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ABSTRACT

Does 'inner' competition – rivalry among network members – worsen performance in a network of cooperative banks? Inner competition might, in fact, endanger network-dependent scale economies. We test our hypothesis on Banche di Credito Cooperativo (BCCs), Italy's network of mutual cooperative banks. We find a worsening of performance both at incumbent and (even more) at aggressor BCCs when they compete among themselves. Instead, the worsening is mild when BCCs compete with non-BCC comparable banks. We conclude that inner competition among cooperative banks is a negative sum game and, thus, limiting it would be desirable to preserve the stability of cooperative banking networks.

Keywords: Cooperative Banks, Rivalry Among Network Members, Strategic Interactions, Negative Sum Game

JEL classification codes: D47, G21, G34

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1. Introduction

According to the economic mainstream, competition is the engine to efficiency. Nevertheless, exceptions apply. Three cases stand out. First, *internal economies of scale* in production, or other restrictions that limit the number of players (e.g. patents), may lead to restrain competition. Second, *asymmetric information*, e.g. in the markets for labor (Spence, 1973) and credit (Stiglitz and Weiss, 1981; Diamond, 1984), can make competition unworkable. Third, *network economies* (i.e. when the economies of scale or the value of a product depend positively on the extent of the network of users) imply that cooperation could achieve efficiency where competition wouldn't (Katz and Shapiro, 1994). In those situations, market structure is going to affect actual outcomes.

Thus, with reference to the Italian banking market, one cannot assume that competition is by definition efficiency enhancing within the Banche di Credito Cooperativo (henceforth BCCs), a system of a few hundreds cooperative firms organized in a banking network. In this case, two of the principles making competition potentially undesirable join forces. In the first place, belonging to a network in which some products/services are jointly produced may lead to sizable network economies, thus suggesting cooperation – rather than competition – as the avenue to achieve efficiency. Secondly, BCCs operate in the credit market, where untamed competition could lead to worse outcomes: Without relationship banking – based on long-term bank-firm rapports – lender-borrower information asymmetries would be higher and credit rationing would increase, a less desirable outcome for both borrowers and banks.

Then, evaluating the relative merits of competition vs cooperation is non-trivial for BCCs. On one hand, competition looks beneficial as it should expel from the market inefficient BCCs. On the other hand, cooperation might boost BCCs' efficiency, as it enhances their network economies, and supports a way of doing business – namely, relationship banking – that is particularly suitable towards the small and medium-sized enterprises (SMEs), the typical BCC customers, with the side effect of reducing costs implied by market failure in collecting information in credit markets.

In addition, an important issue to be addressed is the role of 'outer competition' vs 'inner competition' in BCCs' performance. The former applies when a BCC competes with other bank types but not with other BCCs. Instead, we have inner competition when a BCC competes with one or more other BCCs.

Barbetta et al. (2016) provide empirical evidence supporting the hypothesis that outer competition has positive effects on BCCs while inner competition delivers negative consequences on these mutual banks. Specifically, studying the BCCs operating in the province of Trento (North-Eastern Italy) they find that: i) 'loans to deposits' and 'loans to total assets' ratios are significantly higher for BCCs that do not compete with each other, but only with non-mutual banks, and ii) 'bad loans to total loans' ratios are significantly lower for the same group of banks. This evidence seems to suggest that both 'local effectiveness' (i.e. ability to transform local savings into local loans) and 'mission efficiency' (i.e. ability to manage credit risk) of BCCs are better achieved when the degree of outer competition is high, but the degree of inner competition is low.

In turn, Coccorese et al. (2016) address analogous issues but on data for the whole of Italy. They show that: a) branch productivity is negatively affected moving from a BCC monopoly to a BCC duopoly, b) branch productivity is negatively affected moving from 'outer' competition only to both 'inner' and 'outer' competition.

The signals that inner competition is problematic for BCCs are clear enough from Barbetta et al. (2016) and Coccorese et al. (2016). However, both papers fail to explain the channels through which inner competition deteriorates performance and are therefore unsatisfactory in two main respects. First, they consider only a limited number of variables (loan/deposit ratio, bad loans/total loans ratio, branch productivity) and the case would be more convincing if one could show that also other standard measures of performance – e.g., ROA and/or efficiency scores – tell the same story.

Moreover, the two papers examine inner competition without distinguishing between aggressor BCC and incumbent BCC and the strategic actions at play between them. In this respect, we can consider three main strategic outcomes for the competitive attack by the aggressor BCC: i) it succeeds and the incumbent BCC is pushed out of the market, ii) it is unsuccessful with only the aggressor BCC suffering a worsened performance, and iii) it is unsuccessful with both the aggressor BCC and the incumbent BCC suffering lower performance. In the first case, the damage to performance detected by Barbetta et al. (2016) and Coccorese et al. (2016) is only temporary and would simply tell that the aggressor BCC is competing out the incumbent BCC. Over time, the latter would be pushed out of the market and the aggressor would then recover higher performance. In that case, the sum of the strategic game between the two BCCs could be zero or even positive if, e.g., an efficient aggressor drives out of the market an inefficient incumbent. However, the sum of the game would be either zero or negative if the second or third cases apply. In case ii) it is the aggressor BCC, possibly indulging in empire building, who bears the brunt of a worse performance. Here, it could turn out that the strategic attack was ill advised and even the survival of the aggressor could be endangered. In case iii), both aggressor BCC and incumbent BCC would be weakened.

Building on these considerations, our paper accomplishes two tasks. First, we enlarge the performance measures to detect the effects of inner competition within the BCC network. Second, and most importantly, we track performance separately for aggressor vs incumbent BCCs. Our main results are that inner competition worsens BCC performance even when we look at additional measures. Furthermore, our findings are most consistent with strategic case two, i.e. performance worsens more evidently for aggressor (attacking) BCCs with lower effects on incumbent (attacked) BCCs. We also show that performance deterioration is milder when an aggressor (incumbent) BCC starts competing with a non-BCC comparable bank. Overall, our evidence supports the view that inner competition – likely damaging BCCs' network economies – is a negative sum game.

In the rest of the paper, Section 2 recaps the literature and frames testable hypotheses, Section 3 presents our database and empirical approach, and Section 4 reports the main econometric results. Section 5 closes, points avenues for future research, and draws the chief policy implications of our findings.

2. Background Literature and Hypothesis Formulation

Some authors cast serious doubts on the efficacy and desirability of the 'level the playing field' mantra that seems to be shaping much of the current approach to banking regulation that is itself questionable (e.g., Admati and Hellwig, 2013; Ferri and Neuberger, 2014).

Going back to the New Institutional Economics (NIE; e.g., Coase, 1937), firms are coordination forms that substitute the market to minimize transactions costs. Firms usually bear costs due to the *organization to be in the market* ('costs of contracting') as well as costs related to *relationships within the firm* ('costs of ownership') (Hansmann, 1996). Moreover, controlling agents' behavior in a context of asymmetric information is crucially important (Bacchiega and Borzaga, 2001).

Traditionally the production of goods and services by investor-owned capitalist firms (shareholders firms) is deemed more efficient than that by non-investor-owned firms (stakeholders firms). However, in many important industries a prominent role is played by non-investor-owned firms (and, in particular, by cooperatives),[1] viewed as an alternative efficient way to organize production by the NIE. In reality, cooperative firms: a) generally do not distribute profits as dividends to cooperative members, thus lessening the search for profits and the exploitation of information asymmetries, b) compared to investor-owned firms, are more closely controlled by their

[1] To be sure, cooperative banks are not the sole component of the stakeholder banking sector. However, in Italy savings banks – the other component – were forcefully transformed into joint stock banks in the early 1990s. Butzbach (2016) tries to explain why savings banks survived in France but not in Italy.

member-owners, because of the substantial fraction of transactions between members and the cooperative, and c) grant benefits to members that are not only monetary, but relate also to the quality of goods and services. Another trait of cooperative firms is the fact that they often benefit of network economies, i.e. the beneficial spillovers deriving from belonging to a network.

At the same time, it is usually recognized that scale and scope economies provide rationales for integration. This is due to efficiency reasons (e.g. integration can avoid contracting frictions and allow to internalize the transfer of some tangible good or service), as well as to strategic motives (integration can be a tool to consolidate or to extend market power). However, many networks have huge potential for economies of scale.

In a network economy, value is created and shared by all network members, rather than by individuals,[2] and economies of scale arise from the size of the network. Furthermore, value arises from connectivity, thus an open system is preferable to a closed system because the former has more nodes. In this respect, firms' competitive advantage increases with their interconnectedness, and cooperation may boost interconnectedness.[3] In turn, beside a network's size, its structure (feasibility of transactions, centrality of members, structural holes, network ties, number of roles each member plays) and conduct (opportunistic behavior, reputation signaling, perceptions of trust) also significantly impact the value of a network to users and providers (Afuah, 2013; Skilton and Bernardes, 2015). Moreover, it has been found that cooperative vs rival behavior in strategic networks may be asymmetric depending on the relative size of the individual participating firm (Mas-Ruiz et al., 2014). Thus, the impact for a firm's strategic behavior of its belonging to a network would go well beyond the effect of multimarket contacts (Chuang et al., 2015).[4]

Therefore, one should study competition within a cooperative banks' network with a specific approach, something mainstream economics fails to do with its prescription of market-enhancing regulations.[5] Those regulations are believed to benefit society in terms of efficiency gains, but, at the same time, they likely reduce the scope for cooperative firms and their aim of reducing the deadweight loss in imperfectly competitive (and informationally opaque) markets. So, the impact of those regulations is ambiguous both on the working of cooperatives and on social efficiency.

Four main features of cooperative bank membership typically affect small and marginal firms in local markets (Grillo, 2013). First, there is a high degree of homogeneity among members (who

[2] See Grandori (1997) for a useful taxonomy to distinguish the types of networks.
[3] Shyam Kumar (2010) documents how cooperative behavior can result in a positive sum game in Joint Ventures. Daskalaki (2010) finds that cooperation boosts innovation in creative industries.
[4] According to some authors, the specificity of network effects – particularly, network intensity and presence of a dominant design in the market – would have implications also for Real Options calculations and market entry decisions (Chintakananda and McIntyre, 2014).
[5] These negative effects of competition in networks would go beyond those found for non-network industries (e.g., Andrevski and Ferrier, 2016).

belong to the same local community and/or social group). Second, individual membership is subject to explicit acceptance by all other members. Third, borrowers are typically members of the cooperative. Fourth, ownership is dispersed (along the 'one head-one vote' principle and the ceiling to any single member's number of shares). These four features combine to enhance – through better screening and monitoring of borrowers – the efficiency/effectiveness of credit cooperatives to serve marginal borrowers.

In addition, credit cooperatives can effectively reduce financial exclusion: since BCCs engage in relationship banking (Boot, 2000; Boot and Thakor, 2000), they are better equipped to deal with borrowers' moral hazard (Angelini et al., 1998). Essentially, BCCs face a trade-off. On one hand, they are disadvantaged by their small size, specialization, and high concentration of credit risks. On the other hand, they are largely not substitutable providers of loans to local borrowers.

Over the years, this trade-off may have been significantly exacerbated for various reasons. First, being created as cooperative groups among self-producers to escape credit rationing, BCCs were mostly 'natural monopolists' in their own territory. Before 1993, this market structure was even enforced by the Banking Law of the time (e.g. legal and financial barriers to entry in local markets, control of the size and branching network of banks). After 1993, territorial overlapping of BCCs became lawful, and both the Bank of Italy and the Italian Competition Authority repeatedly argued that competition among BCCs ('inner competition') is a valuable component of the competitive process in banking markets, along with competition between BCCs and other (non-mutual) banks ('outer competition').

As mentioned, Barbetta et al. (2016) and Coccorese et al. (2016) argue that, on the contrary, one should worry about BCCs territorial overlapping, since BCCs competitive behavior need to be evaluated differently than for other banks. Both papers document that performance worsens at BCCs competing against other BCCs (something not found when BCCs engage in competition with non-mutual banks).

As to the way in which banking competition affects performance of individual banks, many papers cast the issue in terms of strategic interactions among banks (Carletti, 2008). Since traditional banks – such as BCCs – still rely to a large extent on a branch-based supply of services (Gilje et al., 2016), those strategic interactions between any pair of banks may be identified by an overlap of their branches. Then, it is useful to survey papers studying banks' branching decisions.

Several works refer to the U.S. market. For instance, Cohen and Mazzeo (2010) focus on post-deregulation rural banking markets and find that: i) market structure and product differentiation play a major role, and ii) bank branch investments seem to seek a potential entry-deterring effect. This is also consistent with Adams and Amel (2016) and with Berger and Dick (2007). The former

find that the threat of entry is an important factor in the evaluation of the potential competitive effects of proposed mergers and acquisitions, while the latter detect a clear market share advantage for early entrants. Other papers – e.g., Dinger and von Hagen (2011) – study the strategic positioning of bank branches in the newly liberalized banking industries of Central and Eastern Europe. They find that incumbent banks, due to their preferential position in the deposit market, are able to generate higher margins than new entrants, who instead can fund their lending-oriented expansion in the area. For Italy, Felici and Pagnini (2008) examine the determinants of entry into local banking markets during the period 1991–2002. They show that banks are more likely to expand into those markets that are closest to their pre-entry locations, while large banks are also better able to cope with distance-related entry costs than small banks.

Furthermore, bank entry decisions may also reflect the macroeconomic cycle. For instance, on a sample of 124 countries for 1991-2000, Mandelman (2006) shows that ex-post bank markups are strongly countercyclical, and explains this pattern via the highly procyclical entry of (foreign) banks that occurs mostly at the wholesale level and signals the intention to spread to the retail level.

A partially different strand of literature deals with the specificity of the incumbent-aggressor strategic interaction in banking, viewed as an industry characterized by entrenched asymmetries of information. This may be exemplified by Bouckaert and Degryse (2006), who argue that incumbent lenders release information only about a portion of their profitable borrowers for strategic reasons. This would allow incumbents to capture a pool of unreleased borrowers characterized by a severe adverse selection problem. In their view, this prevents aggressors from bidding for all the incumbent's profitable borrowers and reduces their scale of entry. Similarly, Bofondi and Gobbi (2006) test whether asymmetric information between incumbents and aggressors generates barriers to entry into credit markets. Specifically, incumbents' superior information about their own customers and the overall economic conditions of the local credit market may lead aggressors to suffer higher loan default rates than the incumbents. They find that, indeed, the default rate is significantly higher for those banks that entered local markets without opening a branch, suggesting that having a branch on site may help to reduce the informational disadvantage. They also argue that these informational barriers can help to explain why entry into many local credit markets by domestic and foreign banks was slow, even after substantial deregulation. Similarly, Dell'Ariccia et al. (2012) find that the deterioration in lending standards in the run up to the subprime mortgage crisis was more intense where fiercer competition led more banks to open branches.[6]

In view of the surveyed literature, we can formulate the following three hypotheses.

[6] Something similar would happen also in the microfinance market according to McIntosh et al. (2005).

Hypothesis 1: Performance will worsen both at the aggressor BCC and at the incumbent BCC when the two engage in inner competition.

This effect would descend from the fact that inner competition depletes network economies (Afuah, 2013; Mas-Ruiz et al., 2014; Skilton and Bernardes, 2015; Barbetta et al., 2016; Coccorese et al., 2016).

Hypothesis 2: Performance will worsen relatively more for the aggressor BCC than for the incumbent BCC when the two engage in inner competition.

This result is suggested by considering the fact that aggressors stand at a potential disadvantage with respect to incumbents (Bofondi and Gobbi 2006; Bouckaert and Degryse, 2006; Berger and Dick, 2007; Cohen and Mazzeo, 2010; Dinger and von Hagen, 2011; Dell'Ariccia et al., 2012).

Hypothesis 3: Performance will worsen less both at an aggressor BCC and an incumbent BCC when the two compete with a non-BCC comparable bank with respect to when the two engage in inner competition with each other.

This is postulated by the fact that – contrary to inner competition – outer competition doesn't undermine network economies (Afuah, 2013; Mas-Ruiz et al., 2014; Skilton and Bernardes, 2015; Barbetta et al., 2016; Coccorese et al., 2016).

3. Data and Methodology

Our starting point is a confidential dataset (source: Federcasse, the Italian Federation of BCCs) on customer loans of BCC branches from 1996 to 2012, where $LOANS_{ibmt}$ denotes the total amount of loans of branch *i*, belonging to bank *b*, in municipality *m* at year *t*. We have then matched the above data with those drawn from the Bank of Italy – particularly, those regarding the geographical distribution of branches as well as their entrance and exit flows across municipalities and banks during the sample period – and with the balance sheet data provided by ABI (the Italian Banking Association). This database builds on the one used in Coccorese et al. (2016), and readers are pointed to it for a more in depth description of the data.

In order to identify new banks entering in local markets, we have created a dummy variable, $AGGRESSOR_{ibmt}$, which takes the value 1 when a local office *i* is established in municipality *m* at time *t* by BCC *b* (on condition that previously the bank was not present in this municipality).

Correspondingly, we have constructed a second dummy variable, $INCUMBENT_{ibmt}$, which assigns the value 1 to every branch *i* belonging to BCC *b* that was already operating in municipality

m at time *t* before the above entry, i.e. to all local branches that have suffered the entrance from another BCC.

The variable $AGGRESSOR_{ibmt}$ takes the value 1 also for new branches *i*'s that BCC *b* opens in the same municipality *m* in the years following its first entrance. Likewise, the variable $INCUMBENT_{ibmt}$ equals 1 also for new branches *i*'s that BCC *b* opens in the same municipality *m* in the years following the 'aggression' coming from another BCC. Actually, we interpret both events as parts of an overall strategic action of cooperative banks that aims at gaining ground in local markets, on the one side, and at defending their own business position, on the other side.

Since we have to match information from different datasets, we have first assessed: a) whether, for each municipality and each year, the number of observations regarding BCCs' offices (drawn from the Federcasse dataset) equals the number of BCC branches (as reported by the Bank of Italy); b) whether, for each BCC and each year, the number of observations regarding the bank offices in each municipality (drawn from the Federcasse dataset) equals the number of municipality branches (as reported by the Bank of Italy). In case even one of the above conditions does not hold, we have dropped those observations.

Afterwards, we have generated the variable $TOTLOANS_{bmt} = \sum_{i=1}^{N} LOANS_{ibmt}$, measuring the overall volume of loans supplied by BCC *b* at time *t* through its *N* branches operating in municipality *m* (with $N \geq 1$). We have dropped all observations for which $TOTLOANS_{bmt}$ exceeded 5% of customer loans as reported in the official ABI balance sheets (which ensures some flexibility in the data management).

We have also created the variable $TOTLOANS_{bt} = \sum_{m=1}^{M} \sum_{i=1}^{N} LOANS_{ibmt}$, quantifying the overall volume of loans supplied by BCC *b* at time *t* through its *N* branches in the *M* municipalities where it manages branch offices. In this case, we have skipped all observations for which $TOTLOANS_{bt}$ exceeded 15% of customer loans as reported in the ABI dataset.

For any 'aggressive' BCC *b* (i.e. whose observations are characterized by a unit value of $AGGRESSOR_{ibmt}$) and for any sample year *t*, we have calculated the average volume of loans that it has managed in those municipalities where it has entered (up to the considered year) as a share of its total loans (as published in the balance sheets), by means of the following formula:

$$AGGR\_SHARE_{bt} = \frac{\sum_{i=1}^{N} \sum_{m=1}^{M} \left(LOANS_{ibmt} \times AGGRESSOR_{imbt} \right)}{LOANS_{bt}}. \qquad (1)$$

For any 'incumbent' BCC *b* (i.e. whose observations are characterized by a unit value of $INCUMBENT_{ibmt}$) and for any sample year *t*, we have calculated the average amount of loans that it has managed in those municipalities where it has suffered an entry from other BCCs (up to the considered year) as a share of its total loans, according to the following formula:

$$INCUMB\_SHARE_{bt} = \frac{\sum_{i=1}^{N}\sum_{m=1}^{M}\left(LOANS_{ibmt} \times INCUMBENT_{imbt}\right)}{LOANS_{bt}}. \quad (2)$$

When $AGGR\_SHARE_{bt} = 0$, it means that at year *t* cooperative bank *b* operated only in municipalities where it was already established, or where it entered but no other BCCs were operating, while $AGGR\_SHARE_{bt} = 1$ indicates that at year *t* cooperative bank *b* operated only in municipalities where it entered while there was at least another incumbent BCC. A value of $INCUMB\_SHARE_{bt}$ equal to 0 implies that at year *t* cooperative bank *b* operated only in municipalities where no entry of other BCCs had occurred, while a unit value of $INCUMB\_SHARE_{bt}$ suggests that at year *t* cooperative bank *b* operated only in municipalities where it had suffered an entry from at least another BCC.

From the descriptive statistics (see Table 1), we deduce that the average values of *AGGR_SHARE* and *INCUMB_SHARE* for the sample banks amount to 0.0355 and 0.0882, respectively. This means that, during the period 1996-2012, 'aggressive' banks have made about 3.6% of their overall loans in the municipalities where they entered and found another BCC, while in the same municipalities BCCs that faced one (or more) entry have managed about 8.8% of their global loans. It should be noted that 23% of observation exhibit a positive value of *AGGR_SHARE*, corresponding to 200 BCCs that have entered municipalities where at least another cooperative bank was making business. Analogously, 26% of observations are characterized by a positive value of *INCUMB_SHARE*, meaning that 216 BCCs suffered the entry of another cooperative bank in a municipality where they were already operating.

As Figure 1 portrays, the yearly averages of both variables show an upward trend during years, due to both the entrants' progressive penetration of local markets and the increase in the number of BCCs entering new municipalities during time.

INSERT FIGURE 1 ABOUT HERE

We are able now to estimate the following equation:

$$PERFORM_{bt} = \alpha_0 \times AGGR\_SHARE_{bt} + \alpha_1 \times INCUMB\_SHARE_{bt} + \boldsymbol{\beta} \times \boldsymbol{X'} + \gamma_b + \delta_p + \eta_t + \varepsilon_{bt}\,, \quad (3)$$

where: $PERFORM_{bt}$ is a measure of performance of BCCs; $AGGR\_SHARE_{bt}$ and $INCUMB\_SHARE_{bt}$ are calculated as above; $\boldsymbol{X}$ is a vector of (both bank-level and environmental) control variables; γ_b, δ_p and η_t are vectors of fixed effects for banks (with $b = 1,...,B$), provinces where banks operate (with $p = 1,...,P$) and years (with $t = 1,...,T$), respectively; ε_{bt} is the random error term.

Assessing the sign and significance of coefficients α_0 and α_1 is helpful to understand the effects of both tackling and enduring other BCCs on bank outcome. If $\alpha_0 < 0$ and/or $\alpha_1 < 0$, there would be evidence that rivalry among members of the cooperative credit network worsens performance for challengers and/or incumbents. Actually, if $\alpha_0 < 0$, the greater the share of loans that 'aggressive' BCCs earn in municipalities where they have entered and confront with another cooperative bank, the lower their own performance; equally, if $\alpha_1 < 0$, the greater the share of loans that 'incumbent' BCCs hold in municipalities where they have faced the entry of another cooperative bank, the lower their own economic result.

The dependent variables – i.e. the measures of BCCs performance – that we aim at explaining by means of our analysis, are:

- the return on assets (*ROA*), equal to the ratio between pre-tax profit and total assets;
- a measure of cost efficiency of BCCs (*COSTEFF*), which comes from ad hoc estimated Battese and Coelli (1992) scores (see Appendix A for details);
- the average personnel productivity (*EMPLPROD*), here proxied by the sum of loans and deposits divided by the number of BCCs employees;
- the ratio between total loans and total assets (*LOANAST*), an indicator of the extent to which BCCs focus on their traditional activity of loan granting (normally based on relationship lending);
- the ratio of bad loans over customer loans (*BADLOANS*), a proxy for credit risk management.

Finally, besides the just listed partial measures of performance we also consider (the natural logarithm of) the *Z*-score. This is a widely used global measure of performance that many authors employ to assess the stability of a bank (see, e.g., Boyd and Graham, 1986; Hannan and Hanweck, 1988; Boyd and Runkle, 1993; Maechler et al., 2007; Demirgüç-Kunt and Huizinga, 2010; Laeven and Levine, 2009; Beck et al., 2013; Delis and Kouretas, 2011; Fang et al., 2014; Lepetit and Strobel, 2015). Particularly, it is useful to assess banks' distance-to-default, i.e. their individual default risk: bank insolvency risk is higher when the *Z*-score is low, while is lower (that is, banks are more stable) when the *Z*-score is high.

We calculate this index as:

$$ZSCORE_{bt} = \frac{\overline{ROA_b} + \overline{EQAST_b}}{\sigma_{ROA}} \quad (4)$$

where $\overline{ROA_b}$ is the average *ROA* of BCC *b* over years *t*-2, *t*-1 and *t*, $\overline{EQAST_b}$ is the average ratio of total equity to total assets of BCC *b* over years *t*-2, *t*-1 and *t*, and σ_{ROA} represents the standard deviation of *ROA* of BCC *b* calculated over years *t*-2, *t*-1 and *t*.

The vector of control variables ***X*** includes:

- the average municipality share of branches managed by non-mutual banks (*OTHBNKBRANCHES*), which controls for the influence that competition coming from other types of credit institutions may have on the performance of BCCs. For cooperative banks managing branches in more than one municipality, this variable is calculated as a weighted mean, whose weights are given by BCC's municipality loans;
- the natural logarithm of BCC total assets (*TOTAST*), included to account for banks' size;
- the natural logarithm of the BCC age (*BANKAGE*), a proxy of its business experience and length of relationship with borrowers;
- the equity to assets ratio (*EQAST*), which helps to control for the level of BCC capitalization;
- the natural logarithm of the average real per capita value added characterizing the province where the cooperative bank is located (*PERCAPVALADD*), in order to capture the impact of local economic conditions of BCC performance (for multi-province banks, weights are given by BCCs' branches);[7]
- the natural logarithm of the average municipality population (*POP*), which proxies for the size of the reference market (weights are BCC's municipality loans).

Table 1 reports some descriptive statistics for the variables entering the empirical models as well as the description and the specific data sources, while Table 2 exhibits the correlation matrix for the same variables (with significance levels).

INSERT TABLE 1 ABOUT HERE

INSERT TABLE 2 ABOUT HERE

[7] We used data on value added at the provincial level because this is the most disaggregated available figure measuring economic activity. However, during our sample period 70.4% of Italian mutual banks had branches in just one province, and 92.6% in no more than two provinces.

4. Empirical Analysis

4.1 *Baseline Estimates*

The empirical results of our five regressions are shown in Table 3.

INSERT TABLE 3 ABOUT HERE

Overall, we find support for Hypothesis 1. Indeed, we observe that the higher the amount of loans of BCCs that entered municipalities where other mutual banks were already operating (measured as a share of their own overall loans), the lower their *ROA*, *COSTEFF* and *EMPLPROD*. In addition, we notice a drop of *BADLOANS* and *Z-SCORE*, and an increase in *LOANAST*. Therefore, adjusting the composition of loan portfolio through an expansion of credit allowance in markets with other cooperative banks is able to increase the loans-to-assets ratio and reduce non-performing loans, but has also adverse effects on profitability, cost efficiency, labour productivity, and overall stability.

Regarding the incumbent BCCs, when the portion of their total loans that is managed in municipalities shared with other cooperative banks rises, we still find evidence of a deterioration in cost efficiency and an upsurge in the *LOANAST* ratio, while no significant effects are found on profits and worker productivity. Yet, they suffer an increase in bad loans as well as individual bank default risk (although the estimated coefficient of the latter variable is significant only at the 10% level).

The combined analysis of the first three estimations makes thus clear that for BCCs entering in municipalities where other cooperative banks already operate causes a drop in their ROA, cost efficiency, employee productivity, and default risk; this negative outcome is higher for larger acquired market shares. The above entry seems to have no significant effect on both profits and personnel productivity of incumbent BCCs, but it causes a fall in both their cost efficiency and stability, which nonetheless are less than a half that suffered by entering BCCs.

On the positive side, both ‘aggressive’ and ‘attacked’ BCCs get a significant increase in their loans-to-assets ratio (fourth estimation), a positive outcome considering the main mission of such credit institutions. However, for the same level of municipal market share, BCCs belonging to the first group get a much higher growth in the loans-to-assets ratio than those included in the second group. Finally, it emerges that ‘aggressive’ BCCs are able to reduce their share of bad loans, while the opposite happens to incumbent BCCs (fifth estimation). This evidence foresees a ‘cherry-picking’ behaviour (Canales and Nanda, 2012; Sengupta, 2007) by entering mutual banks, which

are able to focus their lending activity so as to catch the 'good' customers from established BCCs, leaving them with the worse ones.

It is also valuable to assess the magnitude of the above effects. For this purpose, let us suppose that a BCC is not currently competing with any other cooperative bank, but has decided to enter one or more municipalities where other mutual banks are presently doing business. Let us also imagine that our BCC is planning to provide in such towns 10% of its own loans, corresponding to the (sample) median share of banks that already made this choice (i.e. $\Delta AGGR\_SHARE = +0.10$). Finally, let us assume that the above BCC is representative of those that do not meet other cooperative banks in their reference markets, so its performance indices are currently equal to the median figures of this group: *ROA* = 1.0083%; *COSTEFF* = 0.5596; *lnEMPLPROD* = 8.2739 (i.e. *EMPLPROD* = 3920.21 euro); *LOANAST* = 0.5518; *BADLOANS* = 0.0189; *lnZSCORE* = 4.0329 (i.e. *ZSCORE* = 56.4243).

Based on the estimated coefficients, if *AGGR_SHARE* moves from 0 to 0.10, for our mutual bank ROA will drop to 0.9665 (-4.1%), the cost efficiency score will decrease to 0.5582 (-0.3%), the average labour productivity will fall to 3844.12 euro (-1.9%), the share of non-performing loans over total loans will shrink to 0.0171 (-9.5%), and the *Z*-score will reduce to 52.3892 (-7.2%). Moreover, the loans-to-assets ratio will grow to 0.5690 (+3.1%).

Likewise, let us analyze the outcome for an incumbent BCC that has had no rival mutual banks in its reference towns so far but experiences entry of one or more BCC. We now conjecture that the incumbent ends up holding 25% of its overall loans in such markets (municipalities) after entry, i.e. the (sample) median value for the group of BCCs facing other cooperative banks in the towns where they operate (so that $\Delta INCUMB\_SHARE = +0.25$), with its indices of performance equaling the median values of the said cluster (hence: *ROA* = 1.0086%; *COSTEFF* = 0.5663; *lnEMPLPROD* = 8.2662, i.e. *EMPLPROD* = 3890.16 euro; *LOANAST* = 0.5442; *BADLOANS* = 0.0192; *lnZSCORE* = 4.0286, i.e. *ZSCORE* = 56.1822).

Our empirical evidence now indicates that, in case *INCUMB_SHARE* moves from 0 to 0.25, our incumbent BCC will not be hit by significant drops in profitability and employee productivity. Regarding the other indices, we note that the cost efficiency score will fall to 0.5651 (-0.2%) and the *Z*-score will drop to 55.3347 (-1.5%), while the ratio between loans and total assets will increase to 0.5503 (+1.1%), and the ratio between non-performing loans and total loans will rise to 0.0204 (+6.3%).

Summing up, consistently with our Hypothesis 2, the negative effects of inner competition seem to be larger for aggressor than for incumbent BCCs. In particular, local competition among mutual banks has an adverse effect on stability, profitability and labour productivity of entrant banks. The

bank default risk of incumbent banks also rises, but the magnitude of this effect is much smaller. Cost efficiency of both newcomer and incumbent banks is negatively affected as well, also if the size of this impact can be regarded as negligible. For both groups there is an increase in the amount of loans (calculated as a fraction of total assets), but it is more conspicuous for entrant BCCs, presumably due to the need of establishing links with new borrowers as well as capturing significant market shares. Regarding bad loans, we record different effects among entrants and incumbents, with both magnitudes being also remarkable: the first group gets significant improvements at the expense of the second group, an outcome that we have ascribed to a 'cream-skimming' or 'cherry-picking' behaviour from entrants, which are able to capture a good deal of low-risk borrowers from the incumbent banks.

Overall, it emerges that competition among BCCs causes a drop of performance and stability for both incumbents (whose efficiency is relatively harmed and whose best clients are at risk) and challengers (whose only significantly good result is the reduction of the portion of non performing loans, but at the expense of the incumbents). It follows that inner competition among cooperative banks is a negative sum game and, thus, limiting it would be desirable.

Regarding the bank control variables, the presence of other types of banks in the municipalities where BCCs operate (*OTHBNKBRANCHES*) causes a fall in cost efficiency and business productivity, but is beneficial in terms of loans-to-assets ratio and bad loans ratio. Hence, competition from non-BCCs has an impact on the performance of incumbent BCCs that is qualitatively similar to the one deriving from competition by newcomer BCCs (in the regression using ROA as the dependent variable, the sign of the coefficient of *OTHBNKBRANCHES* is again the same as that of *AGGR_SHARE*, but it is not significantly different from zero). Regarding bank size (*lnTOTAST*) and bank age (*lnBANKAGE*), we find that smaller and older BCCs enjoy higher ROA but lower labour productivity; moreover, bigger mutual banks are less efficient on the cost side but have less non-performing loans, while newer banks tend to lend a larger fraction of their assets. More capitalized BCCs (*EQAST*) are characterized by lower profits and productivity as well as a higher fraction of non-performing loans, but exhibit also better cost efficiency scores and a higher *Z*-score, hence a lower default risk.

So as to the market control variables, mutual banks doing business in more wealthy regions (*lnPERCAPVALADD*) – not surprisingly – exhibit a higher level of profits and personnel productivity, are more cost efficient, and have both lower loans-to-assets ratios and less non-performing loans. Finally, the size of the business market (*lnPOP*) exerts a negative influence on cost efficiency and the amount of bad loans.

4.2 *Robustness Checks*

In this section we perform two robustness checks so as to corroborate our evidence on the impact of competition among BCCs on their performance, on the one side, and to compare the above results with those characterizing the interaction between cooperative banks and other non-mutual banks of similar size, on the other side.

The first test consists in using alternative measures of market shares of both 'aggressive' and 'incumbent' BCCs. Particularly, we build them starting from the number of branches in the various municipalities (a publicly available figure) rather than from the (confidential) amount of local loans. Of course, the cost of changing the reference aggregates lies in the fact that we lose the information on the business size of each branch, as we are going to implicitly assume that all offices manage the same amount of loans.

Hence, we have created the following new variable:

$$AGGR\_SHARE2_{bt} = \frac{\sum_{i=1}^{N}\sum_{m=1}^{M} AGGRESSOR_{imbt}}{BRANCHES_{bt}}. \tag{5}$$

Remembering that $AGGRESSOR_{ibmt}$ equals to one when at time t BCC b opens local office i in municipality m (where it was not previously operating), $AGGR\_SHARE2_{bt}$ represents the average market share (in terms of branches) that the 'aggressive' BCC b has managed at year t in those municipalities where it has entered (up to the considered year).

Likewise, we have built another new variable as follows:

$$INCUMB\_SHARE2_{bt} = \frac{\sum_{i=1}^{N}\sum_{m=1}^{M} INCUMBENT_{imbt}}{BRANCHES_{bt}}. \tag{6}$$

It refers to the 'incumbent' BCC b that was already operating in one or more municipalities where it suffered an entry from another BCC, and measures its average market share (again in terms of branches) in the above municipalities at year t (up to the considered year).

As the average values of *AGGR_SHARE*2 and *INCUMB_SHARE*2 are, respectively, 0.0505 and 0.0801 (see Table 1), in the sample period 'aggressive' BCCs had about 5% of their branches in the municipalities where they entered and found another cooperative bank, while in the same municipalities 'incumbent' BCCs managed about 8% of their branches.

We have then estimated Equation (3) with the new variables, also replacing *OTHBNKBRANCHES* and *POP* with analogous regressors (*OTHBNKBRANCHES*2 and *POP*2)

where the municipality share of branches managed by non-mutual banks and the average municipality population have been both weighted by BCC's branches (rather than municipality loans).

Table 1 reports some descriptive statistics also for our new variables, while the estimation results of this alternative baseline model are shown in Table 4.

INSERT TABLE 4 ABOUT HERE

As it is evident, they are rather comparable to those exhibited in Table 3 and obtained working on local loans instead of local branches. The only difference is that in the new estimations both *AGGR_SHARE*2 and *INCUMB_SHARE*2 lose their statistical significance in the regression with *BADLOANS* as the dependent variable. One plausible explanation for this outcome is the missing link between the above regressors and local loans (that we already recalled before), which may reverberate on their estimated relationship with the ratio between bad loans and customer loans.

A second robustness test consists in assessing whether the empirical evidence changes when we consider the competitive interaction between BCCs and other small non-mutual banks. In this case, our first task was identifying the latter group of credit institutions among those operating in the Italian banking market during the sample years. Our choice criteria for eligible banks were the following: a) they must be characterized by a ratio between interest margin and intermediation margin higher than 0.25; b) they need to have a ratio between customer loans and total assets higher than 0.40; c) they must have managed less than 24 branches over the sample period (we have set this value by adding to the sample mean of branches, i.e. 7.56, twice the corresponding standard deviation, amounting to 8.02). In our opinion, such criteria guarantee that the bank is a financial institution mainly providing retail banking services, and has a size not too dissimilar to the sample BCCs.

As a result, we identified 108 banks, and performed the same analysis exposed in Section 3 in order to create two additional variables. The first is

$$AGGR\_SHARE\_NONBCC_{bt} = \frac{\sum_{i=1}^{N}\sum_{m=1}^{M} AGGRESSOR\_NONBCC_{imbt}}{BRANCHES_{bt}}, \qquad (7)$$

which measures the average market share at time *t* (in terms of branches) of an 'aggressive' BCC *b* in those municipalities where it has entered (up to the considered year) and found an already-operating small non-mutual bank. The second variable is:

$$INCUMB\_SHARE\_NONBCC_{bt} = \frac{\sum_{i=1}^{N}\sum_{m=1}^{M} INCUMBENT\_NONBCC_{imbt}}{BRANCHES_{bt}}, \quad (8)$$

which delivers the average market share at time *t* (again in terms of branches) of an 'incumbent' BCC *b* in those municipalities where it was established and suffered an entry from a small non-mutual bank (up to the considered year).

Again, we have estimated Equation (3) using the above variables – whose main statistics are still displayed in Table 1 – along with *OTHBNKBRANCHES*2 and *POP*2. Table 5 portrays the empirical evidence.

INSERT TABLE 5 ABOUT HERE

If we compare Table 5 with Table 4, we discover that an 'aggressive' BCC will face a loss of neither profitability nor labor productivity when it enters a municipality where non-mutual banks are already making business. In addition, the loss of cost efficiency is lower, and the adverse impact on the *Z*-score is less than in the case of entering municipalities with other BCCs. Regarding incumbent BCCs, when non-mutual banks enter their current local markets they suffer a drop of efficiency and an increase of bad loans, but are also able to increase labor productivity. Moreover, their individual default risk – as measured by the *Z*-score – is not affected by such market entry. Overall, consistently with our Hypothesis 3, we confirm that for the Italian mutual banks 'inner competition' causes more damage than does 'outer competition' (i.e. with other types of banks).

4.3 *Simulation*

As a final benchmark to gauge the effects of inner competition, we simulate the out of sample effects on the equity ratio of the average aggressor and the average incumbent. Specifically, we start from the actual values of the equity ratio in 2012 – 9.00 and 9.34%, respectively, for the average aggressor BCC and the average incumbent BCC – and simulate the out of sample equity ratio for the following five years, based on some hypotheses. These hypotheses derive partly from the estimated performance effects of inner competition and partly from the observed past trends.

In particular, we let total assets (the denominator) evolve at the average growth rate over 2010-2012 – namely, 12.23 and 9.22%, respectively, for the aggressor and the incumbent – and let total equity (the numerator) change according to the following positive and negative components. The positive component consists of profits – we extrapolate the average ROA of 0.187 and 0.244%, respectively, for aggressor and incumbent – which, for the aggressor, are reduced by the estimated

coefficient -0.4181 (as it turns out statistically significant) multiplied by the average value of *AGGR_SHARE* (0.1887 in 2012).

A further benefit for the aggressor derives from the negative coefficient estimated on the bad loan ratio (-0.0182). This effect for the aggressor is computed multiplying that coefficient by the average bad loans ratio for 2011-2012 (2.99%), keeping the loans to asset ratio constant at its average value for 2011-2012 (66.5%) and assuming a 40% recovery rate on bad loans. The estimates of Table 3 identify, on the contrary, a detriment for the incumbent, whose bad loans ratio coefficient is positive and significant (0.0049). This effect for the incumbent is calculated multiplying that coefficient by the average bad loans ratio for 2011-2012 (3.04%), keeping the loans to asset ratio constant at its average value for 2011-2012 (67.4%) and assuming a 40% recovery rate on bad loans. For both the aggressor and incumbent we assume that loan losses are entirely deducted from profits.

Finally, we account for the fall in efficiency scores – a significant effect but larger for the aggressor than for the incumbent – translating it into larger expenses, which then depress profits. The increase in expenses for the aggressor is computed multiplying its estimated fall in efficiency (-0.0135) by its efficiency score (0.4745), by its average costs-assets ratio over 2011-2012 (0.0225), and by the average value of *AGGR_SHARE* (0.1887 in 2012). The increase in expenses for the incumbent is calculated multiplying its estimated fall in efficiency (-0.0048) by its efficiency score (0.4619), by its average costs-assets ratio over 2011-2012 (0.0223), and by the average value of *INCUMB_SHARE* (0.3753 in 2012).

As represented in Figure 2, our simulation suggests that, as a result of inner competition, equity to assets ratios drop noticeably for both the aggressor and the incumbent. After five years out of sample, the ratio drops from 9.00 to 4.23% for the aggressor, and from 9.34 to 5.08% for the incumbent. However, it is worth noting that in relative terms the drop in equity levels is a bit stronger for the aggressor: the difference between the equity to assets ratio of the incumbent and that of the aggressor increases from 0.35 to 0.85%. This seems to confirm that, within our negative sum game, aggressors suffer relatively more than incumbents.

INSERT FIGURE 2 ABOUT HERE

5. Conclusions

There are various reasons why, differently than in a standard market set up, we cannot assume that competition is by definition efficiency enhancing when dealing with networks of cooperative

banks. Two of them stand out prominently: the existence of network economies (that could be damaged by rivalry among network members), and the presence of asymmetric information in credit markets (which generates intrinsic adverse selection and moral hazard problems between lenders and borrowers).

The Italian Banche di Credito Cooperativo (BCCs) – a system of mutual cooperative banks – were successful over time typically adopting the relationship banking business model to cope with those problems. Yet, heightened competition might make this model unsustainable for them. In particular, this would descend from competition inside the network, possibly destabilizing the functioning of the BCCs' banking network.

Hence, evaluating the relative merits of competition vs cooperation is non-trivial for the BCCs. On one side, competition could be a welcome force when it helps to expel the least efficient BCCs from the market. But, on the other side, cooperation might work to the advantage of BCC efficiency because it both enhances their network economies and supports relationship banking.

Focusing on 'inner competition' (when a BCC competes with one or more other BCCs), in this paper we have tried to confirm that inner competition is harmful to BCCs' performance enlarging the measures of performance considered with respect to previous studies (Barbetta et al., 2016; Coccorese et al., 2016). Moreover, we have examined inner competition distinguishing between the incoming BCC and the incumbent BCC and contemplating the strategic actions at play between them.

Building on these considerations, our paper accomplished two chief tasks. First, we enlarged the performance measures – expanding them beyond mere productivity (as done in Coccorese et al., 2016) – to detect the effects of inner competition. Second, and most importantly, we tracked performance separately for incoming vs incumbent BCCs. Our main results are that inner competition worsens BCC performance even when we look at additional measures. Furthermore, our findings are most consistent with the strategic case in which performance worsens more evidently for incoming (attacking) BCCs, with minor effects on incumbent (attacked) BCCs. In addition, our robustness check of a specification where BCCs strategically compete with attacking or incumbent non-mutual banks of equivalent size identified much smaller effects than those found in our baseline – inner competition – specification (*AGGR_SHARE* vs *INCUMB_SHARE*). Thus, overall, our empirical evidence supports the view that inner competition – that is, competition between a BCC and another BCC – turns out to be a negative sum game.

Future research might investigate the ultimate outcomes of inner competition. Namely, inner competition may represent an unstable equilibrium that is unlikely sustainable over time. Indeed, the findings of its detrimental impact on performance suggest that inner competition might not last

forever. Then, it would be interesting to address some questions like the following. Is it the incoming or the incumbent BCC to exit the local market experiencing inner competition? Is performance worsened to the point of provoking distress of one of the two BCCs? And, possibly related to this, are the BCCs entangled with inner competition more likely to be the targets of acquisitions by other BCCs or other banks? Answering these questions would add to the understanding of the consequences of rivalry among mutual banks. That would be complementary to the analyses we carried out so far. In fact, Coccorese et al. (2016) identified the negative effects of inner competition on productivity, while the present paper strove to pinpoint the distributional effects of a negative sum game between incoming and incumbent BCCs in a short-medium run framework. However, the ultimate implications of this inner rivalry – something unnatural to see among mutual banks until two decades ago – remain to be explored. We leave this to future research.

Some policy implications stem from our analysis. Limits to inner rivalry appear welfare improving, at least in cooperative banking networks (where various types of market failures combine to question the virtues of competition). And the grounds for limiting inner competition seem to go beyond efficiency. In the light of the reform of the BCCs passed in Italy in the spring of 2016, the Holding Company(ies) at the heart of the network should pursue a phasing out of inner competition among participating BCCs.

Appendix A

In order to estimate the bank-level cost efficiency scores, employed as one of the BCC performance measures, we have estimated a cost frontier function with a stochastic efficiency term capturing the distance between banks' actual costs and the best-practice frontier costs. In particular, by means of the stochastic frontier model of Battese and Coelli (1992), we have obtained time-varying cost efficiency scores. Actually, their approach allows to split the error term into two components: banks' own inefficiency (given by the deviation between the observed output and the 'frontier' output, i.e. the efficient output from a given input set) and unobserved heterogeneity due to stochastic shocks and measurement errors.

Assuming that, for bank i at time t, production costs C are a function of output Q, input prices W, inefficiency u and random error v (and also that the last two terms are independent), we can write the logarithmic specification of the cost function as follows:

$$\ln C_{it} = f(Q_{it}, W_{it}) + v_{it} + u_{it} . \tag{A1}$$

As usual, the error term v_{it} is independent and identically distributed as $N(0,\sigma_v^2)$. The non-negative inefficiency term u_{it} is supposed to be independent and identically distributed as a truncated normal distribution with mean μ and variance σ_u^2. In addition, it is modelled as a function of time:

$$u_{it} = u_i \{\exp[-\gamma (t-T_i)]\} . \tag{A2}$$

Hence, the final period T_i contains the base level of bank i's inefficiency, which varies with time: if $\gamma > 0$, bank i improves its cost efficiency over time, as the level of inefficiency decays toward the base level; if $\gamma < 0$, there is an increase of bank i's inefficiency over time up to the base level; if $\gamma = 0$, inefficiency does not change with time.

In line with the majority of banking studies, and following the intermediation approach to banking costs, we employ a translog specification of the cost function (Christensen et al., 1971; Brown et al., 1979; Caves and Christensen, 1980) with three inputs – deposits, labour, and capital – and one output – loans:

$$\ln C_{it} = \alpha_0 + \alpha_1 \ln Q_{it} + \sum_{h=1}^{3} \alpha_h \ln W_{hit} + \alpha_T \ln TREND \tag{A3}$$

$$+\frac{1}{2}\left\{\alpha_{QQ}\left(\ln Q_{it}\right)^2+\sum_{h=1}^{3}\sum_{k=1}^{3}\alpha_{hk}\ln W_{hit}\ln W_{kit}+\alpha_{TT}\left(\ln TREND\right)^2\right\}$$

$$+\sum_{h=1}^{3}\alpha_{Qh}\ln Q_{it}\ln W_{hit}+\alpha_{TQ}\ln TREND\ln Q_{it}$$

$$+\sum_{h=1}^{3}\alpha_{Th}\ln TREND\ln W_{hit}+v_{it}+u_{it}\ ,$$

Here, C is total cost, Q is output, W_h are factors prices, and $TREND$ is a time trend included to account for technical change, while v_{it} and u_{it} are the error and inefficiency terms, respectively.

The cost efficiency scores CE are then estimated as $CE_{it}=E\left[\exp\left(-u_{it}\right)|\,\varepsilon_{it}\right]$, where ε_{it} is the overall error term (Kumbhakar and Lovell, 2000). Given that $u_{it}\geq 0$, the value of CE_{it} ranges between 0 and 1, with $CE_{it}=1$ characterizing the fully efficient bank.

We calculate the price of deposits (W_1) as the ratio between interest expenses and the sum of deposits and other funding, the price of labour (W_2) as the ratio between personnel expenses and the number of employees, and the price of capital (W_3) as the ratio between other operating costs and the number of branches. Output Q has been measured by total loans, while total cost C has been set equal to the sum of interest expenses, personnel expenses, and other operating costs (net of financial expenses). Data on banks' balance sheet as well as profit and loss account data come from ABI (the Italian Banking Association).

For estimating the efficiency scores, we have considered all types of Italian credit institutions (commercial, popular, savings and cooperative banks), because taking into account the whole Italian banking industry, instead of just a limited subgroup, allows a better assessment of cost performances. During the estimation, the standard conditions of symmetry and linear homogeneity in input prices have been also imposed. Details and statistics of such econometric analysis are not reported here, but are available upon request.

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Table 1 – Descriptive statistics

Variable	Mean	Std. Dev.	Minimum	Median	Maximum	Obs.
ROA	0.9909	0.6921	-3.9189	0.9751	3.8619	5,513
COSTEFF	0.5621	0.1282	0.2657	0.5372	0.9803	5,513
EMPLPROD	4,279.68	1,266.02	922.26	4,102.41	12,485.43	5,513
LOANAST	0.5796	0.1494	0.1515	0.5881	0.9099	5,513
BADLOANS	0.0271	0.0309	0.0006	0.0173	0.3824	5,220
Z-SCORE	91.4011	192.72	2.6670	57.0226	9866.47	5,332
AGGR_SHARE	0.0355	0.1128	0	0	1	5,513
INCUMB_SHARE	0.0882	0.2009	0	0	1	5,513
OTHBNKBRANCHES	0.6081	0.2814	0	0.6824	0.9973	5,513
TOTAST	191,447.40	209,630.10	3,769.64	122,518.70	1,880,559.00	5,513
BANKAGE	49.1714	23.4066	1	61	77	5,513
EQAST	0.1149	0.0356	0.0167661	0.1091	0.3752	5,513
PERCAPVALADD	20,384.25	5,355.79	8,960.88	21,529.43	37,445.00	5,513
POP	20,441.65	39,711.01	423.00	8,616.39	964,081.90	5,513
AGGR_SHARE2	0.0505	0.1299	0	0	1	5,513
INCUMB_SHARE2	0.0801	0.1805	0	0	1	5,513
AGGR_SHARE_NONBCC	0.1235	0.2219	0	0	1	5,513
INCUMB_SHARE_NONBCC	0.0309	0.1320	0	0	1	5,513
OTHBNKBRANCHES2	0.6029	0.2795	0	0.6774	0.9973	5,513
POP2	19,422.07	39,227.94	423.00	8,121.00	964,082.00	5,513

Variable	Description	Source
ROA	Return on assets (percentage)	ABI
COSTEFF	Cost efficiency scores (based on the Battese-Coelli model)	Own calculations
EMPLPROD	Average personnel productivity (sum of loans and deposits / employees; constant 2000 thousands euro)	ABI
LOANAST	Total loans / Total assets	ABI
BADLOANS	Bad loans / Customer loans	ABI
Z-SCORE	*Z*-score (measuring individual bank default risk)	Own calculations on ABI data
AGGR_SHARE	Average loans managed in municipalities where the BCC entered (up to the considered year) / Total loans	Own calculations on Federcasse and ABI data
INCUMB_SHARE	Average loans managed in municipalities where the BCC suffered an entry from other BCCs (up to the considered year) / Total loans	Own calculations on Federcasse and ABI data
OTHBNKBRANCHES	Average municipality share of branches managed by non-BCC banks (weights: BCC's municipality loans)	Own calculations on Federcasse, Bank of Italy and ABI data
TOTAST	Total assets (constant 2000 thousands euro)	ABI
BANKAGE	Bank age (years)	Bank of Italy
EQAST	Total equity / Total assets	ABI
PERCAPVALADD	Average per capita provincial value added (constant 2000 thousands euro; weights: BCC's provincial branches)	Own calculations on Bank of Italy and Istat data
POP	Average municipality population (weights: BCC's municipality loans)	Own calculations on Federcasse, Bank of Italy and Istat data
AGGR_SHARE2	Branches managed in municipalities where the BCC entered (up to the considered year) / Total branches	Own calculations on Bank of Italy data
INCUMB_SHARE2	Branches managed in municipalities where the BCC suffered an entry from other BCCs (up to the considered year) / Total branches	Own calculations on Bank of Italy data
AGGR_SHARE_NONBCC	Branches managed in municipalities where the BCC entered and found a small non-BCC (up to the considered year) / Total branches	Own calculations on Bank of Italy data
INCUMB_SHARE_NONBCC	Branches managed in municipalities where the BCC suffered an entry from a small non-BCC (up to the considered year) / Total branches	Own calculations on Bank of Italy data
OTHBNKBRANCHES2	Average municipality share of branches managed by non-BCC banks (weights: BCC's branches)	Own calculations on Bank of Italy data
POP2	Average municipality population (weights: BCC's branches)	Own calculations on Bank of Italy and Istat data

Table 2 – Correlation matrix for selected variables

	ROA	*COSTEFF*	*EMPLPROD*	*LOANAST*	*BADLOANS*	*Z-SCORE*	*ENTERLOANSHARE*	*INCUMBLOANSHARE*	*OTHBNKBRANCHES*	*TOTAST*	*BANKAGE*	*EQAST*	*PERCAPVALADD*	*POP*
ROA	1													
COSTEFF	0.09*	1												
EMPLPROD	-0.09*	0.16*	1											
LOANAST	-0.20*	-0.11*	0.52*	1										
BADLOANS	-0.11*	-0.02	-0.29*	-0.34*	1									
Z-SCORE	0.04*	-0.01	0.03*	0.03*	-0.06*	1								
AGGR_SHARE	-0.21*	-0.05*	0.08*	0.17*	-0.06*	-0.02	1							
INCUMB_SHARE	-0.12*	-0.21*	0.18*	0.29*	-0.11*	-0.00	0.14*	1						
OTHBNKBRANCHES	-0.14*	-0.51*	-0.03*	0.24*	-0.10*	-0.01	0.22*	0.25*	1					
TOTAST	-0.06*	-0.54*	0.33*	0.43*	-0.16*	0.02	0.07*	0.30*	0.38*	1				
BANKAGE	-0.00	-0.03*	0.28*	0.22*	-0.18*	0.05*	-0.05*	0.10*	-0.07*	0.12*	1			
EQAST	0.12*	0.30*	0.00	-0.21*	-0.08*	0.06*	-0.09*	-0.20*	-0.35*	-0.18*	0.10*	1		
PERCAPVALADD	0.06*	0.15*	0.28*	0.39*	-0.41*	0.05*	-0.07*	0.07*	-0.11*	0.19*	0.36*	0.15*	1	
POP	-0.11*	-0.10*	0.03*	0.05*	-0.04*	-0.01	0.20*	0.26*	0.38*	0.12*	-0.12*	-0.14*	-0.10*	1

* = the level of the correlation coefficient is significant at the 5% level or better.

Table 3 – Baseline model: estimation results

	Dependent variable					
	ROA	*COSTEFF*	*lnEMPLPROD*	*LOANAST*	*BADLOANS*	*lnZSCORE*
AGGR_SHARE	-0.4181 **	-0.0135 ***	-0.1964 ***	0.1716 ***	-0.0182 ***	-0.7422 ***
	(-2.49)	(-9.17)	(-5.00)	(8.36)	(-2.72)	(-2.70)
INCUMB_SHARE	0.0100	-0.0048 ***	0.0128	0.0244 ***	0.0049 **	-0.1522 *
	(0.18)	(-9.82)	(0.99)	(3.60)	(2.14)	(-1.71)
OTHBNKBRANCHES	-0.0766	-0.0038 ***	-0.1951 ***	0.0345 ***	-0.0282 ***	-0.2589
	(-0.73)	(-4.09)	(-7.90)	(2.67)	(-6.50)	(-1.46)
lnTOTAST	-0.1930 ***	-0.0019 ***	0.1523 ***	0.0035	0.0196 ***	-0.0436
	(-4.17)	(-4.60)	(14.06)	(0.62)	(10.30)	(-0.57)
lnBANKAGE	0.2635 ***	0.0001	-0.0769 ***	-0.0197 ***	0.0020	0.0617
	(6.56)	(0.18)	(-8.18)	(-4.02)	(1.18)	(0.69)
EQAST	-6.9320 ***	0.0126 ***	-1.9376 ***	-0.0259	0.1275 ***	4.7487 ***
	(-13.41)	(2.79)	(-16.02)	(-0.41)	(5.44)	(5.07)
lnPERCAPVALADD	1.0454 ***	0.0068 ***	0.2023 ***	-0.0547 **	-0.0342 ***	0.3935
	(5.67)	(4.23)	(4.69)	(-2.42)	(-4.60)	(1.32)
lnPOP	-0.0294	-0.0007 **	0.0081	-0.0009	0.0042 ***	0.0651
	(-0.84)	(-2.31)	(0.99)	(-0.20)	(2.96)	(1.13)
N. banks	582	582	582	582	577	563
N. obs.	5,513	5,513	5,513	5,513	5,220	5,332
R^2	0.4339	0.9651	0.7253	0.7238	0.2037	0.1206

*** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.
The variables *AGGR_SHARE*, *INCUMB_SHARE*, *OTHBNKBRANCHES* and *lnPOP* are based on the amount of loans provided in each municipality where banks operate.
t-values in parentheses. Provincial, year and bank dummies are included in all estimations but are not reported.

Table 4 – Alternative baseline model: estimation results

	Dependent variable					
	ROA	*COSTEFF*	*lnEMPLPROD*	*LOANAST*	*BADLOANS*	*lnZSCORE*
AGGR_SHARE2	-0.3629 ***	-0.0077 ***	-0.1075 ***	0.1185 ***	-0.0072	-0.4725 **
	(-2.84)	(-6.86)	(-3.59)	(7.56)	(-1.36)	(-2.24)
INCUMB_SHARE2	0.0629	-0.0048 ***	0.0219	0.0227 ***	0.0037	-0.2157 **
	(1.02)	(-8.83)	(1.52)	(3.02)	(1.42)	(-2.17)
OTHBNKBRANCHES2	-0.1312	-0.0034 ***	-0.1827 ***	0.0472 ***	-0.0211 ***	-0.2389
	(-1.17)	(-3.40)	(-6.92)	(3.42)	(-4.58)	(-1.25)
lnTOTAST	-0.2016 ***	-0.0024 ***	0.1436 ***	0.0073	0.0192 ***	-0.0538
	(-4.39)	(-5.85)	(13.32)	(1.30)	(10.10)	(-0.71)
lnBANKAGE	0.2649 ***	0.0001	-0.0747 ***	-0.0210 ***	0.0021	0.0735
	(6.59)	(0.36)	(-7.92)	(-4.27)	(1.23)	(0.82)
EQAST	-6.9935 ***	0.0115 **	-1.9534 ***	-0.0184	0.1317 ***	4.7657 ***
	(-13.54)	(2.53)	(-16.11)	(-0.29)	(5.60)	(5.09)
lnPERCAPVALADD	1.0302 ***	0.0072 ***	0.2081 ***	-0.0557 **	-0.0328 ***	0.4111
	(5.59)	(4.43)	(4.81)	(-2.47)	(-4.40)	(1.38)
lnPOP2	-0.0285	-0.0010 ***	0.0066	-0.0056	0.0037 ***	0.0730
	(-0.89)	(-3.57)	(0.89)	(-1.45)	(2.82)	(1.39)
N. banks	582	582	582	582	577	563
N. obs.	5,513	5,513	5,513	5,513	5,220	5,332
R^2	0.4348	0.9648	0.7237	0.7225	0.1978	0.1204

*** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.
The variables *AGGR_SHARE2*, *INCUMB_SHARE2*, *OTHBNKBRANCHES2* and *lnPOP2* are based on the number of branches managed in each municipality where banks operate.
t-values in parentheses. Provincial, year and bank dummies are included in all estimations but are not reported.

Table 5 – BCC vs. small non-mutual banks: estimation results

	Dependent variable					
	ROA	*COSTEFF*	*lnEMPLPROD*	*LOANAST*	*BADLOANS*	*lnZSCORE*
AGGR_SHARE_NONBCC	0.0365	-0.0051 ***	-0.0045	0.0377 ***	-0.0009	-0.2690 ***
	(0.62)	(-9.92)	(-0.33)	(5.24)	(-0.39)	(-2.83)
INCUMB_SHARE_NONBCC	-0.0504	-0.0053 ***	0.1198 ***	0.0116	0.0119 ***	0.0097
	(-0.49)	(-5.82)	(4.95)	(0.91)	(2.80)	(0.06)
OTHBNKBRANCHES2	-0.1196	-0.0035 ***	-0.1740 ***	0.0459 ***	-0.0210 ***	-0.2281
	(-1.07)	(-3.55)	(-6.62)	(3.33)	(-4.58)	(-1.20)
lnTOTAST	-0.2220 ***	-0.0025 ***	0.1366 ***	0.0116 **	0.0189 ***	-0.0687
	(-4.87)	(-6.26)	(12.79)	(2.08)	(10.06)	(-0.92)
lnBANKAGE	0.2686 ***	0.0001	-0.0719 ***	-0.0220 ***	0.0023	0.0796
	(6.68)	(0.31)	(-7.63)	(-4.45)	(1.35)	(0.89)
EQAST	-6.9690 ***	0.0113 **	-1.9370 ***	-0.0240	0.1343 ***	4.7927 ***
	(-13.49)	(2.49)	(-16.00)	(-0.38)	(5.71)	(5.12)
lnPERCAPVALADD	1.0553 ***	0.0073 ***	0.2159 ***	-0.0613 ***	-0.0321 ***	0.4265
	(5.73)	(4.54)	(5.00)	(-2.70)	(-4.31)	(1.43)
lnPOP2	-0.0528 *	-0.0012 ***	-0.0022	-0.0003	0.0032 **	0.0545
	(-1.70)	(-4.23)	(-0.30)	(-0.08)	(2.53)	(1.07)
N. banks	582	582	582	582	577	563
N. obs.	5,513	5,513	5,513	5,513	5,220	5,332
R^2	0.4338	0.9650	0.7242	0.7204	0.1985	0.1200

*** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.
The variables *AGGR_SHARE_NONBCC*, *INCUMB_SHARE_NONBCC*, *OTHBNKBRANCHES2* and *lnPOP2* are based on the number of branches managed in each municipality where banks operate.
t-values in parentheses. Provincial, year and bank dummies are included in all estimations but are not reported.

Figure 1 – Average share of loans that entering and incumbent BCCs managed in municipalities with new entries (expressed as a fraction of mutual banks' overall loans)

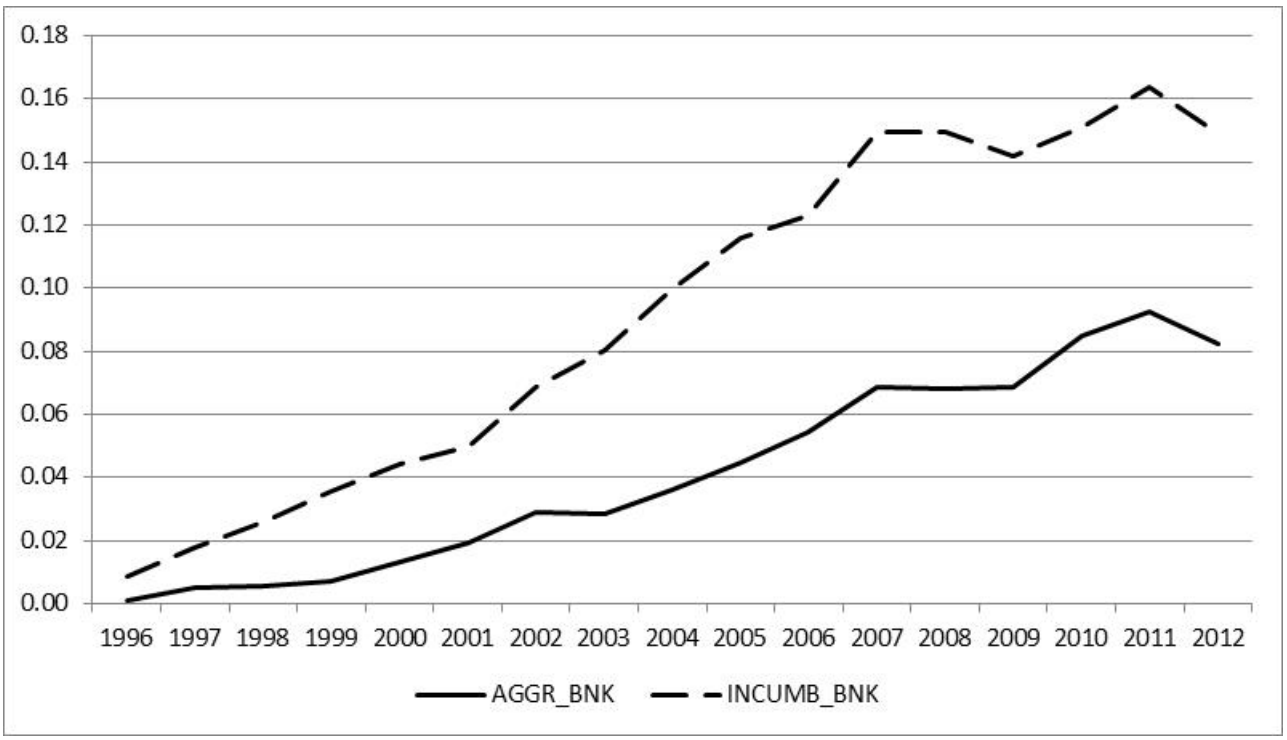

Figure 2 – Simulated out of sample equity ratio for the average aggressor and incumbent (based on Table 3)