

THE PECULIARITY OF THE COOPERATIVE AND MUTUAL MODEL: EVIDENCE FROM THE EUROPEAN BANKING SECTOR

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The crucial role of mutual banks in promoting local development is highlighted by an extensive theoretical and empirical literature. The historical success of mutual banks derives not only from their specific business model, but also from their peculiar and distinguishing corporate governance with member ownership. According to a copious literature, these features have probably allowed mutual banks to better withstand financial crisis. This work compares the cost efficiency of European mutual banks by analyzing a sample which consists of the universe of all the banks operating in Italy, Germany, France and Spain over the period 2011–2016, by employing a stochastic approach (Stochastic Frontier Analysis-SFA) to determine the effects of the recent financial crisis on the efficiency level of this particular kind of bank. The analysis aims to point out the determinants of efficiency in order to understand if the mutual model reveals to be still attractive in the modern banking system. The main contribution of the paper to previous literature consists in comparing different impacts of financial crisis on efficiency of mutual banks in main European countries. Furthermore, the results enrich the recent debate about the cooperative and mutual banking system and its *raison d'être*. Our results show that the European mutual banks reveal a higher degree of efficiency with respect to commercial banks. Cost efficiency appears to be significantly and negatively related to the level of regulatory capital, the level of credit risk, the level of leverage and the cost-income ratio. On the other hand, it is significantly and positively related to the profitability of the traditional lending activity, to the level of prudence in terms of provisions against credit risk and to the amount of liquidity as a buffer against unexpected troubles.

Keywords: Cooperative banks; savings banks; efficiency; stochastic frontier analysis; financial crisis.

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1. Introduction

The European banking system is characterized by the massive presence of mutual banks that exhibit a business strategy very different from other kinds of credit institutions. It is very important to study this particular banking model since it is based on a particular organizational design which is different from private banks that “restrict” their functioning in the interest of their shareholders. This research is based on the hypotheses that (h_1) cooperative and mutual banks have historically played a crucial role in the financial systems of almost all European countries; (h_2) their peculiar business model and institutional features provided them quite a success; (h_3) in detail, their business has a regional/local focus and (h_4) their main goals are the value creation for members and the construction of a long-term relationship based on trust. Moreover, (h_5) the customer proximity and the traditional lending-based activity make them the major interlocutor for local communities in supplying a comprehensive range of financial services, and so, (h_6) they are particularly active in lending to families and SMEs. Furthermore, (h_7) the owners and providers of equity are not called shareholders but members and each member has only one vote in the annual general meetings (principle “one person-one vote”), regardless of the number of shares held. Cooperative and mutual banks are self-governed private organizations and, according to the “principle of identity”, members are their main customers and conversely many of their clients are also members. So, (h_8) there is a partial coincidence between members and customers and consequently the customers/members own and control the bank and they are fully involved in the decision-making process. Again, (h_9) mutual banks actively support the sustainable development of their territory by reinvesting a significant portion of their available profits back into the community and they could be considered “not-for-profit” banks as their main goal is to increase their members’ welfare and not to distribute dividends to them.

This kind of institutional model presents both positive and negative implications. A first strength (h_{10}) of the cooperative and mutual model derives from territorial proximity that allows to collect savings on a local basis. These resources are used to grant loans to households, SMEs and local authorities. A second advantage (h_{11}) is represented by the prudent management (EACB 2016). This high level of prudence is due to many reasons. Most of cooperative and mutual banks’ resources come from deposits. Secondly, they mainly provide retail banking products. Thirdly, the proximity allows mutual banks to assess risks accurately. The intimate knowledge of customers should allow (h_{12}) a better selection, increasing the credit quality and reducing the incidence of nonperforming loans (NPLs) (Aiello & Bonanno 2016). The long-term strategy, aimed at financing the economy and the development of communities rather than short-term profit, represents (h_{13}) a further element of structural stability. Cooperative banks are often well capitalized because their profits are largely held in reserve. Also their governance has positive implications. Members/customers elect their own representatives to run their local bank. This fact should

ensure (h_{14}) that cooperative and mutual banks satisfy better the interests of the customers in their community.

On the other hand, a relevant limit of the cooperative and mutual business model (h_{15}) is the members' weak incentive to monitor the performance of the managers (Bülbül *et al.* 2013). This is due to the fact that “owners-members” can hardly benefit from policies that would increase the value of their shares because ownership stakes in cooperative banks are not easily marketable. For the same reason, (h_{16}) members cannot exert pressure on management due to the fact that they cannot accumulate a sufficient number of voting rights. There is no market in corporate control so that it is virtually impossible for hostile bids for ownership to take place. This could be seen as a disincentive for an efficient and good management (Aiello & Bonanno 2016).

Despite international trends — e.g. globalization, deregulation, innovation — produced significant changes in mutual banks, they are still well-distinguished in terms of operating model from other types of banks. Still today they maintain a significant weight in the banking sector. According to statistics from the European Association of Cooperative Banks,^a there are about 3135 local cooperative banks in Europe, with 80.5 million members, serving more than 209 million customers, and with an average market share of 20%.

Although, historically, profit maximization and efficiency are not the primary goals of mutual banks, over the last two decades, (h_{17}) the harmonization of financial services in the European Union and the growing level of globalization and integration of financial markets increased the competitive pressure. In addition, the consequences of the recent financial crisis led banks to pay more attention on efficiency and productivity and to focus on their determinants.

Starting from the traits or hypotheses previously described, this paper aims to answer to two research questions. First of all, (RQ₁) this research wants to discover the effects of the recent financial crisis on the efficiency level of mutual and cooperative banks. The analysis aims also (RQ₂) to point out the determinants of efficiency in order to understand if the mutual model reveals to be still attractive in the modern banking system.

So the objective of this paper is twofold. First of all, it compares the relative efficiency of mutual banks by analyzing a sample that consists of the universe of all the banks operating in Italy, Germany, France and Spain over the period 2011–2016, by employing a stochastic approach (Stochastic Frontier Analysis-SFA). Within this time horizon, it is also possible to evaluate the effects of the recent financial crisis on the efficiency level of this particular kind of bank^b and the effects of the increased risk level on efficiency in order to analyze its time persistence. Secondly, the analysis aims to point out the determinants of efficiency in order to understand if the cooperative and mutual model reveals to be still attractive in the modern banking system.

^aThe European Association of Co-operative Banks (EACB) represents 28 member institutions and cooperative banks. <http://www.eacb.coop/en/home.html>.

^bIn order to define the subprime crisis period, see Bank of International Settlements (2010).

This research advances the literature in different ways. First of all, the main contribution of the paper to previous literature consists of comparing different impacts of the financial crisis on efficiency of mutual banks in the main European countries. Furthermore, the results enhance the recent debate about the cooperative and mutual banking system and its “*raison d’être*”. Our results support the theory of mutual banks’ survival during the financial crisis, demonstrating that the mutual business model is still able to meet customers’ needs and, at the same time, preserve profitability and efficiency. These kinds of results are a useful instrument for managers, for policymakers and for European regulators.

The paper is organized as follows: Section 2 reviews the literature; Sec. 3 provides the main features of the mutual and cooperative banking systems in European countries, with a particular focus on those examined in the empirical analysis; Sec. 4 outlines the methodology; Sec. 5 describes data and variables used for the empirical analysis and illustrates the empirical results and Sec. 6 concludes.

2. Literature Review

The work on efficiency and productivity of industrial firms by Farrel (1957) was the first which defined inefficiency as the distance of a business unit from a frontier production function considered as a benchmark. Later on, the literature on efficiency and productivity began to analyze banking systems only in the 1990s.

A branch of this literature dealing with efficiency is focused only on methodological issues, for example comparing estimates produced by parametric approaches (SFA and Distribution Free Analysis - DFA) and nonparametric approaches (Data Envelopment Analysis - DEA). Unfortunately, they provide contradictory results (Allen & Rai 1996, Berger & Mester 1997, Bauer *et al.* 1998, Coelli *et al.* 1998, Beccalli *et al.* 2006, Halkos & Tzeremes 2013).

Another branch of this literature tried to apply those models to obtain some numerical results that can be compared and discussed in order to provide some considerations at a managerial and regulatory level. Over the years, many studies focused on cost efficiency and productivity of banks from a single country, in order to discover the sources of inefficiency and the role of both environmental and internal factors such as size, geographical location, ownership, risk management processes, capital structure, financial structure, corporate governance, relationship lending, organizational structure, business model, and diversification. These authors analysed the efficiency levels of national banking systems worldwide, including: France (Jimborean & Brack 2010), Italy (Resti 1997, Girardone *et al.* 2004, Romano *et al.* 2012, Durante *et al.* 2013, Fiordelisi & Mare 2013), Germany (Koetter 2008), Spain (Pastor 1999), United Kingdom (Duygun *et al.* 2013), the US (Berger & De Young 1997, Berger & Mester 1997, Barr *et al.* 2002, Akhigbe & McNulty 2003, Elyasiani & Wang 2012, Harris *et al.* 2013), Greece (Halkos & Tzeremes 2013), China (Wang *et al.* 2014), Japan (Assaf *et al.* 2011, Homma *et al.* 2014) and Australia (Sathye 2002).

Beyond these studies on single countries, there is also number of works offering an international comparison of efficiency and productivity in different banking systems (Radić *et al.* 2012, Bellavite Pellegrini *et al.* 2012, Ferreira 2013, Mirzaei 2013, Kalyvas & Mamatzakis 2014, Kontolaimou 2014). In particular, the consolidation process of the European Union markets inspired new studies which developed an international comparison of banks using two different techniques: the construction of separate production frontiers for the banking system of each country (Beccalli 2004, Bos & Schmiedel 2007, Lozano-Vivas & Pastor 2010) or the construction of a common production frontier equal for all banks (Pastor 2002, Casu & Molyneaux 2003, Girardone *et al.* 2009, Kenjegaliev *et al.* 2009, Delis & Papanikolaou 2009, Girardone & Casu 2010, Chortareas *et al.* 2012, Pampurini & Quaranta 2018).

Few researches investigated the efficiency of different organizational models in the financial sector: some authors studied cost economies among subgroups (Rangan *et al.* 1989), while other focused on distribution systems and group affiliation (Elyasiani & Mehdian 1990). A latest work compared cost and profit efficiency of European financial conglomerates with respect to universal banks (Vander Venet 2002). In particular, there are two studies that tried to evaluate efficiency and productivity change of Italian conglomerates (Casu & Girardone 2002, Casu & Girardone 2004).

Focusing on the literature that investigates specifically the efficiency of cooperative and mutual banks, the most important works compare the cooperative model with other types of banks (Ayadi *et al.* 2009, 2010). Results are very divergent, so that, in terms of efficiency, no clear predominance emerges between the commercial banking model and the cooperative/mutual model. Groeneveld empirically investigates to what extent the financial performance of European Cooperative Banking Groups (ECBGs) over recent business cycles is related to the original characteristics of the cooperative model itself. To this end, the author uses a database with a broad range of financial variables for 15 ECBGs in 10 countries and collects similar indicators for the entire banking systems of the observed countries. The results suggest that the banks characterized by a corporate governance based on members' influence and specific decision making mechanisms seem to lead to a relatively low risk appetite and high capitalization, a high degree of stability and a predominant focus on retail banking (Groeneveld 2014).

With reference to the Italian case, an empirical analysis (Mattei & Miglietta 2011) based on the comparison between "Banche Popolari" (a particular type of cooperative bank) and joint-stock banks, shows that the formers exhibit a lower credit quality in terms of both loan loss provisions and nonperforming loans, higher capitalization and higher profitability in terms of net interest margin with respect to the latter. According to the authors, these results could be explained by noticing that SMEs (which are the cooperatives' typical customers) suffered more than other enterprises from the crisis and this could have resulted in a deterioration of the credit quality. Indeed, the high level of profitability in terms of Net Interest Margin could be probably due to higher interest rates charged to customers in response to their greater riskiness. Alternatively, the figure could indicate that Popolari took

advantage from the closer relations with their clients and were able to pay lower interest rates on funding.

Many authors believe that cooperative banking model revealed a better “resistance” to the financial turmoil generated by the international financial crisis of 2007 (Mottura 2008, ANPB 2009, EACB 2010).

A lesser amount of literature, instead, focuses only on European cooperative banks (Doumpos & Zopounidis 2013, Spulbār *et al.* 2015, Clark *et al.* 2018). Doumpos & Zopounidis analyzes cooperative banks from five major European countries over the period 2005–2010. They use a DEA to evaluate the efficiency level of those banks; then, they adopt a multicriteria evaluation procedure to analyze the performance of the same banks in a common setting based on widely used financial ratios. The results provide several interesting findings on the effect of the crisis on the efficiency and performance of the banks in each examined country (see *infra par.* 3). Spulbār *et al.* uses a stochastic frontier model to estimate the cost efficiency of cooperative banks and savings banks from nine countries over the period 2005–2011. The results show that a higher growth rate of the Gross Domestic Product (GDP) implies an increase in the inefficiency level. In addition, they show that smaller cooperative and savings banks are more efficient in managing costs compared to larger banks (Spulbār *et al.* 2015). Clark *et al.* by analyzing a large sample of cooperative banks in the European Union between 2006 and 2014, find that it is tantamount to carefully account for cooperative banks’ specific features whilst assessing the relationship between market power and stability in cooperative banking (Clark *et al.* 2018).

In line with the most of the cited works, this paper presents an integrated analysis of a large sample of European banks comparing cooperative banks, popolari banks and savings banks (i.e. mutual banks) with commercial banks.

3. Cooperative and Mutual Banks’ Divergences Across Main European Countries

On the basis of the results from previous literature, the comparison of mutual banks across different countries in Europe shows both common features and distinctive characteristics (Fonteyne 2007, Ayadi *et al.* 2009, Boscia *et al.* 2010, Karafolas 2016, Clark *et al.* 2018). In this study, we adopt a broad definition of “mutual bank” that includes all the banks that adopt a socially-oriented model: so we refer to both “cooperative banks” and “savings banks” in Bureau Van Dijk database definition (see *infra paragraph* 5). The historical background and the main features of mutual banks operating in examined countries are described below.

The origins of cooperative banks are rooted in the second half of the 19th century in **Germany**. The German cooperative banking sector includes the *Raiffeisenbanken*, founded in rural areas, and the *Volksbanken*, established in towns and urban centers. They are part of a two-stage network constituted by themselves at first level, and their central institutions at second level. The *Volksbanken* and the

Raiffeisenbanken are independent cooperative banks established locally in form of registered associations with legal personality. The central financial institutions are Deutsche Zentral-genossenschaftsbank (DZ-Bank) and Westdeutsche Genossenschafts-Zentralbank (WGZ-Bank). The key central institution is the DZ-Bank that supports the local *Raiffeisenbanken* and *Volksbanken* as financial service provider, but that is also one of the largest commercial bank in Germany. Instead, the WGZ-Bank is the only regional central bank that still exists today and operates for the cooperative banks in the federal district of Rheinland and Westfalen. From a legal perspective, the cooperative banks are single banks with individual independence and autonomy of the corporate governance. From an economic point of view, the cooperative banks and their central institutions form a cohesive economic banking group (named *Finanzgruppe*). The cooperative banks are regulated by the Federal Banking Law (*Kreditwesengesetz*) and by the Cooperative Federal Law (*Genossenschaftsgesetz*) in corporate governance aspects. The German cooperative banking system preserved its peculiar connotations over the time. The strength of the system is the coexistence of both the independence of local banks and the advantages of an integrated banking group. Banks considered in our empirical analysis are *Raiffeisenbanken*, *Volksbanken*, Sparkassen and Landesbanken (that means “savings banks”). Zentralbanken such as Zentral-genossenschaftsbank (DZ-Bank) and Westdeutsche Genossenschafts-Zentralbank (WGZ-Bank) are not included.

In **France**, the current cooperative banking system is articulated in three cooperative groups as a result of a complex process of consolidation. Each group includes all the institutions and their subsidiaries, whatever their legal status, controlled by the cooperative network. The cooperative network is a three-tier system: local, regional and national tier. Entities at local level own the institutions at regional level according to an inverted pyramid scheme. At national level, there is a central body controlled by the regional level. The first group is Credit Agricole, made up of 2.447 local banks and 39 regional banks.^c The central institution of Groupe Credit Agricole is Credit Agricole S.A., 56.6%-owned by the regional banks and listed on Euronext Paris. The second group is BPCE that comprises two cooperative banking networks: Caisse Nationale des Caisses d'Épargne and Banque Fédérale des Banques Populaires. The first network includes 15 Caisses d'Épargne. The second network includes 14 Banques Populaires.^d The third group is Credit Mutuel Group which consists of 2092 local banks.^e The cooperative banks are regulated by the Loi n. 2010–1249 du 22 octobre 2010 de Régulation Bancaire et Financière. The French mutual banks considered in our sample include Caisse Régionale, Caisse d'Épargne and Banques Populaires. In addition to these entities, parent companies are also considered. All cooperative groups were recently interested by innovation in two directions. First of all, a process of diversification and external growth that

^c Groupe Credit Agricole, 2017 key figures, www.credit-agricole.com.

^d Groupe BPCE, Identity, www.groupebpce.fr.

^e Credit Mutuel Group, 2017 Activity Report, www.creditmutuel.com.

conducted to a sort of hybridization of the cooperative model. Secondly, the increase of trans-border operations that enabled French cooperative banks to play an important role in the European banking consolidation process.

In **Italy**, the cooperative model was imported from Germany by Luigi Luzzatti and the first Popolare bank — currently belonging to the Banco BPM banking group — was founded in Lodi in 1864. The cooperative banking system in Italy combines two kinds of banks: Banche Popolari and Banche di Credito Cooperativo (hereafter BCC). They are very similar in their legal structure, the main differences pertaining to the territorial limitation of BCC and to the allocation of the net returns coming from the banking activity. BCC can operate exclusively in a predefined territory and mainly with shareholders; moreover, they must allocate 70% of their net returns to the legal reserve. On the other hand, Popolari are allowed to operate everywhere and must allocate at least 10% of their net profits to the legal reserve. Popolari and BCC, as a whole, represent a widespread and lively part of the Italian banking system, about 21% in terms of branches.^f Most of the cooperative banks' branches (about 80%) are concentrated in geographical areas where the presence of small and medium enterprises is predominant and this represents an important issue in explaining the strict link between cooperative banks and SMEs. The two types of Italian mutual banks, Banche Popolari and BCC, exhibit some important differences. After a long historical evolution, Popolari banks maintained the same legal form and the same ownership structure as cooperative banks, based on the pro-capite vote, but differently than cooperative banks they have gradually abandoned the original mutual purpose. Recently, the Italian Government approved a reform (Law 33/2015) — whose legitimacy is currently being examined by the European Court of Justice — which forces the larger Popolari banks to transform into a joint-stock company. BCC, on the other hand, preserved over time the mutual purposes in favor of their members and in favor of the areas in which they are present. Also BCC have been recently reformed (Law 49/2016). According to the reform, each BCC must join a cooperative banking group, otherwise it must be transformed into a joint-stock company. The governance of these groups will be regulated by the so-called “cohesion contracts”. This reform introduced new rules on BCC ownership. The maximum ownership threshold referred to a single shareholder has been increased from €50000 to €100000, the minimum number of shareholders for each BCC has been increased from 200 to 500 and it has been stated that new share issues must be previously authorized by the Bank of Italy. To date, three banks — i.e. Iccrea Bank, Cassa Centrale Banca and Cassa Centrale Raiffeisen — applied to serve as the parent company of cooperative banking groups. Thus far, 144 BCCs have expressed an interest in joining Iccrea, 95 in joining Cassa Centrale Banca and 39 in joining Cassa Centrale Raiffeisen. In the present work, the empirical analysis takes into account both BCC and Popolari banks.

^fBank of Italy, Annual report 2017, 31 May 2018.

The **Spanish** cooperative banking system is currently formed by 65 institutions (of which 63 Cooperativas de credito and 2 Cajas de ahorros[§]). They are foundations of private nature combining financial activity with social vocation. Most cooperative banks belong to the National Union of Credit Cooperatives (Unión Nacional de Cooperativas de Crédito - UNACC).^h The cooperative banks are regulated and supervised by the Bank of Spain on the basis of the Law 13/1989 (Ley de Cooperativas de Crédito) and of the National Cooperative Act (Law 27/1999). They mainly consist of rural saving banks (named Caja's rurales). Most of cajas rurales form the Grupo Caja Rural banking group, headed by Banco Cooperativo Español, SA. These kinds of institutions allocate at least 50% of total profits to reserves. Regarding their governance, the General Assembly is formed by different stakeholders, including employees, representatives of depositors, local and regional government representatives (up to a limit of 50% of total voting rights), founding entities and community interest groups. After the crisis, the Spanish banking system was involved in an important reform process aimed to restructure and strengthen the sector. Also cooperative banks have been affected by numerous mergers and acquisitions.

Although the four examined countries are all characterized by a banking system with a long history and a rooted tradition, they reacted to the crisis in different ways. Spain, in particular, seems to have suffered the most from the crisis compared to the other three countries (Bülbül *et al.* 2013, Doumpos & Zopounidis 2013). May be, this is probably due to the fact that, differently from France and Germany, Spanish cooperative banks are not organized in groups (they are almost completely decentralized). In terms of integration, France can be considered as the more integrated system, followed by Germany. In Italy, the regulation reform adopted after the crisis and concerning mutual banks (both BCC and Popolari banks) fosters a high level of consolidation and the adoption of a group model similar to the French and the German system.

4. Methodology

The methodology applied in this analysis is concerned with the concept of X-efficiencies and the construction of efficient frontiers. This technique is based on the comparison between the efficiency level of each unit and the efficient frontier (which represents the best practice): the greater this difference, the lower the degree of efficiency of the observed subject. This difference may depend both on internal factors, such as the skills of the manager or the organization, and on external factors, such as the socio-economic characteristics of the environment in which the subject operates. For this reason, we chose a model based on the measurement of X-efficiencies that is able to take into account both internal and external variables that should affect the banking group efficiency. This method is based on a two-stage approach: first of all, we identify the model for evaluating the efficiency and,

[§]Banco de Eoana, Registros de Entidades. As of 25/05/2018.

^hAt the end of 2016, 43 "Cooperativas de Credito" were members of UNACC. Unacc, Anuario 2016.

secondly, we define the particular functional form of the efficiency frontier that needs to be estimated with optimization techniques. Regarding the first point, we decided to use a parametric approach for two reasons: parametric models reveal a high flexibility and adaptability to sample data, furthermore they are frequently used in literature so there is the possibility to compare the results with many empirical studies.ⁱ We discarded nonparametric models because of three reasons. First, they do not allow the possibility of measurement errors. Second, they do not consider that sometimes the performance may be influenced by random factors that have nothing to do with the strategies of the manager. Lastly, the nonparametric models do not consider the possibility that the use of different accounting principles may cause deviations between the estimated values and the real ones. Not being able to manage these “exogenous” factors, the nonparametric models conclude that any difference between the efficiency estimate for each unit and the efficiency estimate for the best practice firm is entirely attributed to inefficiency.

After the choice of a parametric model, the second stage deals with the functional form of the production function, the formula that represents the technology with which the firm transforms inputs into outputs. Our study deals with cost efficiency where cost efficiency measures the difference between the cost of each firm and the cost of the best practice firm to produce the same output bundle under the same conditions.^j

The cost function model (in natural logs) is

$$\ln TC = TC(Q, P) + \varepsilon.$$

It is derived from a cost function where the observed total cost of production for each bank TC depends on the prices of variable inputs P and on the quantities of variable outputs Q .^k The main characteristic of the parametric approaches is the ε , a two-component error term that can be written as

$$\varepsilon = v + u,$$

where v is a normal random variable (two tails) with zero mean and variance σ^2 which represents statistical noise and is assumed to be independent and identically distributed; and u is a non-negative (or one-sided) random variable (with mean μ and variance σ_u^2) representing inefficiency and it is assumed to be distributed independently of the v . In our study, we assume $\mu = 0$ so that the u are half-normal random variables that can vary with time.

With regard to the algebraic formulation of the cost function to use in the SFA model, the literature proposes various solutions that differ from each other for the

ⁱFor a detailed overview of the differences between the two approaches, see Berger & Humphrey (1997).

^jWe chose a cost function (instead of a production function) because it has some advantages in terms of comparability. Few works propose a valuation based on a production frontier and they usually find smaller efficiency values than other works based on cost frontiers. Nevertheless, the ranking of the observed units seems equal in both cases (see for example Maudosa *et al.* 2002). Sometimes previous literature showed that the results obtained with a cost frontier model reveal a better data fitting (see for example Fries & Taci 2005).

^kIn this work we employ three outputs marked with subscript i ($i = 1, 2, 3$), three inputs whose prices are marked with the subscript j ($j = 1, 2, 3$). See Table 1 for a detailed explanation.

flexibility (or the ability to represent different production technologies) and for the ability to comply with certain properties.¹ They are the Cobb–Douglas, the Constant Elasticity of Substitution and the Translogarithmic function (Transcendental Logarithmic). The first two functions are characterized by an excessive rigidity therefore they are not very popular in literature, while the third is very common in econometric studies and in particular in the field of financial intermediaries. This function shows many advantages: it allows convex average cost curves (in the form of a U) that are able to fit different sizes, secondly it allows variability in the elasticity of production and of substitution between the inputs. For these reasons we employ a translog cost function that includes within the variables the value of equity to account for risk and for an alternative capital source of financing and to avoid scale bias^m and other macroeconomic indicators, such as the GDP deflators, that allow us to take into account some differences related to the characteristics of each country. The translog cost function takes the following form:

$$\begin{aligned} \ln TC = & \alpha_0 + \sum_{i=1}^m \alpha_i \ln Q_i + \sum_{j=1}^n \beta_j \ln P_j + \lambda_E \ln E \\ & + \frac{1}{2} \left[\sum_{i=1}^m \sum_{j=1}^n \delta_{ij} \ln Q_i \ln Q_j + \sum_{i=1}^m \sum_{j=1}^n \gamma_{ij} \ln P_i \ln P_j + \varphi_{EE} \ln E \ln E \right] \\ & + \sum_{i=1}^m \sum_{j=1}^n \rho_{ij} \ln Q_i \ln P_j + \sum_{j=1}^n \kappa_{jE} \ln P_j \ln E + \sum_{i=1}^m \varsigma_{iE} \ln Q_i \ln E + \varepsilon_i, \end{aligned}$$

where TC is the total cost of production for each banking group in each year and α , β , λ , δ , γ , ρ , κ , ς , τ , χ and η are the parameters to be estimated. The Q_i represent the output quantities of each banking group in each year, while the P_i represent the input prices for the same banking group in the same year.ⁿ In order to have linear homogeneity in factor prices we impose: $\sum_{j=1}^3 \beta_j = 1$ $\sum_{i=1}^3 \gamma_{ij} = 0$ $\sum_{j=1}^3 \rho_j = 0$ $\sum_{j=1}^3 \kappa_j = 0$ while to have standard symmetry, we assume: $\delta_{ij} = \delta_{ji}$ and $\gamma_{ij} = \gamma_{ji}$.

Because of the peculiar function of banking activity, there is no general agreement about the identification of inputs and outputs that have to be adopted in modeling the frontier. Two approaches are generally adopted in previous studies: the production approach (Berger & Humphrey 1997, Altunbas *et al.* 2001, Pastor 2002) and the intermediation approach (Casu & Molyneaux 2003, Beccalli *et al.* 2006, Assaf *et al.* 2011). The debate between the two approaches is based on a different concept of the bank transformation process.^o Even if the literature underlines that

¹Coelli *et al.* (1998).

^mMester (1996).

ⁿFor a detailed explanation of the variables, refer to the next paragraph.

^oAccording to the production approach, banks use capital and labor to produce loans and deposits, which are thus considered as outputs. The intermediation approach, introduced by Sealey & Lindley (1977), treats banks as intermediators of financial services rather than producers of loans and deposits: banks collect deposits from customers and transform them, through labor and capital, into loans and investments for clients.

Table 1. Inputs and outputs.

Variables	Proxies from balance sheets and financial statements
TC = total cost of production	Financial costs (interests paid on deposits), personnel expenses and other operating costs
Outputs:	
Q1 = loans	Net loans
Q2 = financial assets	Total securities
Q3 = off-balance sheet items	Off-balance sheet items
Inputs prices:	
P1 = human capital	Personnel expenses/Total assets
P2 = financial capital	Interest expenses/Total funds
P3 = physical capital	Depreciation and other expenses/Fixed assets
E = equity capital	Equity

neither of these two approaches is perfect, because banks fulfil both producer and intermediary functions, we adopt the intermediation approach since it better captures the decisions to minimize the cost of the financing mix.^P

According to the intermediation approach, we consider three main inputs such as human capital, financial capital and physical capital and three outputs such as loans, financial assets and off-balance sheet items. As said before, we also include the equity capital in order to account for different preferences in terms of risk taking.^Q Table 1 summarizes and describes our input and output variables.^r

After evaluating the efficiency level of each banking group, we tested whether some variables representing strategic choices of the manager and the business model of the group can influence the level of efficiency. The purpose of this analysis is to find which are the most important key factors that drive the business success. In order to test the impact of those variables on the level of efficiency, we can choose among different approaches. Starting from 2001, after the work of [Dietsch & Lozano-Vivas \(2000\)](#), the “one stage” approach assessed the convenience (and the advantages) of including environmental variables directly in the frontier. Nevertheless, the following literature showed different approaches about this issue. Following [Altunbas et al. \(2000\)](#), [Hasan & Marton \(2002\)](#), [Casu & Girardone \(2002\)](#), [Weill \(2004\)](#), [Bos & Kool \(2006\)](#), [Fethi & Pasiouras \(2010\)](#), [Bertay et al. \(2013\)](#), [Beccalli et al. \(2015\)](#), we adopted a “mixed” approach.^s In particular, we put in the translog function the

^P[Berger & Humphrey \(1997\)](#).

^Q[Huges & Mester \(1993\)](#), [Mester \(1996\)](#).

^rIn order to ensure linear homogeneity in prices we normalize our data dividing the total cost (TC), the price of labor (P1) and the price of financial capital (P2) by the price of physical capital (P3). In addition, we deflated all the input and output variables taken from the banking groups’ balance sheets in order to control for microeconomic differences among countries.

^sWe decided for the mixed approach also because the dataset has many missing values, especially for the idiosyncratic variables, so it is impossible to build up the efficient frontier. We then decided not to drop so many observations and to use the largest possible dataset to work out the frontier. Then the “internal” variables are employed in the second-stage regressions.

Table 2. Internal variables.

Variables	Proxies from balance sheets and financial statements
Capital requirements	TIER1 ratio (TIER1)
Capitalization	Equity/Total Assets (ETA)
Business model	Net Loans/Total Assets (LOANSTA) Total Securities/Total assets (TSTA)
Credit risk	Impaired loans/Gross loans (IMPLGL)
Prudence	Loan Loss Provisions/Average Gross Loans (LLPAGL)
Profitability	Return on Average Equity (ROAE) Net Interest Income/Operating Revenues (NIIOR) Interest Earning Assets/Total Assets (INTERNATA)
Costs	Cost Income Ratio (COSTINCOME)
Liquidity	Liquid Assets/Deposits and Short Term Funding (LIQDSTF)

environmental variables that can be considered “systemic” variables because they are referred to the whole country in which each bank operates. On the other hand, we decided to introduce “internal” (idiosyncratic) variables in the second step of the analysis, since they represent the characteristics of each single business unit and the managerial choices of every single bank, independently from the external environment. These variables are referred to regulatory capital requirements, to the level of capitalization/leverage, the level of credit risk and provisions, the level of liquidity, the business model, the profitability of the bank business and the ability to control the impact of costs (Table 2).

In order to assess the explanatory power of these variables we implement a multivariate analysis based on the following OLS regression:

$$\begin{aligned} \text{COSTEFF}_{it} = & \alpha_0 + \alpha_1 \text{IMPLGL}_{it} + \alpha_2 \text{LLPAGL}_{it} + \alpha_3 \text{COSTINCOME}_{it} + \alpha_4 \text{TIER1}_{it} \\ & + \alpha_5 \text{ETA}_{it} + \alpha_6 \text{LOANSTA}_{it} + \alpha_7 \text{ROAE}_{it} + \alpha_8 \text{TSTA}_{it} + \alpha_9 \text{NIIOR}_{it} \\ & + \alpha_{10} \text{LIQDSTF}_{it} + \alpha_{11} \text{CAAR}_{it} + \alpha_{12} \text{INTERNATA}_{it} + \varepsilon_{it}. \end{aligned}$$

5. Empirical Results

5.1. The cost efficiency level of the European mutual and commercial banks

In our research, we collected input, output and explanatory variables data from the Bureau Van Dijk database (Orbis Bank Focus), while deflators and macroeconomic data come from the World Bank database. The sample consists of the universe of all the banks operating in Italy, Germany, France and Spain. The observed period spans from 2011 to 2016 and includes three important events: the first recovery after the sub-prime crisis (2011–2012), the Sovereign Debt crisis (2012–2013) and the NPL crisis (2016).

Table 3. Composition of the whole sample. Number of observations and total number of banks in the panel.

	2011	2012	2013	2014	2015	2016	Panel
DE	162	168	1461	1462	1450	1423	6126
ES	16	17	54	62	93	99	341
FR	47	49	156	164	167	165	748
IT	303	348	386	408	407	410	2262
Panel	528	582	2057	2096	2117	2097	9477

The geographical composition of our sample is presented in Table 3; it is an unbalanced panel that accounts for 2197 banks for a total of 9477 observations.^t

This panel is composed of Commercial banks, Savings banks, Popolari banks and Cooperative banks, but in this work we focused only on mutual banks (Savings banks, Popolari banks and Cooperative banks). Table 4 shows the composition of the whole sample in terms of specialization and the particular geographical composition of the sub-groups of cooperative and savings banks.

Germany and Italy are the countries characterized by the highest number of mutual banks but these banks are, on average, the smaller with respect to the whole sample (see Table 5).

The cost efficiency scores of the mutual banks evaluated with the stochastic frontier approach ranges from a minimum of 60% (Spain in 2016) to a maximum of 89% (France in 2011 and 2012) (see Table 6). This result is in line with previous literature on the banking system and it means that our units waste about 11% (with respect to the maximum of 89%) of their inputs or, which is the same, they could increase their outputs with the same input factors and costs. As we can see in Table 6, except for Spanish banks,^u the mutual banks are significantly more efficient than commercial banks. Indeed, the average cost efficiency scores of the mutual banks range from a minimum of 81% to a maximum of 86% while the average cost efficiency scores of the commercial banks range from a minimum of 68% to a maximum of 71%.

^t Each observation deals with the balance sheet data of a single group in each single year while the variable “Panel” represents the total number of banks for each country (last column on each row) and for the entire observation period (last row of each column). The changes in the number of banks from one year to another are due to two reasons: (i) the data available from the Bureau Van Dijk database and (ii) the technicality behind the X-efficiency model. About this last point, it is to be noticed that in order to build up the efficient frontier, we need a continuous stream of financial data for each bank in the sample; this means that in case of lack of those data for one or more years, we have to cancel the bank under investigation for the only period before (or after) this lack. Of course, we tried to maintain the most recent data to the detriment of the elder ones. This fact has only a negligible impact because the most important banks are always present, for each country and for the entire period.

^u Our result is in line with previous literature (see for example Bülbül *et al.* 2013, Doumpos & Zopounidis 2013). The Spanish case is characterized by high differences with respect to the other countries and so it could deserve a specific analysis in a next in-depth study of the work.

Table 4. Composition of the sample of mutual banks in terms of specialization and country. Number of observations and total number of banks in the panel.

	2011	2012	2013	2014	2015	2016	Panel
Commercial banks	131	141	263	266	272	271	1344
Mutual banks	397	441	1794	1830	1845	1826	8133
Mutual banks by category							
Savings banks	85	86	531	536	534	529	2301
Popolari banks	19	21	23	23	22	21	129
Cooperative banks	293	334	1240	1271	1289	1276	5703
Mutual banks by country							
DE	116	119	1368	1367	1359	1337	5666
ES	9	9	33	37	61	59	208
FR	21	21	73	82	83	87	367
IT	251	292	320	344	342	343	1892

Table 5. Geographical composition of the sample of mutual banks in terms of size at the end of 2016 (Total Assets – Thousand €).

	Mean	Median	St. dev.	CV	Max	Min
DE	3,599,657	691,530	59,973,584	16.66	2,118,765,000	16,888
ES	14,553,797	523,775	53,119,670	3.65	362,209,032	24,570
FR	62,673,515	14,701,446	253,290,314	4.04	1,722,849,000	72,053
IT	1,985,008	494,265	8,371,060	4.22	112,383,917	20,838
Mutual banks	6,464,879	684,295	77,182,158	11.94	2,118,765,000	16,888

The degree of efficiency of the mutual and commercial banks of our sample is always decreasing in the observed period (Table 6) even if there is a huge difference among the groups belonging to different countries. Figure 1 offers a graphical comparison of the differences in the levels of efficiency of mutual banks in our sample.

The highest efficiency scores of the mutual banks range between 86% and 89% and they are attributable to banking groups from Italy^v and France, while less efficient banks belong to Spain with a score that ranges between 60% and 73%. German mutual banks lie in the middle with a score that ranges between 80% and 83%.^w The level of efficiency of mutual banks is on average decreasing in the observed period, but in the case of Spain this trend is particularly dramatic. Otherwise, the lack of efficiency for the Spanish mutual banks is 13% while for the other countries it is smaller (3% in case of Germany and France, 2% in case of Italy). With the

^vThese results are in line with previous literature such as *Lozano-Vivas et al. (2002)*, *Weill (2004)*, *Pastor & Serrano (2005)*, *Pacelli & Pampurini (2016)*.

^wThis difference between German groups and other countries' groups is in line with previous literature's results (*Lozano-Vivas et al. 2002*, *Weill 2004*, *Pastor & Serrano 2005*) and it is probably due to the fact that in the last decade, the German banking system suffered many problems of capitalization and stability so that many banks received state benefits in order to survive.

Table 6. Cost efficiency estimates for mutual and commercial banks by country.

	2011	2012	2013	2014	2015	2016
DE	0.83	0.82	0.81	0.81	0.80	0.80
ES	0.73	0.72	0.67	0.66	0.61	0.60
FR	0.89	0.89	0.87	0.87	0.86	0.86
IT	0.88	0.88	0.87	0.87	0.87	0.86
Mutual banks	0.86	0.86	0.82	0.82	0.81	0.81
DE	0.65	0.65	0.64	0.65	0.65	0.65
ES	0.84	0.83	0.73	0.71	0.70	0.63
FR	0.68	0.67	0.69	0.69	0.68	0.68
IT	0.76	0.76	0.75	0.76	0.75	0.74
Commercial banks	0.71	0.71	0.69	0.69	0.69	0.68

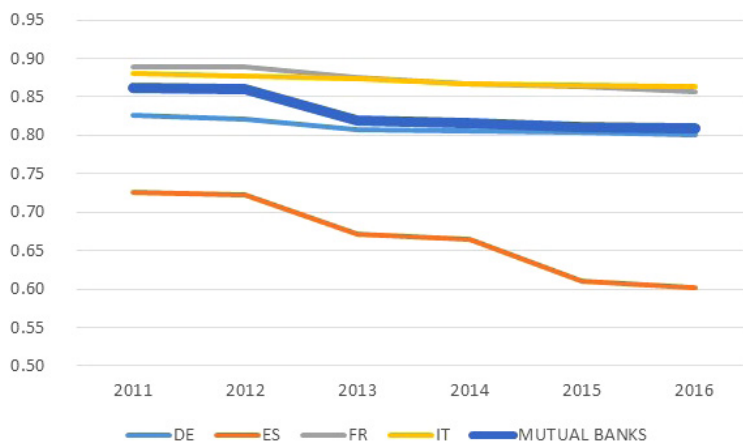


Fig. 1. Mutual banks: Cost efficiency trends by country.

exception of Spain, this trend reveals a very good result for the mutual banks analyzed because it means that, despite of the problems caused by the sub-prime crisis, the Sovereign Debt crisis and the NPL crisis, the mutual banks' business model proved to be strong. Although, the mutual banks remain significantly more efficient than commercial banks (except for Spain), the average reduction of efficiency for the mutual banking system (5%) is higher than the lack of efficiency of the commercial banks (3%) in the same period. So, the systemic variables that led to the reduction in the efficiency of the whole banking system have hit more the mutual banks than the commercial ones, but these factors did not determine the overtaking in the levels of efficiency of commercial banks compared to mutual ones (they remain on average more efficient during and after the financial crises).^x

^xThis result is in line with previous literature. See, for example, [Mottura \(2008\)](#), [ANPB \(2009\)](#) and [EACB \(2010\)](#).

This result may seem surprising because some countries, like Italy and Spain, had a really troubled period in recent years, especially after the Sovereign Debt Crisis. But, in order to understand these data, it is useful to take into account some features. For example, in 2011 the Italian economic system suffered a strong speculative attack focused in particular on Sovereign Bonds, the media spoke of a system bordering on near collapse, but in a few weeks Italy recovered. Italian banks revealed to be able to stop speculation buying a huge quantity of Treasury bonds so that their price that was rapidly falling down recovered to previous levels. Of course, this solution was successful because the banking system took advantage of its high level of liquid assets and could access more liquidity from the Central Bank showing that it was much more robust than supposed by the general opinion (the most important banks maintained their rating while the Italian Government was downgraded). As a result, the Italian spread reduced and the value of the Treasury bonds increased with a strong positive effect on banks' balance sheets.^y In addition, it is also to be noticed that many discussions about the (high) level of NPLs usually take into account the value of gross loans and from the international comparison the situation of some banking systems like, for example the Italian system, appears dramatic. Actually, if we have a closer look at the accounting situation of Italian banks we see that the high level of NPLs is deeply counterbalanced by a high level of provisions so that the real coverage ratio of these banks' loans is higher than the European average.^z Besides, recent literature^{aa} shows that, on average, Italian banks were able to recover more than 40% of their bad loans. Also this result is due to a difference in the methods used by banks from different countries to distinguish a NPL from another kind of uncertain loan: Italian rules are very severe and the impact on the NPL ratio is, of course, huge.^{bb} Another characteristic of the banking systems of the Southern Europe, especially Italian banks, regards the use of financial leverage: these banks usually work with a low level of leverage. Of course this fact may be responsible of a lower level of profitability when we compare these banks with northern banks.^{cc}

^y Another element that is helpful to understand the advantage of Italian banks relates to a very recent topic discussed on the table of the ECB: the problem of the evaluation of risk weighted assets (Resti 2016, ABI 2017). As observed, most of the banks operating in the southern Europe adopted the Standardized Approach to evaluate their risk weighted assets (RWAs) for capital ratios. Only few banks implemented an Internal Rating Based method. The situation in the central and northern Europe is just the opposite. Recent literature observed that the two approaches generate different RWAs for the same exposure and, of course, the results of IRB models are lower. This means that even if the capital ratios of southern banks are, on average, higher than northern banks, they do not reflect a real riskier situation, it is only an algebraic result. As a consequence, the Basel Committee is discussing a proposal for a reform in IRB models.

^z ABI (2017).

^{aa} ABI (2017).

^{bb} Our data confirm this result. We omitted this table, but it is available on request.

^{cc} ABI (2017). Also in this case we omitted the table, but it is available on request.

5.2. A focus on the Italian cooperative banking system

As discussed in Sec. 3, the cooperative banking system in Italy combines two kinds of banks: Banche Popolari and Banche di Credito Cooperativo (hereafter BCC), whose main differences pertaining to the territorial limitation of BCC and to the allocation of the net returns coming from the banking activity. Popolari and BCC banks, as a whole, represent a relevant share of the Italian banking system and their importance relates to the particular link with small and medium enterprises. This means that their business, whose aim is to sustain the local community and the families, is strongly influenced by the health of the social fabric of the area in which they operate.

In the following tables and figures, we present the composition of the whole sample of Italian banking groups in terms of specialization (Table 7), the composition of the sub-sample of Italian mutual banks in terms of size at the end of 2016 (Table 8) and their cost efficiency estimates and trends (Table 9 and Fig. 2).

Table 7 shows the composition of the sample of Italian banking groups in terms of specialization distinguishing commercial, cooperative, popolari and savings banks in the observed period and it shows a slight increase in the number of banks from 2011 to 2016.^{dd} Table 8 shows the composition of the sample of Italian mutual banks in terms of size at the end of 2016. It can be noticed that cooperative banks are the most numerous, but they are the smallest in terms of size; despite this, they exhibit the lowest variability coefficient (CV) therefore it means that they are more homogeneous (in terms of size) than the other two categories (popolari and savings banks).

Table 7. Composition of the sample of Italian banking groups in terms of specialization. Number of observations and total number of banks in the panel.

	2011	2012	2013	2014	2015	2016	Panel
Commercial	52	56	66	64	65	67	370
Cooperative	212	251	275	299	299	300	1636
Popolari	19	21	23	23	22	21	129
Savings	20	21	22	22	21	21	127
Panel	303	349	386	408	407	409	2262

Table 8. Composition of the sample of Italian mutual banks in terms of size at the end of 2016 (Total Assets – Thousand €).

	Mean	Median	St. dev.	CV	Max	Min
Cooperative banks	1985008	390925	2817027	1.42	46854799	20838
Popolari banks	13445598	1226616	27086751	2.01	112383917	67824
Savings banks	6992850	3137211	11035000	1.58	52992004	1042568

^{dd}In order to understand the reason for this increase see footnote number 20.

Table 9. Cost efficiency estimates for Italian banks by category.

	2011	2012	2013	2014	2015	2016
Cooperative banks	0.88	0.88	0.88	0.87	0.87	0.87
Popolari banks	0.86	0.85	0.85	0.85	0.85	0.84
Savings banks	0.85	0.85	0.84	0.84	0.84	0.84
Mutual banks	0.88	0.88	0.87	0.87	0.87	0.86
Commercial banks	0.76	0.76	0.75	0.76	0.75	0.74

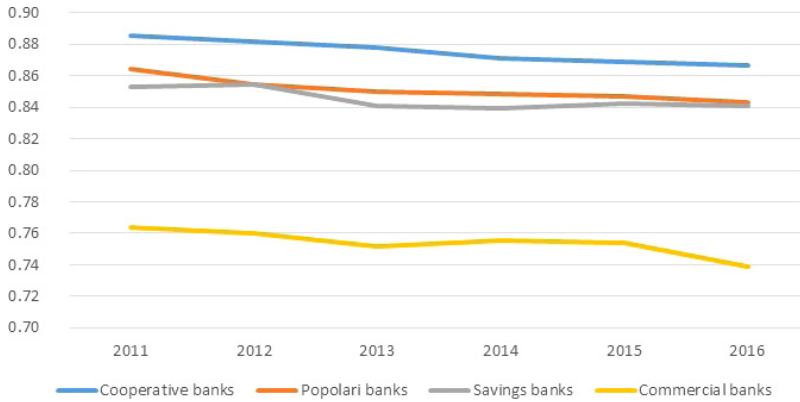


Fig. 2. Italian banks: Cost efficiency trends by category.

Table 9 and Fig. 2 show the cost efficiency estimates and trends for Italian mutual banks. The cost efficiency scores of Italian mutual banks evaluated with the stochastic frontier approach range from a minimum of 84% (savings banks from 2013 to 2016 and popolari in 2016) to a maximum of 88% (cooperative banks from 2011 to 2013). This result means that our units waste about 12% (with respect to the maximum of 88%) of their inputs or, which is the same, they could increase their outputs, with the same input factors and costs. Above all, our analysis focused on the Italian banking system confirms the result obtained from the observation of the whole European sample since it reveals that all the categories of Italian mutual banks are significantly more efficient than Italian commercial banks. This difference is, on average, equal to 12%. Within the heterogeneous category of Italian mutual banks, cooperative banks are, by far, the more efficient with a cost efficiency coefficient varies from 88% (in the first half of the observed period) to 87% (in the remaining years). On average, cooperative banks' efficiency score is about 3% greater than popolari and savings banks' scores.

Our analysis also reveals that the degree of efficiency of the mutual and commercial banks of our sample is always decreasing in the observed period with the same reduction rate (2% from 2011 to 2016 both for mutual and commercial banks), but this reduction rate is lower than those of the other countries analyzed.

So, the systemic variables that led to the reduction in the cost efficiency scores of the European banking systems hit in the same measure both Italian mutual and commercial banks, but the Italian banking system as a whole suffered less than the other European banking systems, showing a higher level of robustness during the financial crises.

5.3. *The determinants of the cost efficiency of mutual banks*

As discussed in the introduction, this paper aims also (RQ₂) to point out the determinants of efficiency in order to understand if the mutual model reveals to be still attractive in the modern banking system. So, the following analysis tries to identify some variables that show a relationship with the efficiency level of mutual banks in order to discover the key points that managers should focus on when they plan their business strategies. As stated before, these variables.^{ee} are referred to regulatory capital requirements, to the level of capitalization/leverage, the level of credit risk and provisions, the level of liquidity, the business model, the profitability of the bank business and the ability to control for the impact of costs. In order to assess the explanatory power of these variables^{ff} we implemented a multivariate analysis; the results are shown in Table 10.

The business model is captured by the ratio of net loans on total assets (LOANSTA) and by the ratio of internet earning assets on total assets (INTEARNATA): a bank focused on traditional lending activity reveals a high level of both these variables. We also considered the ratio of total securities on total assets (TSTA) which can be considered as a proxy of the investment activity of the bank. This ratio is usually very high, with respect to LOANSTA, for investment banks, but in case of traditional banks, it also may be important since it represents the aptitude to invest the liquidity that exceeds loans in order to maintain a suitable amount of financial instruments for personal purposes and for trading with customers. The level of credit risk aversion of each unit is captured by the ratio of impaired loans on gross loans (IMPLGL) and by the ratio of loan loss provisions on average gross loans (LLPAGL): the meaning of these indicators is not univocal since an excessive quantity of bad loans surely worsens the position of a bank against credit risk, on the other hand, the decision to put more loans under impairment and increase the provisions signals a high prudential behavior. The Regulatory capital requirement captured by the TIER1 ratio represents the capital strength of a bank. The role of capital is quite debatable in literature since, from one side it is considered a good buffer against all the losses that a bank can incur, but on the other side capital is expensive and is often considered like a cost. Our analysis wants to show which of

^{ee}We chose these variables according to recent literature on X-efficiency and scale economies. See, for example, Fethi & Pasiouras (2010) and Beccalli *et al.* (2015).

^{ff}All these variables are free from collinearity problems since all the Variance Inflation Factors (VIF) values are very low.

Table 10. Determinants of cost efficiency for mutual and commercial banks — multivariate analysis.

	Mutual banks	Commercial banks
IMPLGL	-0.000763*	-0.0191***
Credit risk	(0.00187)	(0.00563)
LLPAGL	0.0209***	-0.00927
Credit risk	(0.00725)	-0.00751
COSTINCOME	-0.00303***	0.000168
Costs	(0.000380)	-0.00103
TIER1	-0.0597***	-0.0159**
Regulatory Capital Requirements	(0.00209)	-0.00728
ETA	0.0670***	0.0137
Capitalization	(0.00583)	-0.0138
LOANSTA	0.00623**	-0.00985
Business model	(0.00297)	-0.00638
ROAE	0.000891*	0.000755
Profitability	(0.00133)	-0.00187
TSTA	0.00743**	-0.0142***
Business model	(0.00300)	-0.00522
NIOR	0.00479***	0.00609***
Profitability	(0.000410)	-0.00219
LIQDSTF	0.0147***	-0.00364
Liquidity	(0.00222)	-0.00315
INTEARNATA	0.0103***	0.000659
Business model	(0.00299)	-0.00509
Constant	0.802***	0.720***
	(0.00435)	-0.0145
Observations	7084	7084
Number of INDEX	1733	1733

Notes: Standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

these two effects prevails.^{gg} The level of capitalization is also analyzed with the ratio of equity on total assets (ETA), this indicator represents also the inverse of the leverage. The profitability of the core business of the mutual banks is captured by the well-known Return on Average Equity ratio (ROAE) and by another indicator that refers specifically to the core lending activity that is the ratio of net interest income on operating revenues (NIOR). The ability to control the level of costs is captured by the cost-income ratio (COSTINCOME) and, eventually, the level of liquidity is captured by the ratio of liquid assets on deposit and short term funding (LADSTF). Also in this case, there are some difficulties to interpret this variable since it is known that in the traditional business model a high level of liquid assets contributes to

^{gg} According to previous literature (Casu & Molyneux 2003, Weill 2004, Curi *et al.* 2015, Zelenyuk 2014) we analyzed other bank specific characteristics that should impact on the efficiency level. We did not report these results because they were not statistically significant and we could not prove robust conclusions, but they are available on request.

decrease liquidity risk but, on the other hand, it represents an opportunity cost for the bank.

As we can see from Table 10, all the variables are significant. The relationship between the level of regulatory capital and cost efficiency is negative, this is probably due to the fact that a high level of TIER1 is considered a good protection against different kinds of risks, but it is costly because this capital cannot be invested in more profitable ways. On the other hand, the link between the level of efficiency and the level of capitalization (the inverse of leverage) is positive,^{hh} meaning that an excess of capital is seen as an important buffer against any kind of problem. The relationship between the business model based on traditional lending activity (LOANSTA) and the degree of cost efficiency is positive; this is an important result (confirmed also by previous literature) that underlines the relevance of the lending business despite the problems that arise during and after the global crisis period. For the mutual banks of our sample also, the investment business (TSTA) reveals powerful and this is probably due to two different reasons. First of all, in a period characterized by low (or negative) interest rates, the banks tried to invest a share of their liquidity in financial instruments with a bit higher return; for the same reason, the ratio of interest earning assets on total assets (INTEARNATA) also reveals a positive relationship with efficiency.ⁱⁱ Secondary, the banks probably tried to maintain a well-equipped portfolio to facilitate the direct trading with customers. This means that mutual banks were not strongly damaged by the effects of the crisis on borrowers probably thanks to the fact that the proximity to the customers let them collect hard and soft information useful to monitor properly the borrowers. The relationship between credit risk (IMPLGL) and cost efficiency is negative, as expected, because a huge quantity of bad (impaired) loans signals a problematic situation and represents a real cost in terms of lack of interests and in terms of losses. On the other hand, the relationship with provisions (LLPAGL) is positive, meaning that a severe amount of provisions reveals a high level of prudence in the board behavior and, of course, a high coverage ratio.^{jj} The relationship between efficiency and profitability of the mutual banks is positive and this is true both for the overall indicator (ROAE) and especially for the core business profitability indicator (NIIOR). This result is important because it means that, even if the lending activity forces the banks to take on more credit risk, the net interest margin, and then the traditional lending business, is still one the most important elements for the efficiency of mutual banks. On the same way, as expected, the ability to decrease the costs (COSTINCOME) associated with the banking business has a positive impact on efficiency. Lastly, the relationship between efficiency and liquidity is positive, meaning that a prudent amount of cash or of financial instruments that can be promptly converted into cash, reveals to be an important buffer to offset unexpected and sudden problems.

^{hh} These results are in line with previous literature. See, for example, [Groeneveld \(2014\)](#) and [Mattei & Miglietta \(2011\)](#).

ⁱⁱ These results are in line with previous literature. See, for example, [Mattei & Miglietta \(2011\)](#).

^{jj} These results are in line with previous literature. See, for example, [Groeneveld \(2014\)](#).

In order to understand if the same key variables can be considered strategic also for commercial banks, we tried to evaluate the relationship between the above mentioned measures and the level of efficiency of the commercial banks in our sample. The results are shown in the second column of Table 10. It is clear that the impact is very different, in fact, most variables lose their significance and in some cases they also reveal an opposite sign. The relationship between efficiency and credit risk is confirmed only in the case of the ratio of impaired loans on gross loans, but the relationship with provisions is opposite and is not significant. The impact of the level of regulatory capital is the same, but, on the contrary, the leverage is now not significant. The relationship between cost efficiency and the business model is really opposite since the signs of the variables that represent the traditional lending activity and the investment business are negative and, in the first case, the variable is not significant. This result is confirmed also by the fact that the ratio of interest earning assets on total assets loses its significance too. The relationship between efficiency and profitability maintain the same sign but the coefficient of ROAE is not significant. The impact of costs, as well, exhibits no significance in case of commercial banks.

From the comparison of the results referred to mutual banks and commercial banks, we can infer that the determinants that are responsible for the high-level of mutual banks' cost efficiency are not able to influence, in the same positive way, the degree of efficiency of commercial banks.

6. Conclusions

As discussed in the introduction, this paper has two main objectives. First of all, it compares the relative efficiency of mutual banks by analyzing a sample which consists of the universe of all the banks operating in Italy, Germany, France and Spain over the period 2011–2016 and then, it points out the determinants of efficiency in order to understand if this particular business model reveals to be still attractive in the modern banking system.

About the first research question, the empirical analysis reveals that the highest efficiency scores of the mutual banks observed ranges between 86% and 89% and they are attributable to banking groups from Italy and France, while less efficient mutual banks belong to Spain with a score that ranges between 60% and 73%. German mutual banks lie in the middle with a score that ranges from 80% to 83%. The level of efficiency of mutual banks is on average decreasing in the observed period, but in the case of Spain this trend is particularly dramatic. Otherwise the lack of efficiency for the Spanish mutual banks is 13% while, for the other countries, it is smaller (3% in case of Germany and France, 2% in case of Italy). With the exception of Spain, this trend reveals a very good result for the European mutual banks analyzed because it means that, despite the problems caused by the sub-prime crisis, the Sovereign Debt crisis and the NPL crisis, the mutual banks' business model proved to be strong. Our analysis reveals that, except for Spanish banks, the mutual banks are significantly

more efficient of commercial banks in the period analyzed. Indeed, the average cost efficiency score of the European mutual banks ranges from a minimum of 81% to a maximum of 86% while the average cost efficiency score of the European commercial banks ranges from a minimum of 68% to a maximum of 71%.

Although, except for Spanish banks, the European mutual banks analyzed remain significantly more efficient than commercial banks, the average reduction of mutual banks' efficiency (5%) is higher than the lack of efficiency of the commercial banks (3%) in the same period. So, the systemic variables that led to the reduction in the efficiency of the European banking system hit more the European mutual banks than the commercial ones. Despite this, the same factors did not determine the overtaking in the levels of efficiency of commercial banks compared to mutual ones, which remain, on average, more efficient during and after the financial crises. These data could provide relevant information both for bank directors and for policy makers.

About the specific case of Italy, our analysis reveals that Italian mutual banks are significantly more efficient than Italian commercial banks. The average cost efficiency score of Italian mutual banks ranges from a minimum of 86% to a maximum of 88% while the average cost efficiency score of Italian commercial banks ranges from a minimum of 74% to a maximum of 76%. Within the heterogeneous category of Italian mutual banks, cooperative banks are, on average, the most efficient with a cost efficiency coefficient that varies from 88% (in 2011, 2012 and 2013) to 87% (in 2014, 2015 and 2016). Our analysis also reveals that the degree of efficiency of the Italian mutual and commercial banks is always decreasing in the observed period with the same reduction rate: 2% from 2011 to 2016 both for mutual and commercial banks. This value is lower than those of the other countries analyzed. So, the systemic variables that led to the reduction in the efficiency of European banking system hit in the same measure both Italian mutual banks and Italian commercial ones, but in Italy the lack of efficiency is lower than in the other European countries analyzed. This is an important result that shows the solidity of the Italian banking system during the period of the financial crises and, specifically, the profitability of the business model based on the relationship lending typical of Italian mutual banks.^{kk} In particular, we believe that the main factors of success for Italian cooperative banks, which are, by far, the most efficient banks during the period analyzed, are referred to their business model based on the intimate knowledge of customers that should allow a better selection process; in this way they are able to increase the credit quality and reduce the incidence of NPLs. Another important distinguishing feature of the Italian cooperative model is the long term vision combined with a strategy that is aimed at financing the regional economy and the development of the communities rather than pursue only a short-term profit. This represents a further element of structural stability. Moreover, the capital solidity of the Italian cooperative banks (their profits are largely held in reserve) and the governance model, based on the

^{kk} This kind of relationship is also highlighted in previous literature. See, for example, [Groeneveld \(2014\)](#).

involvement of local representatives, can be considered further and fundamental anti-cyclical levees against the effects of the financial crisis.

About the second research question, the empirical analysis reveals that the mutual banks' cost efficiency is significantly and negatively correlated with the level of regulatory capital, underlining that this amount of unprofitable capital is seen as an opportunity cost. Also the relationship between credit risk and cost efficiency is negative and significant meaning that a huge quantity of bad (impaired) loans signals a problematic situation and represents a real cost. On the contrary, the link between cost efficiency and the level of provisions is positive and significant because a high level of provisions is considered a good shield against unexpected troubles. These two results combined together show that the improvement of the risk management function will be one of the most important topics for mutual banks' managers in the future years. Otherwise, the link between cost efficiency and the business model based on traditional lending activity is positive and significant. This probably reveals that the banks devoted to traditional lending activity, like mutual banks, were able to afford the negative effects of the crisis. Similarly, the mutual banks' cost efficiency is significantly and positively correlated with the profitability of both the whole business and of the traditional core business meaning that, even if the lending activity forces the banks to take on more credit risk, the net interest margin is still one of the most important sources of income for mutual banks and so, despite the significant and negative impact of NPLs, mutual banks managed to maintain high levels of profitability of the traditional core business. Our analysis shows that the same variables have not the same importance in case of commercial banks. Most of them lose their significance and in some cases they also exhibit an opposite sign. This result emphasises the peculiarity of the mutual bank business model and underlines the fact the key variables that drive cooperative banks to success are different than in case of commercial banks. Cooperative banks' managers should concentrate upon their vocation to traditional lending following a strategy able to improve the risk management function (in order to control the quantity of risk that the bank is able to afford) and to maintain a discrete amount of capital that allows the bank to survive to particularly stressed periods.

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