA_{T-1}	-0.0914	0.128**	-0.0433	-0.060	0.170***	-0.0521
TA_{T-1}	-0.0643	0.0140	-0.0310**	-0.0766***	0.0387**	-0.0257
DL_{T-1}	-0.0600	0.106***	-0.0344	-0.055*	0.138***	-0.0319
CTA_{T-1}	-0.105	-0.0800	0.0129	-0.131***	-0.114**	0.00748
SI_{T-1}	0.0716	0.0429**	-0.0721	0.041	0.0627***	-0.0884
N	6364	4310	2054	2054	4310	2054
AR(2)	0.599	0.980	0.727	0.653	0.314	0.785
Hansen	0.905	1.000	1.000	0.924	1.000	1.000
GEO	Yes	Yes	Yes	Yes	Yes	Yes
TIME	Yes	Yes	Yes	Yes	Yes	Yes
PERIOD	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014
N	6364	4310	2054	6364	4310	2054

Table 12 *GMM Regressions to estimate the relationship between banking performance and financial stability. The role of asset market structure*

Notes ** p < 0.10, ** p < 0.05, *** p < 0.01*

Summing up, the findings confirm that banks operating in concentrated market contribute more to financial stability, when the whole bank system is taken into account. We could rationalize this result on the ground that larger (monopolistic) banks in concentrated banking systems may enhance profits (Freixas and Rochet, 1997) and thus reduce financial fragility by proving higher "capital buffers" that protects from external macroeconomic and liquidity shocks (Matutes and Vives, 2000; Boyd et al., 2004). Our first evidence then sustains the "concentration theory". However, when cooperative banks are separately considered, results show evidence in favour of the "competition theory", according to which high market power will lead banks to raise interest rates on loans, inducing adverse selection (i.e. more risky project could be finances) and moral hazard (i.e. risk shifting), with a negative effect for the stability of the banking system. This confirm a positive link between competition and bank stability (see Beck et al. 2006; Shaeck et al. 2009; Liu et al. 2012; Fiordelisi et al. 2014). As already pointed out before, we are interested in analysing the relationship between performance and stability in different market structures in order to check whether the efficiency of the financial intermediaries makes the system more stable and more resilient to the negative shocks (i.e. financial crisis) in concentrated markets with respect to partially competitive markets. The results obtained so far suggest the importance of focusing the attention of the differences between cooperative and non-cooperative banks, since their characteristics drive the results more than bank dimension, location or type of market considered (i.e. loans, deposits and assets). However, what we cannot say is at which level of concentration the bank system in more or less stable. In order to investigate this issue, we focus on the distribution of the market share index. This allows us to explore whether the results change at different level of concentration of the banking system. In order to examine this issue, we calculate the tertiles of the market share index (MS) associated to bank specific loans (MSL), deposits (MSD) and assets (MSA). More specifically, the first tertile (33.3% of sample distribution) identifies a low level of market concentration (i.e. high level of market competition), the second tertile (33.3% of sample distribution) identifies a middle level of concentration (i.e. middle level of market competition) and finally the third tertile (33.3% of sample distribution) identifies a high level of market concentration (i.e. low level of market competition). Results (for the sake of brevity we report the results when using the tertiles of the market share index associated to bank specific loans) are summarized in Table 13, both for cost (Table 13, Columns 1, 2 ad 3) and profit (Table 13, Columns 4, 5 and 6) efficiency. The empirical evidence shows a positive and statistically significant coefficient associated to bank performances in the first tertile (Table 13, Column 1) and in the third tertile (Table 13, Column 3) when the cost efficiency has been taken into account; this suggests that a higher level of bank efficiency leads to a more stable financial system at low level of concentration (i.e. high level of competition) and at high level of concentration (i.e. low level of competition). When the profit efficiency is considered, instead, the positive and statistically significant effects of bank performances on the stability of the banking system are present only in the third tertile (Table 13, Columns 6), meaning that at a high level of concentration (i.e. low level of competition) there is a positive association between bank efficiency and financial stability. It seems that the empirical evidence suggest a non-linear relationship between the effect of bank performances on financial stability and the degree of market concentration; in other words, an increase in bank performances appear to improve stability in relative competitive (i.e. first tertile) and uncompetitive (i.e. third tertile) banking environments, rather than in moderate concentrated markets. Intuitively, this result could be explained by the presence of both cooperative and non-cooperative banks in the market. Indeed, when focusing on the distribution of the market share index, we are not able to perform the analysis separately for cooperative and non-cooperative banks as we do not have enough observation to rely on. Indeed, the positive and statistically significant coefficient associated to bank performances in the first tertile (Table 13, Column 1), suggesting that the lower is the

market power the higher is the effect of bank performances on stability, is probably explained by the behaviour of the cooperative banks; on the other hand, the positive and statistically significant coefficient associated to bank performances in the third tertile (Table 13, Column 3), suggesting, instead, that the higher is the concentration the higher is the effect of bank performances on financial stability, is probably explained by the presence of the non-cooperative banks. This result, therefore, is in line with the previous findings. Lastly, another cause for reflection arising from the empirical evidence, is that when profit efficiency is taken into account, we found a positive and statistically significant effect of bank performances on the stability of the banking system only in the third tertile (Table 13, Columns 6), in line with the idea that higher concentration is related to higher stability of the banking system. Indeed, profit efficiency is more easily associated with the idea of getting more market power as the higher is the bank efficiency in term of profit, the higher are the profits gained by the financial institutions (rather than being efficient in term of cost and therefore minimising the cost of operating in the market).

	(1) WHOLE SAMPLE; PERF=Cost efficiency 1st tertile MS_L	**(2) WHOLE SAMPLE PERF=Cost efficiency 2st tertile MS_L**	**(3) WHOLE SAMPLE PERF=Cost efficiency 3st tertile MS_L**	**(4) WHOLE SAMPLE; PERF=Profit efficiency 1st tertile MS_L**	**(5) WHOLE SAMPLE PERF=Profit efficiency 2st tertile MS_L**	**(6) WHOLE SAMPLE PERF=Profit efficiency 3st tertile MS_L**
FS_{T-1}	0.765***	0.577***	0.671***	0.825***	0.618***	0.660***
FS_{T-2}	0.090***	0.206***	0.130***	0.055	0.228***	0.126***
FS_{TOT}	0.855***	0.783***	0.801***	0.880***	0.846***	0.786***
$PERF_{T-1}$	0.302	0.152*	0.574***	0.012	0.027	0.055**
$PERF_{T-2}$	0.180**	-0.024	-0.032	-0.0008	-0.016	-0.012
$PERF_{TOT}$	**0.482****	0.128	**0.542*****	0.011	0.011	**0.043***
ETA_{T-1}	-0.102*	-0.017	-0.157*	-0.140**	-0.046	-0.145**
LTA_{T-1}	-0.073	-0.114**	-0.129	-0.032	-0.135**	-0.161*
TA_{T-1}	-0.075***	-0.058***	-0.032**	-0.047	-0.045***	-0.038***
DL_{T-1}	-0.079*	-0.041**	-0.051	-0.045	-0.046**	-0.121**
CTA_{T-1}	-0.045	-0.229***	-0.146**	-0.064	-0.218***	-0.111
SI_{T-1}	0.030	0.090**	0.104**	0.037	0.069*	0.122***
AR(2)	0.595	0.290	0.461	0.824	0.248	0.663
Hansen	1.000	1.000	1.000	1.000	1.000	1.000
GEO	Yes	Yes	Yes	Yes	Yes	Yes
TIME	Yes	Yes	Yes	Yes	Yes	Yes
PERIOD	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014
N	6364	4310	2054	6364	4310	2054

Table 13 *GMM Regressions to estimate the relationship between banking performance and financial stability. The role of different distribution of loan market structure*

Notes ** p < 0.10, ** p < 0.05, *** p < 0.01*

4.4 Does the Characteristics of Market Structure Affect Performance-Stability Nexus?

As already specified in Section 5.3. in order to measure the level of market concentration, we rely on three different measures of market structure being MSL, MSD and MSA market share indexes measuring competition in the loan, deposit and asset market, respectively. For instance, considering the ratio of banks specific loans to total loans at SLL level (MSL), we calculate the loans of banki over the total loans of all the other banks in the SLL level, being those banks both cooperative and non-cooperative banks. In other words, we assume that cooperative and non-cooperative banks compete in the same market. For robustness and in order to deeper analyse the relationship between bank performances and financial stability in different market structures, we relax this assumption. We assume that cooperative banks mainly compete with cooperative banks as well as that non-cooperative banks mainly compete with non-cooperative banks. This means that we calculate again the market share indexes calculating the loans (deposit or assets)

of a cooperative bank (non-cooperative bank) over the total loans (deposits or assets) of all the other cooperative (non-cooperative) banks in the SLL. Tables 14, 15 and 16, show the results on the relationship between banking performance and financial stability considering the role of the loan, deposit and asset market, respectively. Firstly, the empirical evidence shows that an increasing in bank performance predicts an increase in the financial stability of the banking system only when cost efficiency has been considered (Table 14, Column 1, Table 15, Column 1, Table 16, Column 1).

	(1) ONLY CB'S PERF=Cost efficiency	**(2) ONLY NO CB'S PERF=Cost efficiency**	**(3) ONLY CB'S PERF=Profit efficiency**	**(4) ONLY NO CB'S PERF=Profit efficiency**
FS_{T-1}	0.164	0.775	0.604***	0.817***
FS_{T-2}	0.0402	0.0668	-0.00711	0.0560
FS_{TOT}	0.2042	0.8418	0.5968***	0.873***
$PERF_{T-1}$	0.183	0.140	-0.0125	-0.00659
$PERF_{T-2}$	0.316***	0.0241	0.00369	-0.00615
$PERF_{TOT}$	**0.499*** **	0.164	-0.008	-0.012
MSL_{T-1}	-0.0195	0.00378	-0.0336	0.0161
MSL_{T-2}	-0.00653	0.0210	0.00245	0.0243*
MSL_{TOT}	-0.0260	0.0247	-0.0311	**0.0404***
ETA_{T-1}	0.571***	-0.132	0.170	-0.164**
LTA_{T-1}	0.146**	-0.0530	0.193***	-0.0719
TA_{T-1}	0.0149	-0.0263	0.0423**	-0.0318**
DL_{T-1}	0.115***	-0.0277	0.152***	-0.0230
CTA_{T-1}	-0.0801	0.0194	-0.119**	-0.0227
SI_{T-1}	0.0265	-0.0459	0.0467***	-0.0782
AR(2)	0.941	0.980	0.301	0.937
Hansen	1.000	1.000	1.000	1.000
GEO	Yes	Yes	Yes	Yes
TIME	Yes	Yes	Yes	Yes
PERIOD	2001-2014	2001-2014	2001-2014	2001-2014
N	4310	2057	4310	2057

Table 14 *GMM Regressions to estimate the relationship between banking performance and financial stability. The role of loans market structure*

Notes ** p < 0.10, ** p < 0.05, *** p < 0.01*

	(1) ONLY CB'S PERF=Cost efficiency	**(2) ONLY NO CB'S PERF=Cost efficiency**	**(3) ONLY CB'S PERF=Profit efficiency**	**(4) ONLY NO CB'S PERF=Profit efficiency**
FS_{T-1}	0.177	0.746***	0.624***	0.775***
FS_{T-2}	0.0436	0.0714**	-0.00534	0.0704*
FS_{TOT}	0.2206	0.8174***	0.6186***	0.8454***
$PERF_{T-1}$	0.175	0.172	-0.0130	-0.00937
$PERF_{T-2}$	0.311***	0.0117	0.00408	-0.00779
$PERF_{TOT}$	**0.486*** **	0.183	-0.0082	-0.0171
MSD_{T-1}	-0.0319	-0.00438	-0.0368**	0.00537
MSD_{T-2}	0.00357	0.0339***	0.00285	0.0380***
MSD_{TOT}	-0.0283	**0.0295*** **	**-0.0339** **	**0.0433*** **
ETA_{T-1}	0.554***	-0.107	0.147	-0.127
LTA_{T-1}	0.150***	-0.0594	0.190***	-0.0812*
TA_{T-1}	0.0160	-0.0210	0.0390	-0.0220
DL_{T-1}	0.122***	-0.0495*	0.153***	-0.0559*
CTA_{T-1}	-0.0881	0.0220	-0.120**	-0.0255
SI_{T-1}	0.0288	-0.0503	0.0497**	-0.0645
AR(2)	0.921	0.772	0.301	0.877
Hansen	1.000	1.000	1.000	1.000
GEO	Yes	Yes	Yes	Yes
TIME	Yes	Yes	Yes	Yes
PERIOD	2001-2014	2001-2014	2001-2014	2001-2014
N	4310	2057	4310	2057

Table 15 *GMM Regressions to estimate the relationship between banking performance and financial stability. The role of deposits market structure*

Notes ** p < 0.10, ** p < 0.05, *** p < 0.01*

	(1) ONLY CB'S PERF=Cost efficiency	(2) ONLY NO CB'S PERF= Cost efficiency	(3) ONLY CB'S PERF=Profit efficiency	(4) ONLY NO CB'S PERF=Profit efficiency
FS_{T-1}	0.175	0.730***	0.595***	0.789***
FS_{T-2}	0.0441	0.0740**	-0.00374	0.0639*
FS_{TOT}	0.2191	0.804***	0.5912***	0.8529***
$PERF_{T-1}$	0.187	0.159	-0.0119	-0.0122
$PERF_{T-2}$	0.312***	0.0350	0.00350	-0.00606
$PERF_{TOT}$	**0.499*** **	0.194	-0.0084	-0.0182
MSA_{T-1}	-0.0308	-0.000951	-0.0390	0.00803
MSA_{T-2}	0.00587	0.0297**	0.00488	0.0337**
MSA_{TOT}	-0.0249	**0.0287** **	-0.0341	**0.0417** **
ETA_{T-1}	0.560***	-0.0864	0.175	-0.140*
LTA_{T-1}	0.142**	-0.0414	0.186***	-0.0517
TA_{T-1}	0.0154	-0.0220	0.0421**	-0.0214
DL_{T-1}	0.117***	-0.0261	0.151***	-0.0233
CTA_{T-1}	-0.0840	0.0200	-0.119**	-0.0171
SI_{T-1}	0.0261	-0.0495	0.0491**	-0.0731
AR(2)	0.912	0.730	0.307	0.973
Hansen	1.000	1.000	1.000	1.000
GEO	Yes	Yes	Yes	Yes
TIME	Yes	Yes	Yes	Yes
PERIOD	2001-2014	2001-2014	2001-2014	2001-2014
N	4310	2057	4310	2057

Table 16 *GMM Regressions to estimate the relationship between banking performance and financial stability. The role of assets market structure*

Notes ** p < 0.10, ** p < 0.05, *** p < 0.01*

Turning to the market share measure, the empirical evidence shows that when the analysis is performed only on cooperative banks, the coefficient associated to the market share index is still negative in all cases but statistically significant only when the deposits market and the profit efficiency are taken into account (Table 15, Column 3). When, instead, the analysis is performed only considering the non-cooperative banks, the findings show a positive and statistically significant coefficient associated to the market share index when both the bank cost and profit efficiency are taken into account (Table 14, Column 4; Table 15, Columns 2 and 4; Table 16, Columns 2 and 4), suggesting that more concentrated markets boost financial stability. In other words, results seem to suggest that competition in the banking sector has a detrimental effect on financial stability, supporting the "concentration-stability" view according to which banks may have higher profits in collusive markets (Allen and Gale, 2000, 2004) when the non-cooperative banks are taken into account.

Finally, we focus again on the distribution of the market share index, by calculating the tertiles of the market share index (MS) associated to bank specific loans (MSL), deposits (MSD) and assets (MSA). Again, the first tertile identifies a low level of market concentration (i.e. high level of market competition), the second tertile identifies a middle level of concentration (i.e. middle level of market competition) and finally the third tertile identifies a high level of market concentration (i.e. low level of market competition). Results (for the sake of brevity we report the results when using the tertiles of the market share index associated to bank specific loans), summarized in Table 17, both for cost (Table 17, Columns 1, 2 ad 3) and profit (Table 17, Columns 4, 5 and 6) efficiency, confirm a positive and statistically significant coefficient associated to bank performances in the first tertile (Table 17, Column 1) and in the third tertile (Table 17, Column3) when the cost efficiency has been taken into account; instead, the positive and statistically significant effect of bank performances on the stability of the banking system is present only in the third tertile, when the profit efficiency is considered (Table 17, Columns 6).

	(1) WHOLE SAMPLE; PERF=Cost efficiency 1st tertile MSL	(2) WHOLE SAMPLE PERF=Cost efficiency 2st tertile MSL	(3) WHOLE SAMPLE PERF=Cost efficiency 3st tertile MSL	(4) WHOLE SAMPLE; PERF=Profit efficiency 1st tertile MSL	(5) WHOLE SAMPLE PERF=Profit efficiency 2st tertile MSL	(6) WHOLE SAMPLE PERF=Profit efficiency 3st tertile MSL
FS_{T-1}	0.767***	0.577***	0.671***	0.835***	0.618***	0.660***
FS_{T-2}	0.0961***	0.206***	0.130***	0.0509	0.228***	0.126***
FS_{TOT}	0.8631***	0.783***	0.801***	0.8859***	0.846***	0.786***
$PERF_{T-1}$	0.389***	0.152*	0.574***	-0.000497	0.0270	0.0559**
$PERF_{T-2}$	0.166*	-0.0249	-0.0320	0.00261	-0.0164	-0.0121
$PERF_{TOT}$	**0.555*** **	0.127	**0.542*** **	0.0021	0.0106	**0.0438***
ETA_{T-1}	-0.123**	-0.0177	-0.157*	-0.166***	-0.0469	-0.145**
LTA_{T-1}	-0.0713	-0.114**	-0.129	-0.0227	-0.135**	-0.161*
TA_{T-1}	-0.0754**	-0.0583***	-0.0322**	-0.0371	-0.0450***	-0.0384***
DL_{T-1}	-0.0746*	-0.0411**	-0.0514	-0.0274	-0.0464**	-0.121**
CTA_{T-1}	-0.0338	-0.229***	-0.146**	-0.107	-0.218***	-0.111
SI_{T-1}	0.0259	0.0907**	0.104**	0.0471	0.0697*	0.122***
AR(2)	0.540	0.290	0.461	0.784	0.248	0.663
Hansen	1.000	1.000	1.000	1.000	1.000	1.000
GEO	Yes	Yes	Yes	Yes	Yes	Yes
TIME	Yes	Yes	Yes	Yes	Yes	Yes
PERIOD	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014	2001-2014
N	2062	2200	2105	2062	2200	2105

Table 17 *GMM Regressions to estimate the relationship between banking performance and financial stability. The role of different distribution of loan market structure*

Notes ** p < 0.10, ** p < 0.05, *** p < 0.01*

5. Summary and Conclusions

The main aim of the paper has been to investigate the relationship between performance and financial stability focusing on the Italian contest during the period 2001-2014. Specifically, our contribution to this expanding literature is to consider the effects of market power through a market share index based on different financial activities (loans, deposits and assets) as well as to explore the performance-stability nexus and the role played by the market power taking both cooperative and non-cooperative banks into account. After producing cost and profit efficiency, through stochastic frontier analysis, for banks operating in 20 Italian regions between 2001 and 2014, we use a sys-GMM estimator to account for the effects of the bank performance on financial stability, while controlling for bank-specific characteristics and product diversification indicators, relying upon highly territorially disaggregated data at municipality level (at SLL, Sistema Locale del Lavoro, level), in order to better capture the differences across geographical areas.

First of all, the empirical evidence shows that cooperative banks generally obtain higher efficiency than non-cooperative, in line with the literature on Italian banks. When the geographic stratification of the Italian territory has been taken into account, results show that Southern banks are less cost efficient than Northern banks confirming again what has already been found for the Italian banking system. Secondly, the empirical evidence shows a clear positive association between bank performance and financial stability. Thirdly, when the role of the market power on the performance-stability nexus has been taken into account, results seem to suggest that competition in the banking sector has a detrimental effect on financial stability, supporting the “concentration-stability” view according to which banks may have higher profits in collusive markets, when the whole bank system is taken into account. However, when the characteristics and the mission of banks have been taken into account (i.e. cooperative and non-cooperative banks are separately considered), the empirical evidence

suggest that a higher degree of market power in the banking market is associated with lower insolvency of banks only for non-cooperative banks; the market power is, instead, negatively related to financial stability for cooperative banks meaning that higher concentrations leads to higher financial instability. In other words the empirical evidence provides support in favour of the “concentration-stability” view according to which banks may have higher profits in collusive markets, when non-cooperative banks are taken into account, while the results are in favour of the “competition-stability”, according to which when competition is low, stability is also low, when cooperative banks are, instead, considered. Giving evidence of a divergent relationship between bank performances, competition and stability for cooperative and non-cooperative banks could have important policy implications: as the level of homogeneity of the banking sector plays an important role, results could be of interest to those policy makers and government agencies when interventions aiming at implementing the financial stability of the system have to be planned and then implemented.

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