Impact of Mergers on the Degree of Competition in the Banking Industry

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Abstract: In this paper we propose a new test for evaluating the impact of horizontal mergers on competition in the banking industry *ex ante*. The test is based on a monopolistic competition model where firms compete on price and branching, and market structure is endogenous. Using a Maximum Likelihood approach, we fit the branching behavior of French and Italian banks and obtain an estimated measure of competition in local markets for two alternative cases: the pre-merger case, in which the number and branching networks of incumbent banks in each market is the one actually observed; the post-merger case, where we simulate horizontal mergers between incumbent banks. Estimated measures of competition in the two cases are then compared. We provide examples of mergers that are either favorable or detrimental to market competition. Our empirical test can be useful in competition analysis. Thanks to its theoretical foundation, it encompasses more information than traditional measures of concentration, while being as parsimonious as the Herfindahl index in terms of data requirements.

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1. Introduction

Horizontal mergers are considered detrimental to competition, since concentration and competition are usually considered to be as inversely related. Although at the forefront for many years, the debate in applied industrial organization about competition and concentration (see for instance the survey in Schmalensee, 1989) has failed to produce compelling evidence. The issue is particularly critical in banking, where concentration and competition may not only affect the profitability of each individual bank, but the stability of the overall industry as well (see Degryse and Ongena, 2008, and Carletti and Vives, 2009 among others).

And yet, there is no conclusive evidence that mergers always reduce competition, as one side of the literature predicts. In some instances, the opposite may occur. For example, when market structure is fragmented with the exception of a single dominant firm, a horizontal merger between medium-sized players might restore competitive conditions by generating a rival for the incumbent. In this case, greater concentration in market share is accompanied by greater competition, breaking down the inverse relation between concentration and competition (as argued by Cetorelli, 1999, Berger *et al.*, 2004, and Dick, 2007). In this case, the use of traditional measures of concentration to infer the degree of competition when conducting merger analysis, such as for instance the Herfindahl–Hirschman Index (HHI, thereafter), may be misleading.

The objective of this paper is to provide, within the extant debate, a measure of competition to account for structural changes following M&As among banks. This measure is derived from a model where competition and market structure are simultaneously determined, and it is estimated by using publicly available data, the same that antitrust authorities normally use in their assessments. We provide evidence that some mergers, while increasing concentration, do not necessarily reduce the degree of intra-industry competition. In some cases, by increasing the number of larger players, mergers may even enhance competition.

More specifically, within a model of monopolistic competition where incumbent banks compete by setting interest rates and establishing branching networks, we apply a latent variable approach à la Bresnahan-Reiss (1991a, 1991b) to infer branching costs and revenues in local markets from the observed branching behavior of banks. We interpret the elasticity of estimated profits with respect to branching as a new indicator of the degree of competition in the industry: tougher rivalry over interest rates reduces this elasticity, thus revealing greater competition. The ex-ante effect of horizontal mergers on competition is captured by comparing the value of this elasticity in the pre- and post-merger market structures. First, we estimate our model by using the actual pre-merger number of banks and their branching size. Then we estimate it a second time

under a virtual scenario where we simulate a merger which adds and combines the branches of potentially merging banks, while keeping the branches of other incumbent banks constant. We show that competition, as captured by our measure, is not only affected by the degree of market concentration, but also by the dispersion of market share and by the number of large players in the industry.

We apply our test to the Italian and French banking industries. In both countries the number and size of incumbent banks have substantially changed over recent years, due to the occurrence of several horizontal mergers. It is interesting to study the two banking industries together because of the significant differences in their pre-merger structures. In France, all major banking groups compete against each other in all local markets. In Italy, only a few banking groups operate at the national level, while the majority of actors are local banks, implying that each bank faces a different set of competitors in every single local market. These two industries provide examples of mergers that potentially have contrasting effects in terms of competition.

As an application, we simulate the mergers between Crédit Agricole and Crédit Lyonnais and between Crédit Mutuel and Crédit Industriel Commercial in France, and two of the most important mergers to have occurred in Italy in recent years, the one between Intesa and Sanpaolo IMI, and the one between UniCredit and Capitalia. Our competition indicator detects opposite effects for these mergers: they turn out to be pro-competitive in France, and anti-competitive in Italy. In France, in most local markets those mergers have created at least a new bank, big enough to compete with incumbent dominant banks. In Italy, on the contrary, the two mergers have reduced the number of big players, in some local markets, at least.

These results cannot be fully captured by considering the change in market concentration in isolation, even locally, since in both cases the HHI rises. In addition our measure of competition is parsimonious in terms of required information, since it only uses data on branching market shares of individual banks in local markets, without using accounting data, even when publicly available at this level of disaggregation. These are the same informational requirements used to compute the HHI, which is the measure of concentration most commonly used in antitrust analysis. Finally, our approach, although here applied to retail banks, can be easily transferred to other industries that use retail networks for the sale of a final product, as for instance the insurance industry, grocery chain stores, car dealers, or even to industries where firms operate on the market through a single branch, such as professionals like doctors or lawyers.

In Section 2 we review the main references in the literature; in Section 3 we derive the econometric model from the banks' branching behavior with the objective of measuring the degree

of competition in local markets. Then the results of econometric testing applied to individual banks' data in local markets are presented in Section 4. Section 5 is devoted to the simulation of a few horizontal mergers, to examine their impact on the degree of competition; finally we discuss the relation between our estimated measure of competition and other measures of concentration. Section 6 concludes the paper.

2. Review of the literature

This paper is related to the empirical literature on the industrial organization of endogenous market structure that departs from Bain (1956), as thoroughly discussed in Sutton (1991). More specifically, this paper is related to studies measuring competition in retail markets that use structural models of monopolistic competition. To derive branching costs from observed choices of branching, we follow the latent variable approach adopted by Bresnahan and Reiss (1991a, 1991b), and subsequently refined by Berry and Tamer (2006). Their idea is that, by observing the presence of a firm in a market, it is possible to uncover information about entry costs. We apply this same logic to branching choices: by virtue of its presence in a market with a given number of branches, a bank reveals that it expects to recover the costs of a branching network of that size. Therefore we derive information about the non-observable cost of branching by observing branch presence in a given market. Our paper exploits this result to study the changes in market structure following a merger, and to measure its impact on the degree of competition.

In a recent paper Schaumans and Verboven (2011) estimate a measure of change in competition within a model with differentiated products, and apply it to the local services markets. They estimate an ordered probit entry model, as in Bresnahan and Reiss (1991a, 1991b), jointly with an industry revenue function to obtain a competition measure. Their approach is close in its objective to ours, but it imposes heavier data requirements compared to our test. This is why we think it cannot be easily adapted to industries characterized by a large number of either firms or branches, as in our case.

In that body of literature there is a further potential problem of identification: profits and sunk costs are in fact estimated up to a monotonic transformation. We have solved it here by introducing a measure of competition that only affects profits without affecting branching costs. In this way we are able to estimate directly a measure of the degree of competition.

Based on the idea that firms in more competitive markets suffer from larger decreases in profits when their costs increase, Boone (2008) and Boone *et al.* (2007) have proposed a measure of

competition that captures the elasticity of accounting profits to costs. We use a similar idea by proposing the elasticity of profits to branching as a measure of competition. In contrast to those papers, however, our measure of competition does not require any prior knowledge of accounting data. Cohen and Mazzeo (2007) propose a model of monopolistic competition where they estimate the competitive response of banks to different types of branching behavior. Our approach is similar, since we both estimate directly the structural equations to infer non-observable branching costs; however we improve on this approach, by exploiting the model to simulate the impact of horizontal mergers on the measure of competition.

This paper springs from preliminary articles where the markets considered were, respectively, the Italian provinces between 1989 and 1995 in Cerasi *et al.* (2000) and the national industries of several European countries before and after the implementation of the Second European Directive in 1992 in Cerasi *et al.* (2002). We have exploited the same econometric methodology to fit the model on two countries, France and Italy, but using data of higher quality and making improvements on our methodology by suggesting a way to simulate the impact of horizontal mergers between incumbent banks on our measure of competition.

The simulation of mergers based on a structural model of monopolistic competition departs from other papers in the literature where the impact measurement is carried *ex post* based on accounting data, i.e. after mergers have actually occurred (see applications to the banking industry in Molnar, 2008, and Zhou, 2008). In those papers, the exercise consists in estimating demand and supply parameters before the merger, and subsequently using estimated coefficients to simulate a change of ownership in the allocation of the branches with the purpose of assessing the impact on competition (as surveyed in Budzinski and Ruhmer, 2010). Our objective is similar in that we derive an impact assessment *before* the merger occurs, but without imposing heavy data requirements other than the information needed to compute the HHI at the local market level. We believe that our method provides useful guidance to competition authorities who have to assess the impact of mergers in the banking industry ex ante. The ex-ante assessment provides a method to reject or approve a specific merger, while the ex-post assessment aims at evaluating the change in market structure by taking into account also the reaction by rivals once the merger has already been approved. The two approaches, ex-ante and ex-post, provide complementary ways to formulate an assessment of mergers.

We apply our approach to the banking industry. There are several papers that study the impact of horizontal mergers of banks on market structure (Sapienza, 2002 and Focarelli and Panetta, 2003; to cite just a few). All these papers apply the ex-post approach on data of finer

quality, by using Credit Register's information on the banks' portfolios of loans. However their evidence on the effect of mergers on banks' market power is mixed.

3. Defining a measure of competition

In this section we propose an empirical measure of the degree of competition in banking services at the local level, derived from the observed behavior of banks in local markets.

Here is the rationale for our analysis. Banks compete for clients by opening branches in specific local markets and then setting the price of a bundle of financial services.[1] A bank enters a local market whenever its expected gross profits cover the cost of entry, and the size of its branching network is chosen by equating the marginal revenue of an additional branch with its marginal cost. In formal terms, let us define π_{ij} the gross profit of bank *i* in market *j*. Gross profits, i.e. the revenues of a branching network without accounting for costs, must be an increasing variable with respect to the number of branches in market *j*, $k_{ij,}$ otherwise we would never observe a bank opening new branches. However the increase in bank's gross profits due to an additional branch is the result of the balance of two contrasting effects: i) a positive ("expansion") effect, if the new branch is successful in attracting new clients and earns new revenues, and ii) a negative ("competition") effect, if the new branch steals clients from pre-existing branches of the same bank. The overall effect of an increase in branching size is captured by the notion of elasticity of gross profits to branching, formally $\frac{dln\,\pi_{ij}}{dln\,k_{ij}}$. Notice that this elasticity is indeed affected by the degree of competition in that market. When the gains from opening an additional branch in a local market are large, we infer that banks in that market are facing softer competition for new clients. To summarize, greater competition for banking services in market *j* is reflected by a lower elasticity of profits to branching. This expression uncovers our strategy to measure competition in market *j*, that is, we approximate the degree of price competition in banking services by measuring the inverse elasticity of gross profits to branching.

There are other factors affecting bank profits. First of all, the level of profits of bank *i* in market *j* must be increasing in total market size S_j. Market size represents a demand shifter that captures the maximum reservation value consumers are willing to pay for banking services. Note that, for a given market size *S*, a larger profit implies lower consumers' surplus. Also the total

[1] Branching is still important in retail markets since geographic proximity represents a competitive advantage when monitoring loans to opaque SMEs or when supplying deposits, as argued in Petersen and Rajan (2002), Degryse and Ongena (2005), Brevoort and Hannan (2006) and Dick (2007).

number of branches N_j in market j affects bank profits: as the market becomes crowded with other banks' branches, the additional profit of a new branch shrinks.

Expressing all this in formal terms, bank i gross profit in market j is:

$$\pi_{ij}(k_{ij}, S_j, N_j) \tag{1}$$

The marginal benefit of an additional branch MB_{ij} is the derivative of the function (1) with respect to k_{ij} holding constant all branches by rival banks i.e. $N_j - k_{ij} = \sum_{m \neq i} k_{mj}$.

Banks choose their optimal branching size by setting the marginal benefit of an additional branch MB equal to the marginal cost MC of branching. To keep matters as simple as possible, we assume that an additional branch has a fixed marginal cost MC_{ij}.[2] As summarized in Box 1 each bank sets its branching network size at $k_{ij}^* > 1$ according to Equation (2a), by equating the marginal benefit of an additional branch to its marginal cost; otherwise it sets $k_{ij}^* = 1$ and Equation (2b) holds. In addition, the free entry condition requires that a bank enters market j up to the point where its expected gross profits are equal to the entry cost[3] for a given branching size as stated by Equation (3).

Box 1 – Choice of branching size and entry decision

Branching size choice:	$MB_{ij} = MC_{ij} \Rightarrow k_{ij}^* > 1$	(2a)
	$MB_{ij} < MC_{ij} \Rightarrow k_{ij}^* = 1$	(2b)
Entry decision:	$\pi_{ij} \geq \sigma_{ij}$	(3)

where k_{ij} is the number of branches and σ_{ij} is the entry cost of bank $i \in \{1,\ldots, n\}$ in local market $j \in \{1,\ldots,J\}$.

Note that the marginal benefit of branching can be related to the elasticity of gross profits to branching, since $MB_{ij} = \frac{dln\pi_{ij}}{dlnk_{ij}} \frac{k_{ij}}{\pi_{ij}}$. A greater degree of competition in the price of banking services, that is, a lower elasticity, reduces MB. Note that the degree of competition affects the marginal benefits of branching, while it does not change marginal cost MC, assumed constant. In our framework, tougher price competition has a negative impact on branching size, *ceteris paribus*. For a given market size and number of competitors, if competition gets tougher (lower elasticity of gross profits to branching) a bank may end up closing branches (k^* will decrease in (2a)) since the expected gains from a larger branching network shrink.

The major advantage of this approach is that it requires a very limited amount of information to recover bank and branch profitability, i.e. we just need to know the number of branches of each

[2] This is not the marginal cost of producing banking services, but the unit cost of opening a new branch. This cost is specific to each bank in each local market.

[3] Given that we do not observe new entries in any of the markets, this condition is redundant and we will not use it in the econometric implementation.

bank in a specific local market: this is publicly available information. We can list several reasons as to why it is convenient to use this approach. First, these are easily accessible data even at the disaggregate level, while instead we lack accounting records for profits at the local market level for banks that are simultaneously active in several markets. Second, merger analysis uses the measure of the HHI derived from market shares with respect to branches, in order to detect potential restrictions to competition; our framework uses precisely the same data, without requiring additional information. Finally, in addition to the number of branches in a specific market we may also observe its evolution over time: this information is crucial to measure expected long-term profitability. Since the opening and closing of branches is a costly affair, a bank opens new branches only when it expects to recover the cost of its branching network through additional profits in the future. This profitability, although affected by contingent macroeconomic factors, depends also upon long-lasting features of market structure, such as the number of competitors, market size etc. Thus a measure that uses information implicit in the size of branching networks aims to capture also the idea of long-term profitability within a specific market structure.

3.1. Econometric specification

To derive branching costs from observed choices of branching, we follow the latent variable approach. We assume that the latent marginal costs of branching explain observed branching decisions. Exploiting the variation in the number of branches of individual banks, we can retrieve not only marginal branching costs, but also the degree of competition in each market that is compatible with observed changes in the size of branching networks.

The objective is to write a likelihood function for our observations in terms of branching behavior. From the previous section we know that either one of the two branching Conditions (2a) or (2b) must hold, once we assume that banks instantaneously adjust the optimal size of their branching networks in each period and market. We classify each observation (*ijt*), namely bank *i* in period *t* in local market *j*, into one of the following four categories:

[a] "expanding multi-branch" bank if $\Delta k_{ijt} = (k_{ijt} - k_{ijt-1}) > 0$ and $k_{ijt} > 1$;

[b] "static multi-branch" bank if $\Delta k_{ijt} = 0$ and $k_{ijt} > 1$;

[c] "shrinking multi-branch" bank if $\Delta k_{ijt} < 0$ and $k_{ijt} > 1$;

[d] "unit-branch bank if $\Delta k_{ijt} = 0$ and $k_{ijt} = 1$.

Note that, at time *t*, for multi-branch banks included in cases [a] to [c], Condition (2a), i.e. marginal branching benefits equal marginal branching costs, must hold, while for unit-branch banks of case

[d], Condition (2a) is replaced by Condition (2b): marginal branching benefits must be lower than marginal branching costs.

For the purpose of the econometric estimation we choose a specific functional form[4] for the profits of bank *i* in market *j* (omitting time *t*) which satisfies the properties of the function described in the previous section, namely:

$$\pi_{ijt}\left(k_{ijt}, S_{jt}, N_{jt}\right) = S_{jt}\frac{k_{ijt}^{cci_{jt}}}{\sqrt{N_{jt}}} \tag{4}$$

This functional form exhibits the coefficient *cci*, the elasticity of gross profits to branching and our inverse measure of competition, as an explicit coefficient in the formula.[5] To exploit the observed changes in the size of branching networks, we replace MB_{ijt} with A_{ijt} inside the branching Conditions (2a) and (2b):

$$A_{ijt} = S_{jt}\frac{k_{ijt}^{cci_{jt}-1}}{\sqrt{N_{jt}}}\left(cci_{jt} - \frac{k_{ijt-1}}{2N_{jt}}\right) \tag{5}$$

which is a slightly modified formula with respect to *MB*, where instead of the number of branches at time *t*, k_{ijt}, we use its lagged value k_{ijt-1} inside the brackets. It follows that: when $k_{ijt-1}<k_{ijt}$, then $A_{ijt}>MB_{ijt}$ for the expanding multi-branch banks in case [a]; when $k_{ijt-1}>k_{ijt}$, then instead $A_{ijt}<MB_{ijt}$ for shrinking multi-branch banks in case [c]; while $A_{ijt}=MB_{ijt}$ for static multi-branch banks in [b] and for unit banks in [d], neither of which changes the size of its branching network in the observed time span. It also follows that in the modified Condition (2a), the equality between MB_{ijt} and MC_{ijt} is substituted by the inequality between A_{ijt} and MC_{ijt} for all banks falling in cases [a] and [c]. Specifically $A_{ijt}>MC_{ijt}$ for expanding banks, and $A_{ijt}<MC_{ijt}$ for shrinking banks.

These modified conditions yield a simplified partitioning of observed banks into two subsets:[6]

$$E_{1t}: all\ banks\ in\ [a]\ and\ [b]\ so\ that\ A_{ijt} \geq MC_{ijt} \tag{6}$$
$$E_{2t}: all\ banks\ in\ [c]\ and\ [d]\ so\ that\ A_{ijt} < MC_{ijt}$$

To cast each observation in the probability space, we assume that the marginal branching cost for bank *i* in market *j* at time *t* is a random variable with known probability distribution. More specifically, we assume that the distribution is lognormal and that the logarithm of costs has a mean different from zero:

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[4] In the econometric exercise we tested other functional forms without obtaining relevant differences in terms of results.

[5] The elasticity of profits with respect to branches is given by $\left(cci - \frac{k}{2N}\right)$ and as *N* increases the elasticity collapses to *cci*.

[6] Since we have made an arbitrary choice when allocating the "static multi-branch" banks in the sub-set E_{1t}, we will check the robustness of our results to a different classification criterion in the next section.

$$lnMC_{ijt} = mc_{ijt} + u_{ijt}, \quad (7)$$

where mc_{ijt} is the mean of the logarithm of costs that can be approximated with observable variables, and the purely stochastic component, $u_{ijt,}$ is a standard normal random variable with distribution function Φ. We assume $u_{ijt,}$to be independent across banks, i, and across markets, j.

Using the partitioning of observations in Equation (6), the probability that each observation (ijt) falls either in subset E_{1t} (expanding or static multi-branch banks) or subset E_{2t} (shrinking multi-branch or unit-branch banks) is given by:

$$Pr\{(ijt) \in E_{1t}\} = Pr(MC_{ijt} \leq A_{ijt}) = Pr(u_{ijt} \leq lnA_{ijt} - mc_{ijt}) = \Phi(lnA_{ijt} - mc_{ijt}) \quad (8)$$

$$Pr\{(ijt) \in E_{2t}\} = Pr(MC_{ijt} > A_{ijt}) = Pr(u_{ijt} > lnA_{ijt} - mc_{ijt}) = 1 - \Phi(lnA_{ijt} - mc_{ijt})$$

Finally, we can write the likelihood function for all the observations in the dataset as follows:

$$L = \sum_{(ijt)\in E_{1t}} ln\Phi(lnA_{ijt} - mc_{ijt}) + \sum_{(ijt)\in E_2} ln[1 - \Phi(lnA_{ijt} - mc_{ijt})] \quad (9)$$

Our measure of competition, cci_{jt} enters A_{ijt} as a non-observable component in addition to marginal branching cost, i.e. the mean of the logarithm, mc_{ijt} that it is also non observable. We are able to estimate both components separately by imposing some identifying restrictions: we assume them to be linear functions of two distinct sets of observable variables. In the case of cci_{jt} we select a set of market-specific variables, W_{jt}, while for mc_{ijt} a set of variables specific to each bank, Z_{ijt}. To conclude, given the estimated parameters and the conditioning of observable variables, we compute a specific measure of competition, *cci*, for each individual market, and a marginal cost, *mc*, for each individual bank.

4. Empirical analysis

In this section we begin by describing our dataset and then present the results of maximum likelihood estimation that enable us to recover an estimated measure of competition for each local market.

4.1. The data

In the econometric model the threshold value A_{ijt} is function of market-specific variables, such as the market size S_{jt} measured by total deposits (which are highly correlated with total loans) and the total number of branches N_{jt} in the market, and bank-specific variables such as the number of branches of bank i in market j at time t, k_{ijt}, and its lagged value k_{ijt-1}.

Our local markets are the 95 *départements* in France and the 103 *provinces* in Italy. We observe different banks belonging to the same banking group. Given that they coordinate their

decisions on interest rates and branching, we decided to define the banking group rather than the single bank as the appropriate unit of observation.[7] Each observation therefore describes banking group *i* operating in local market *j* at time *t* with given branching size k_{ijt}.[8]

We gathered information on the number of branches held by each banking group in every local market in two years, 2005 and 2007 in France, and 2004 and 2006 in Italy. We computed Δk_{ijt}, that is the change in branching size for each group in each local market, taking 2005 as the initial year for France, and 2004 for Italy.

For Italy, data on bank branches by provinces can be obtained from the public website of Bank of Italy.[9] For France, data on bank branches by departments were directly provided by Crédit Agricole and Caisses d'Epargne. In France almost all banks have branches in all the 95 departments, with the only exception of C.I.C. that has no branches in Corsica. In Italy six national banking groups control branches located in almost all 103 provinces, while the remaining groups have branches geographically concentrated in few local markets. Descriptive statistics in Tables 1a and 1b show that the two industries are quite different in terms of network size, with Italian banks being smaller compared to French banking groups, since average branching size is 19 in Italy, while it is 46 in France (median value is 7 in Italy compared to 23 in France). The total number of branches for every local market is greater in France, although market shares are on average larger indicating that several large players are simultaneously active in each market. The two countries are more similar for what concerns the dispersion of branches within markets, as measured by standard deviation.

[Insert Tables 1a and 1b here]

We do not rely on accounting data for our analysis. As a matter of fact accounting measures of bank profits are rarely available at this level of disaggregation: accounting statements provide balance sheet data at consolidated level, that is, aggregate across all markets in which the bank is active. For instance, suppose that bank A owns branches in markets *a* and *b*: From its accounting

[7] On the one hand, we exclude from the analysis small groups or independent banks since they do not behave strategically but are price takers and adapt their branching behavior residually. They are nevertheless included in the denominator N_j, representing the total number of branches in that market, since they exert a competitive pressure on branches of the main groups in each local market by behaving like a fringe. On the other hand, we include La Poste among banking groups in France as the banking part of the French postal mail provider has a large and dispersed network. In contrast, Poste Italiane is excluded as it did not play at the time of our analysis a similar role.

[8] To capture coordination among banks belonging to the same group across different local markets in our econometric analysis, we control for ownership by using a dummy variable specific to each group. This has also the advantage that we automatically account for other differences across banks, such as mutual vs. commercial banks without adding further dummies in the estimation.

[9] The number of branches for individual banks are taken from www.bancaditalia.it, while we followed the ABI guidelines for the definition of banking groups.

statement we would be able to recover only consolidated profits across the two markets, not the two profits separately, i.e. the profit of bank A in market *a* and profit of bank A in market *b*, as required by our analysis to recover the competitive behavior of banks at local level. Luckily our empirical strategy provides us with a simple proxy for bank's profit in each market, as expressed by the reduced form in Equation (4), which is a function of the market share of the bank in each local market based on the number of branches.

Still our definition of a bank's profits in each local market must be correlated with the actual accounting profits. Consider that accounting profits are proportional to deposit or loan market shares for retail banks. Since these are also highly correlated with branching market shares, we expect a high correlation between our profits given by reduced form in Equation (4) and the recorded accounting profits.

Finally, in the empirical specification of mc_i, we include Z_{it} a dummy for each banking group among explanatory variables. Our assumption is that a greater percentage of branching costs is affected by the cost structure and the internal organization of the bank, rather than by the characteristics of the market where the branch is located.[10] The inverse measure of competition *cci* instead depends upon a set of market-specific variables, W_{jt}, including per capita loans (LPC), the proportion of rural areas in each county (SHRUR) in France, and a dummy indicating densely populated urban areas (DBIGPRO) in Italy. These variables, taken from the two countries' central statistical agencies, INSEE for France and ISTAT for Italy, capture the expected level of activity of all banks in a given local market. We expect to find tougher competition in markets with higher per capita loans and more densely populated areas, due to the greater incentive to compete for the marginal client when economic activity is more intense.

4.2. Maximum likelihood results

The econometric model is estimated for a cross-section of data covering year 2006 in Italy and year 2007 in France. These results, defined the "base model", will be confronted with the results of the estimation simulating the mergers in the next section. All coefficients of the maximum likelihood estimation in Tables 2a and 2b are significant, although differences in their values capture local heterogeneity.

[10] This assumption is supported by findings in Cerasi *et al.* (2002) where we show that variables such as the total number of employees and the distance of the branch from the location of bank's headquarters significantly affect marginal branching costs. This implies that marginal branching costs depends upon variables specific to the bank rather than to each local market.

[Insert Tables 2a and 2b here]

The signs of the coefficients associated to *cci* are in accordance with our intuition: a positive sign indicates that competition is weaker (greater *cci*) in less densely populated areas in France, measured by a greater incidence of rural areas (SHRUR), while in Italy competition is stronger (smaller *cci*) in those provinces where we find a big city (DBIGPRO). In addition, in both countries competition increases with the level of economic activity as measured by per capita loans (LPC).

Tables 3a and 3b show the differences in competition, branching costs and profitability between the two countries. The mean value of *cci*, is higher in Italy at 1.17, when compared to France, which has a value of 0.68 (lower values of *cci* imply stronger competition) meaning that local markets are on average more competitive in France than in Italy. Marginal costs of branching are lower in France than in Italy, and, moreover, they represent a smaller share of our estimated per branch profits: the French banking system is not only more competitive but each branch costs less.

[Insert Tables 3a and 3b here]

Tables 4a and 4b exhibit heterogeneity of estimated marginal branching costs across banking groups, in particular Crédit Agricole and La Poste have higher branching costs and considerably lower per-branch profits compared to rival French groups. These two groups are indeed characterized by large branching networks spread all over the country, even in less densely populated areas. Conversely, in Italy per branch profits are relatively more homogeneous across banking groups, with higher marginal costs for UniCredit.

[Insert Tables 4a and 4b here]

In Tables 8a and 8b (reported in the Appendix), we compile the ranking of local markets using our estimated measure of competition. The parameter *cci* varies considerably across local markets. In densely populated areas our measure *cci* takes smaller values indicating tougher competition. For instance, in Paris *cci* reaches its lowest value. In Italy the overall variance of *cci* is greater. Notice that *cci* takes lower values in most Italian Northern provinces compared to Southern provinces. This result suggests that banks located in Northern regions face greater competition compared to those located in Southern regions. (See Cerasi *et al*., 2000 and Guiso *et al*., 2006, among others, for similar empirical evidence.)

Finally we provide an indication of how good is the econometric model in fitting the data. A goodness-of-fit measure is obtained by comparing predicted branching behavior to the actual partitioning of observations between subset E_1 (all expanding multi-branch or static multi-branch banks) and E_2 (all shrinking multi-branch or unit-branch banks). Tables 5a and 5b report the percentage of observations whose behavior in terms of branching is correctly predicted by the model; namely, that it correctly forecasts the number of banks that should have opened new

branches and have indeed done so, and that it does the same for banks that should have closed some of their branches or kept them unchanged: the percentage is 84% for France and 75% for Italy.[11]

[Insert Tables 5a and 5b here]

5. Measuring the impact of mergers on competition

We now use our econometric model to simulate the impact on competition of specific horizontal mergers between two or more banks. For a given merger, we undertake the following exercise: we sum the branches of the merging banks in each local market where the banks are active and re-estimate the model assuming that these new entities replace the old ones; we also assume that rivals are passive, in the sense they don't react to the merger by changing their branching size in any of the local markets. Our econometric model yields the estimated degree of post-merger competition. We then compare this new estimated measure of competition to the degree of competition in the base model. By comparing the two *cci*, pre- and post-merger, we can say whether the merger under evaluation is pro- or anti-competitive. An increase in our measure of competition implies a reduction of per branch profit; for given market size S, this implies a larger surplus and therefore from the consumers' point of view the merger is beneficial.

We think that this exercise provides a useful guide to antitrust authorities when evaluating the short term impact of horizontal mergers on competition. However we recognize that our measure cannot fully anticipate the long-term effects, since we don't know how rivals will adjust their branching networks by reacting to a merger, as we assume that the total number of branches is given.[12]

5.1. Simulated mergers

Two of the most important mergers that have recently occurred in France are the merger between Crédit Mutuel (CM) and Crédit Industriel Commercial (CIC) in 1998, and the one between Crédit Agricole (CA) and Crédit Lyonnais (CL) in 2004. Given that our French dataset includes the number of branches as separate banking groups even after the merger, we can exploit this

[11] To check the robustness of our partitioning we have re-estimated the model moving the static multi-branch banks (case [b] in sub-section 3.1) from subset E_1 to subset E_2 defined in Equation (6). Under this partitioning the percentage of observations correctly classified decreases significantly.

[12] There is an empirical literature providing evidence that the anti-competitive impact of a merger may be considerably affected by the competitive reaction of non-merging firms and new entries in the market. (See for instance the discussion in Draganska *et al.*, 2009.)

information to infer the pre-merger situation (which corresponds to our estimated base model) and simulate the impact of the merger "as if" the merger had occurred in our observation period.

Table 6a reports the comparison of the relevant indicators between the base model and the post-merger model. The result of this exercise in terms of the estimated value *cci* shows that these two mergers together improved competition in the credit industry. Table 8a displays the impact of the two mergers in each individual local market: the differences in the estimated values of the *cci* are negative and significant for almost all local markets (as confirmed by Wald tests).

[Insert Table 6a here]

Given that both simulated mergers really occurred before our sample period, one concern is that the reaction of rivals might entirely explain the increase in competition. To control for this, we measured the post-merger change in the market share of rivals across our sample. Rivals' markets shares turn out to be stable over time (results are available upon request): this evidence shows the absence of rivals' reaction to the mergers, at least in the short term, and corroborates our conclusions.

As a further exercise, we added to the previous simulation also the merger between Banques Populaires (BP) and Caisses d'Epargne (CE), which was indeed approved after 2007. Even in this case the parameter *cci* decreases compared to the base model (see last row in Table 6a). This result proves that the initial pro-competitive effect of the merger still operates, even when considering a further increase in concentration.[13]

We have performed a similar exercise for the Italian banking industry. Two of the most relevant Italian mergers in recent years were Intesa (IN) merging with Sanpaolo (SP) and the one between UniCredit (UN) and Capitalia (CP). Notice that this exercise is "virtual" in our sample period since the merger actually occurred after the period considered, that is, at the end of 2007. In Table 6b we list the changes in the main indicators deriving from the two mergers.

[Insert Table 6b here]

The two mergers had an anti-competitive effect, as it results from the increase in the estimated value of *cci* with respect to the base model (last row in Table 6b). In Table 8b, we provide the Wald tests for the differences in *cci*, showing that the changes in the level of competition in local markets are significant.

[13] See Ivaldi (2006) for a detailed analysis of this merger.

5.2. Discussion of results

The differential impact of Italian mergers compared to the French ones can be better understood by analyzing their effects on the local market structure, as shown by changes in measures of concentration.

In what follows we investigate the relation between our measure of competition and standard measures of concentration, namely, the Herfindahl–Hirschman Index (HHI), the Gini index, and the number of large players in each local market. The idea behind these traditional measures is that, when market shares are uniformly distributed, market power is more balanced among firms and, as a consequence, competition is greater. Indeed, the HHI is the sum of squared market shares and captures the degree of concentration in branching at the local market level: this index gives more weight to changes in market shares of the largest banks since large banks have a greater share. The Gini index measures the distance between the actual distribution and the theoretical case of uniform market shares: this index rises with the inequality between market shares. Finally we compute the number of banks with a market share above the average (N. large banks), in each specific market. [14]

What we explore is whether our measure of competition replicates information contained in other concentration measures or whether it conveys additional information. To this aim, we compute the correlations between our *cci* and the traditional measures at the local market level. The results in the Tables 7a and 7b show correlations different from zero, meaning that our measure of competition is indeed related to aspects of market structure in both countries. Competition falls with the HHI and rises with the number of large banks in the market. As for the Gini index, we observe correlation with opposite signs in the two countries: a greater equality in the distribution of market shares increases competition in France, but not in Italy.

[Insert Tables 7a and 7b here]

Note that none of these traditional measures in isolation fully capture the information contained in our measure of competition. To better understand the opposite impact on competition of the mergers considered in sub-section 5.1 we explore their effect on the market structure at the

[14] The role of a large number of big players in enhancing competition is documented for instance by the debate around the proposal of mergers in the Canadian banking industry. Using Bank of Canada's words in response to Minister of Finance (23 June 2003): "In a given market, one player with a 45% market share can leave room for an acceptable level of competition, as long as there are two or three additional players with a certain critical mass who are also operating in the same market."

local level. Table 6a shows that the two mergers of CA with CL and CM with CIC in France reduce the average *cci* across departments that falls from 0.68 to 0.54 indicating a rise in competition. Although the two mergers create two large banking groups in France, we observe a reduction in the Gini index from 0.57 to 0.53 and a rise in the number of banks with a market share above the average from 2.71 to 3.06. Notice that even if the HHI rises due to larger banks increasing their market share, according to our measure the two French mergers have actually promoted competition. The beneficial impact on competition can be explained by the fact that those mergers reduced the asymmetry in the distribution of market shares (as it can be seen from data in Table 8a). The merger between CA and CL, two large players with complementary branching networks, and the merger between two medium-sized players such as CM with CIC have reinforced the presence of a number of large banks in all departments and this has benefited competition.

Conversely, in Italy the mergers of IN with SP and UN with CP have yielded a negative impact on competition, as shown by the increase in the average value of *cci* across provinces from 1.17 to 1.27 (see Table 6b). In contrast with the French example, in Italy the asymmetry of market shares rises following the mergers; the Gini index rises from 0.58 to 0.63, the number of large banks declines from 3.59 to 3.16, and the HHI rises from 1900 to 2400. The impact of the two Italian mergers is clearly anti-competitive at the local market level (as it can be seen from data in Table 8b): they in fact took place among top market players and the overall effect has been a reinforcement of their already strong local market power.

To conclude, our econometric test shows that it would be misleading to base the impact assessment of a merger only on the change in the degree of concentration, as it used to be the case in merger policy, before the reforms in Europe and in the U.S have limited the use of the dominance criteria as the sole test in merger assessment.[15] In our simulation, for instance, such rule would imply rejecting the French mergers, while we have shown they were useful in enhancing market competition. At the same time, note that the information required to compute our measure is precisely the same used in the calculation of local market concentration indexes such as the HHI.

[15] See Shapiro (2010) and Gilbert and Rubinfield (2011) for reviews of merger guidelines in U.S. and E.U before the reforms. They both argue how pre-reform guidelines emphasized the stand-alone role of pre and post-merger HHI thresholds to challenge a merger.

6. Conclusions

This paper addresses the question of how to measure the impact of mergers on competition in the banking sector. This question is relevant for competition policy and ex-ante merger assessments.

We provide a measure of competition in retail banking markets based on the elasticity of profits with respect to branching: the smaller the elasticity, the higher the competition. Our evidence indicates that the retail banking industry in France is more competitive than in Italy.

In addition, we propose an empirical test and perform a few simulations to show its relevance for the ex-ante impact assessment of mergers on competition. Our test is parsimonious in terms of data requirements and is based on a model where branching is an outcome of the strategic interaction among banks. In our simulated examples, we provide cases of either pro- and anti-competitive mergers.

Our findings are based on a static model, in which banks determine their optimal branching size at each period. It is part of our agenda for future research to take into account a more dynamic version of the branching competition game (as for instance in Chizzolini, 2011).

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Appendix – Tables

Table 1a- Descriptive statistics on observable variables (2007, local market values)

FRANCE	Total deposits (S)	Total branches (N)	Individual branches (k)	Market share (k/N)
Mean	12406.1	441	46	10.61
Median	8091.4	373	23	5.36
Maximum	171591.3	1485	389	69.13
Minimum	1691.1	91	0	0.00
Standard deviation	18837.0	253	55	12.61

Note: Total deposits are expressed in Euro.

Table 1b- Descriptive statistics on observable variables (2006, local market values)

ITALY	Total deposits (S)	Total branches (N)	Individual branches (k)	Market share (k/N)
Mean	7064.2	237	19	7.89
Median	3647.6	163	7	4.10
Maximum	128132.5	2050	435	83.04
Minimum	442.8	25	1	0.13
Standard deviation	15323.6	273	34	10.02

Note: Total deposits are expressed in Euro.

Table 2a – Base model (maximum likelihood estimation)

FRANCE		Coefficient	P-value
cci	Constant	0.662	0.000
	SHRUR	0.082	0.192
	LPC	-0.003	0.000
mc	Bank dummies		
	Log likelihood		-346.0
	# obs		862

Note: SHRUR is the share of rural areas within a county, LPC are loans per-capita.

Table 2b – Base model (maximum likelihood estimation)

ITALY		Coefficient	P-value
cci	Constant	1.243	0.000
	DBIGPRO	-0.340	0.000
	LPC	-0.003	0.000
Mc	Bank dummies		
	Log likelihood		-649.284
	# obs		1226

Note: DBIGPRO is a dummy indicating densely populated urban areas, LPC are loans per-capita.

Table 3a – Descriptive statistics on estimated values (local market values)

FRANCE	*cci*	MC	Per-branch profit
Mean	0.68	42.67	149.49
Median	0.69	39.20	115.99
Maximum	0.71	99.38	2240.58
Minimum	0.32	22.45	18.20
Standard deviation	0.04	22.71	208.34

Table 3b – Descriptive statistics on estimated values (local market values)

ITALY	*cci*	MC	Per-branch profit
Mean	1.17	242.51	400.06
Median	1.19	216.90	297.03
Maximum	1.23	502.23	2829.97
Minimum	0.64	132.89	88.55
Standard deviation	0.10	100.22	393.54

Table 4a – Descriptive statistics on estimated values (banking group values)

FRANCE	MC	Per-branch profit	N. branches
BANQUE NATIONAL DE PARIS	28.83	166.15	2154
BANQUES POPULAIRES	22.45	150.95	2475
CREDIT AGRICOLE	51.62	112.67	6238
CAISSES D'EPARGNE	44.78	125.46	4312
CREDIT INDUSTRIEL COMMERCIAL	39.20	186.97	1692
CREDIT LYONNAIS	25.75	173.11	1947
CREDIT MUTUEL	48.96	182.56	3111
LA POSTE	99.38	81.86	15581
SOCIETE GENERALE	23.02	166.43	2204
Mean	42.67	149.57	4412.67
Standard deviation	24.04	35.58	4429.78

Table 4b – Descriptive statistics on estimated values (banking group values)

ITALY	MC	Per-branch profit	N. branches
BANCA ANTONIANA - POPOLARE	254.50	387.52	1007
BANCA INTESA	150.99	369.59	3029
BANCA LOMBARDA E PIEMONTESE	254.50	474.63	787
BANCA NAZIONALE DEL LAVORO	132.89	366.86	731
BANCA POPOLARE DI LODI	194.68	400.37	901
BANCA POPOLARE DI VICENZA	254.50	446.76	524
BANCA POPOLARE EMILIA ROMAGNA	254.50	410.12	1175
BANCHE POPOLARI UNITE (IN FORMAZIONE)	216.90	427.57	1205
BANCO POPOLARE DI VERONA	254.50	450.27	1221
BIPIEMME	446.58	540.84	713
CAPITALIA	200.53	371.07	2013
CARIGE	254.50	422.80	508
CREDITO EMILIANO - CREDEM	319.15	417.31	470
MONTE DEI PASCHI DI SIENA	168.11	369.94	1908
SANPAOLO IMI	178.57	371.02	3171
UNICREDITO ITALIANO	502.23	373.24	3028
Mean	252.35	412.49	1399.44
Standard deviation	99.67	48.15	942.40

Table 5a – Goodness of fit
(predicted vs actual observations in %)

FRANCE	Predicted		
Actual	dk<0,k=1	dk≥0,k>1	
dk<0,k=1	9.74	12.99	22.74
dk≥0,k>1	2.9	74.36	77.26
	12.65	87.35	100

The correct predictions are 84.1% over the total, obtained by summing the percentages along the main diagonal.

Table 5b – Goodness of fit
(predicted vs. actual observations in %)

ITALY	Predicted		
Actual	dk<0,k=1	dk≥0,k>1	
dk<0,k=1	5.22	19.58	24.8
dk≥0,k>1	5.06	70.15	75.2
	10.28	89.72	100

The correct predictions are 75.4% over the total, obtained by summing the percentages along the main diagonal.

Table 6a – Impact of mergers on competition and market structure

FRANCE	*cci*	Gini	HHI	N. large banks
Base model	0.68 (0.04)	0.57 (0.12)	2400 (0.08)	2.71 (0.90)
CA+CL and CM+CIC	0.54 (0.03)	0.53 (0.12)	2600 (0.08)	3.06 (0.82)
CA+CL , CM+CIC and CE+BP	0.55 (0.03)	0.50 (0.14)	2700 (0.08)	3.48 (0.71)

Note: standard deviations are in brackets.
CA=Credit Agricole, CL=Credit Lyonnais, CM=Credit Mutuel, CIC= Crédit Industriel Commercial, CE=Caisses d'Epargne, BP=Banques Populaires.

Table 6b – Impact of mergers on competition and market structure

ITALY	*cci*	Gini	HHI	N. large banks
Base model	1.17 (0.09)	0.58 (0.09)	1900 (0.11)	3.59 (1.51)
IN+SP and UN+CP	1.27 (0.09)	0.63 (0.09)	2400 (0.14)	3.16 (1.17)

Note: standard deviations are in brackets.
IN=Intesa, SP=San Paolo IMI, UN=Unicredito, CP= Capitalia.

Table 7a- Correlation between competition and measures of market structure

FRANCE	*cci*	HHI	GINI	N. Large banks
cci	1.00	0.54	0.59	-0.49
HHI	//	1.00	0.93	-0.72
Gini	//	//	1.00	-0.70
N. Large banks	//	//	//	1.00

Note: the matrix is symmetric.

Table 7b- Correlation between competition and measures of market structure

ITALY	*cci*	HHI	GINI	N. Large Banks
cci	1	0.11	-0.07	-0.21
HHI	//	1.00	0.53	-0.01
Gini	//	//	1.00	-0.20
N. Large banks	//	//	//	1.00

Note: the matrix is symmetric.

Table8a – Descriptive statistics on estimated indicators (local market values)

FRANCE	Base model				CA+CL and CM+CIC				CA+CL and CM+CIC and CE+BP			
Département	*cci*	Gini	HHI	N_large	Δcci	ΔGini	ΔHHI	ΔN large	Δcci	ΔGini	ΔHHI	ΔN large
Paris	0.32	0.29	0.07	5	-0.03	-0.05	0.03	-1	-0.01	-0.16	0.04	0
Hauts-de-Seine	0.51	0.29	0.1	5	-0.07	-0.05	0.03	-1	-0.06	-0.12	0.04	0
Val-de-Marne	0.63	0.29	0.1	6	-0.1	-0.08	0.03	-1	-0.09	-0.11	0.04	-1
Bouches-du-Rhône	0.64	0.37	0.12	4	-0.11	-0.03	0.03	-1	-0.1	-0.07	0.04	-1
Seine-Saint-Denis	0.64	0.34	0.11	5	-0.1	-0.11	0.02	-1	-0.09	-0.14	0.04	0
Bas-Rhin	0.64	0.53	0.2	2	-0.13 *	-0.02	0.04	1	-0.12	-0.04	0.05	2
Haute-Savoie	0.65	0.47	0.16	2	-0.13 *	-0.08	0.03	1	-0.12	-0.11	0.04	2
Rhône	0.65	0.34	0.13	3	-0.13 *	-0.01	0.03	1	-0.12	-0.04	0.05	1
Marne	0.66	0.54	0.22	3	-0.14 *	-0.02	0.03	0	-0.13	-0.05	0.04	0
Haut-Rhin	0.66	0.56	0.22	2	-0.13 *	-0.03	0.03	1	-0.12	-0.04	0.05	2
Essonne	0.66	0.31	0.14	4	-0.12	-0.05	0.02	1	-0.11	-0.04	0.04	1
Nord	0.66	0.41	0.14	4	-0.12	-0.08	0.04	1	-0.12	-0.14	0.05	1
Loire-Atlantique	0.66	0.43	0.16	3	-0.13 *	-0.02	0.03	0	-0.12	-0.07	0.05	1
Yvelines	0.66	0.34	0.13	4	-0.13 *	-0.08	0.02	1	-0.12	-0.08	0.04	1
Ille-et-Vilaine	0.67	0.51	0.18	3	-0.14 *	-0.08	0.03	0	-0.13	-0.13	0.04	1
Territoire Belfort	0.67	0.49	0.18	3	-0.13 *	-0.03	0.03	0	-0.12	-0.06	0.04	1
Seine-et-Marne	0.67	0.42	0.18	3	-0.13 *	-0.04	0.02	1	-0.13	-0.08	0.03	2
Finistère	0.67	0.55	0.19	3	-0.13 *	-0.04	0.02	0	-0.13	-0.09	0.03	1
Loiret	0.67	0.45	0.17	3	-0.14 *	-0.01	0.03	1	-0.13	-0.03	0.04	1
Gironde	0.67	0.45	0.18	4	-0.13 *	-0.04	0.01	0	-0.13	-0.05	0.03	0
Val-d'Oise	0.67	0.39	0.15	5	-0.13	-0.05	0.02	0	-0.12	-0.08	0.04	0
Vendée	0.67	0.62	0.23	3	-0.14 *	-0.05	0.02	0	-0.13	-0.1	0.02	0
Var	0.67	0.45	0.16	3	-0.13 *	-0.04	0.02	0	-0.12	-0.06	0.03	0
Hérault	0.68	0.56	0.18	4	-0.14 *	-0.07	0.01	-1	-0.13	-0.08	0.02	-1
Haute-Garonne	0.68	0.4	0.15	3	-0.14 *	-0.08	0.02	0	-0.13 *	-0.06	0.05	0
Morbihan	0.68	0.55	0.2	3	-0.14 *	-0.06	0.02	0	-0.13 *	-0.11	0.03	1
Moselle	0.68	0.51	0.2	3	-0.14 *	-0.01	0.03	1	-0.13 *	-0.03	0.05	1
Maine-et-Loire	0.68	0.6	0.23	3	-0.14 *	-0.06	0.02	0	-0.13 *	-0.11	0.03	1
Isère	0.68	0.5	0.2	3	-0.14 *	-0.06	0.02	0	-0.13 *	-0.07	0.04	0
Doubs	0.68	0.54	0.23	2	-0.14 *	-0.03	0.02	1	-0.14 *	-0.05	0.03	2
Vaucluse	0.68	0.55	0.17	4	-0.13 *	-0.05	0.02	-1	-0.13	-0.08	0.03	-1
Côte-d'Or	0.68	0.54	0.22	4	-0.14 *	-0.04	0.02	0	-0.14 *	-0.07	0.03	0

Département	*cci*	Gini	HHI	N_large	Δcci		ΔGini	ΔHHI	ΔN large	Δcci		ΔGini	ΔHHI	ΔN large
Alpes-Maritimes	0.68	0.38	0.13	4	-0.14	*	-0.03	0.03	0	-0.13	*	-0.04	0.04	0
Pyrénées-Orientales	0.68	0.62	0.24	3	-0.14	*	-0.06	0.02	0	-0.13	*	-0.06	0.04	0
Mayenne	0.68	0.67	0.27	3	-0.14	*	-0.06	0.01	0	-0.14	*	-0.11	0.02	0
Gard	0.68	0.63	0.25	3	-0.14	*	-0.06	0.01	0	-0.13		-0.07	0.02	0
Meurthe-et-Moselle	0.68	0.44	0.2	3	-0.14	*	0.02	0.03	1	-0.13	*	-0.03	0.04	1
Indre-et-Loire	0.68	0.58	0.26	3	-0.14	*	-0.03	0.02	0	-0.13	*	-0.03	0.03	0
Savoie	0.68	0.63	0.22	3	-0.14	*	-0.07	0.01	-1	-0.13	*	-0.07	0.02	0
Côtes d'Armor	0.68	0.66	0.26	3	-0.14	*	-0.09	0.01	0	-0.14	*	-0.13	0.01	0
Pyrénées-Atlantiques	0.68	0.48	0.15	4	-0.14	*	-0.05	0.03	-1	-0.13	*	-0.06	0.04	-1
Aveyron	0.68	0.69	0.34	3	-0.14	*	-0.03	0.01	0	-0.14	*	-0.04	0.02	0
Deux-Sèvres	0.69	0.58	0.22	4	-0.14	*	-0.06	0.02	0	-0.14	*	-0.1	0.03	0
Loire	0.69	0.48	0.19	3	-0.14	*	-0.02	0.03	0	-0.13	*	-0.04	0.04	0
Charente-Maritime	0.69	0.58	0.24	2	-0.14	*	-0.03	0.01	1	-0.14	*	-0.05	0.02	2
Vosges	0.69	0.51	0.22	3	-0.14	*	-0.05	0.01	1	-0.13	*	-0.08	0.03	1
Calvados	0.69	0.48	0.2	2	-0.14	*	-0.01	0.02	1	-0.14	*	-0.08	0.03	2
Seine-Maritime	0.69	0.43	0.16	3	-0.14	*	-0.03	0.02	1	-0.14	*	-0.09	0.03	1
Oise	0.69	0.54	0.21	3	-0.14	*	-0.05	0.02	0	-0.13	*	-0.1	0.03	0
Sarthe	0.69	0.57	0.24	4	-0.14	*	-0.02	0.02	0	-0.14	*	-0.08	0.03	0
Ain	0.69	0.58	0.25	2	-0.14	*	-0.02	0.02	1	-0.14	*	-0.05	0.03	2
Aube	0.69	0.57	0.25	2	-0.15	*	-0.06	0.02	0	-0.14	*	-0.05	0.03	1
Pas-de-Calais	0.69	0.54	0.19	3	-0.14	*	-0.08	0.02	1	-0.13		-0.15	0.03	1
Tarn	0.69	0.58	0.22	4	-0.14	*	-0.07	0.02	0	-0.14	*	-0.08	0.04	-1
Haute-Vienne	0.69	0.66	0.28	3	-0.14	*	-0.1	0.01	0	-0.14	*	-0.11	0.03	0
Landes	0.69	0.62	0.26	2	-0.14	*	-0.04	0.02	0	-0.14	*	-0.05	0.03	1
Drôme	0.69	0.57	0.24	3	-0.14	*	-0.02	0.01	0	-0.14	*	-0.04	0.03	0
Lot-et-Garonne	0.69	0.66	0.28	2	-0.14	*	-0.05	0.01	0	-0.14	*	-0.06	0.03	1
Tarn-et-Garonne	0.69	0.67	0.31	2	-0.14	*	-0.06	0.01	0	-0.14	*	-0.07	0.02	1
Manche	0.69	0.53	0.2	4	-0.14	*	-0.04	0.02	0	-0.14	*	-0.1	0.03	0
Puy-de-Dôme	0.69	0.64	0.26	2	-0.14	*	-0.06	0.03	0	-0.14	*	-0.07	0.04	1
Eure-et-Loir	0.69	0.54	0.2	4	-0.14	*	-0.05	0.02	0	-0.14	*	-0.11	0.03	0
Loir-et-Cher	0.69	0.63	0.29	2	-0.14	*	-0.02	0.01	0	-0.14	*	-0.05	0.02	1
Vienne	0.69	0.65	0.29	3	-0.14	*	-0.04	0.02	0	-0.14	*	-0.05	0.02	0
Charente	0.69	0.64	0.31	2	-0.15	*	-0.03	0.02	0	-0.14	*	-0.06	0.02	1
Jura	0.7	0.61	0.28	3	-0.15	*	-0.05	0.01	1	-0.14	*	-0.03	0.03	1

Département	*cci*	Gini	HHI	N_large	Δcci		ΔGini	ΔHHI	ΔN large	Δcci		ΔGini	ΔHHI	ΔN large
Somme	0.7	0.65	0.25	3	-0.14	*	-0.08	0.02	0	-0.14	*	-0.15	0.02	0
Aude	0.7	0.76	0.41	2	-0.15	*	-0.04	0	0	-0.14	*	-0.05	0.01	1
Orne	0.7	0.58	0.22	3	-0.15	*	-0.06	0.02	0	-0.14	*	-0.11	0.03	1
Hautes-Alpes	0.7	0.73	0.34	2	-0.15	*	-0.05	0.01	0	-0.14	*	-0.06	0.02	1
Gers	0.7	0.7	0.3	2	-0.15	*	-0.05	0.02	0	-0.14	*	-0.06	0.03	1
Cantal	0.7	0.77	0.38	2	-0.15	*	-0.05	0.01	0	-0.14	*	-0.06	0.02	1
Aisne	0.7	0.62	0.27	3	-0.14	*	-0.05	0.01	0	-0.14	*	-0.1	0.02	0
Corrèze	0.7	0.73	0.34	2	-0.15	*	-0.07	0.01	0	-0.14	*	-0.07	0.02	1
Saône-et-Loire	0.7	0.57	0.26	3	-0.15	*	-0.03	0.02	0	-0.14	*	-0.05	0.03	0
Eure	0.7	0.52	0.21	3	-0.14	*	-0.03	0.02	0	-0.14	*	-0.09	0.03	0
Haute-Loire	0.7	0.69	0.29	3	-0.15	*	-0.05	0.01	0	-0.14	*	-0.08	0.02	0
Indre	0.7	0.7	0.31	3	-0.15	*	-0.06	0.01	0	-0.14	*	-0.08	0.02	0
Cher	0.7	0.67	0.28	2	-0.15	*	-0.03	0.01	0	-0.14	*	-0.04	0.02	1
Yonne	0.7	0.65	0.3	3	-0.15	*	-0.04	0.01	0	-0.14	*	-0.04	0.02	0
Haute-Saône	0.7	0.66	0.35	2	-0.15	*	-0.01	0.01	1	-0.14	*	-0.03	0.02	2
Allier	0.7	0.65	0.3	3	-0.15	*	-0.06	0.01	0	-0.14	*	-0.07	0.03	0
Lozère	0.7	0.76	0.4	2	-0.15	*	-0.02	0.01	0	-0.14	*	-0.03	0.02	1
Ardennes	0.7	0.62	0.27	2	-0.15	*	-0.01	0.03	1	-0.14	*	-0.06	0.03	2
Lot	0.7	0.69	0.31	3	-0.15	*	-0.03	0.02	0	-0.14	*	-0.04	0.04	0
Corse A	0.7	0.74	0.45	1	-0.15	*	0	0.01	1	-0.14	*	-0.01	0.01	1
Nièvre	0.7	0.69	0.32	3	-0.15	*	-0.04	0.01	0	-0.14	*	-0.05	0.02	0
Hautes-Pyrénées	0.7	0.62	0.28	2	-0.15	*	-0.04	0.02	0	-0.14	*	-0.04	0.03	1
Dordogne	0.71	0.75	0.38	2	-0.15	*	-0.06	0	0	-0.14	*	-0.07	0.01	0
Meuse	0.71	0.72	0.38	2	-0.15	*	-0.01	0.01	0	-0.14	*	-0.03	0.02	1
Ariège	0.71	0.72	0.39	2	-0.15	*	-0.04	0.01	0	-0.14	*	-0.05	0.02	1
Ardèche	0.71	0.69	0.33	3	-0.15	*	-0.01	0.02	0	-0.14	*	-0.04	0.02	0
Corse B	0.71	0.78	0.5	1	-0.15	*	-0.01	0	1	-0.14	*	-0.03	0.01	1
Haute-Marne	0.71	0.72	0.4	2	-0.15	*	-0.03	0.01	0	-0.14	*	-0.05	0.01	1
Alpes-haute-Provence	0.71	0.71	0.33	2	-0.15	*	-0.04	0.01	0	-0.14	*	-0.05	0.02	1
Creuse	0.71	0.74	0.39	2	-0.15	*	-0.03	0.01	0	-0.15	*	-0.05	0.02	1

Note: Difference in *cci* relative to base model significant at 10% level (*) or at 5% level (**)

Table 8b – Descriptive statistics on estimated indicators (local market values)

ITALY	Base model				IN+SP and UN+CP				
Province	cci	Gini	HHI	N large	Δcci		ΔGini	ΔHHI	ΔN large
MILANO	0.64	0.5	0.1	5	0.05		0.09	0.05	-1
ROMA	0.76	0.53	0.1	6	0.08		0.11	0.06	-2
TORINO	0.84	0.7	0.28	4	0.1		0.07	0.15	-2
NAPOLI	0.88	0.57	0.27	6	0.11		0.12	0.15	-2
FIRENZE	1.11	0.64	0.14	2	0.08	*	0.03	0.01	2
SIENA	1.12	0.77	0.42	2	0.08	*	-0.02	0	0
BERGAMO	1.13	0.6	0.18	5	0.09	**	0.04	0.04	-1
BOLZANO	1.13	0.65	0.04	1	0.09	**	0.06	0	-1
BOLOGNA	1.13	0.59	0.14	4	0.09	**	0.05	0.03	-1
BRESCIA	1.14	0.59	0.16	4	0.09	**	0.07	0.03	0
PADOVA	1.14	0.7	0.3	6	0.09	**	0.05	0.09	-2
MODENA	1.15	0.61	0.14	4	0.09	**	0.04	0.02	0
TRENTO	1.15	0.74	0.21	3	0.09	**	0	0.02	-1
RIMINI	1.15	0.54	0.07	2	0.09	**	0.07	0.03	1
MANTOVA	1.15	0.56	0.17	4	0.09	**	0.05	0.02	0
PARMA	1.15	0.59	0.17	7	0.09	**	0.08	0.05	-3
PRATO	1.15	0.61	0.13	5	0.09	**	0	0.01	0
REGGIO EMILIA	1.15	0.58	0.13	6	0.09	**	0.05	0.04	0
FORLI'-CESENA	1.15	0.61	0.08	2	0.09	**	0.03	0.01	0
VICENZA	1.16	0.64	0.17	6	0.09	**	0.03	0.04	-1
VERONA	1.16	0.68	0.18	5	0.09	**	0.05	0.03	-1
ANCONA	1.16	0.46	0.07	2	0.09	**	0.05	0.02	1
TREVISO	1.16	0.62	0.13	5	0.09	**	0.07	0.04	-1
UDINE	1.16	0.6	0.23	5	0.09	**	0.11	0.15	-1
RAVENNA	1.16	0.62	0.08	4	0.09	**	0.03	0.01	-1
BIELLA	1.16	0.66	0.19	2	0.09	**	0.06	0.05	-1
SONDRIO	1.17	0.57	0.01	0	0.1	**	0.09	0.01	0
LODI	1.17	0.58	0.3	3	0.1	**	0.09	0.15	0
LUCCA	1.17	0.61	0.16	4	0.1	**	-0.03	0	0
MACERATA	1.17	0.38	0.04	1	0.1	**	0	0.01	0
PESARO E URBINO	1.17	0.59	0.09	5	0.1	**	0.11	0.06	-1
PIACENZA	1.17	0.57	0.21	3	0.1	**	0.08	0.05	-1

Province	cci	Gini	HHI	N. large	Δcci		ΔGini	ΔHHI	ΔN large
LECCO	1.17	0.54	0.07	3	0.1	**	0.07	0.03	-1
CREMONA	1.18	0.62	0.22	3	0.1	**	0.06	0.09	-1
VARESE	1.18	0.61	0.14	4	0.1	**	0.05	0.04	0
COMO	1.18	0.63	0.16	4	0.1	**	0.08	0.13	0
PORDENONE	1.18	0.61	0.25	4	0.1	**	0.12	0.19	-1
AREZZO	1.18	0.7	0.14	2	0.1	**	-0.01	0	0
PISTOIA	1.18	0.62	0.19	2	0.1	**	-0.02	0	0
VENEZIA	1.18	0.62	0.31	7	0.1	**	0.12	0.19	-3
PESCARA	1.18	0.55	0.15	2	0.1	**	0.08	0.03	1
PERUGIA	1.18	0.63	0.16	3	0.1	**	0.01	0.03	0
ALESSANDRIA	1.18	0.54	0.15	6	0.1	**	0.05	0.04	-1
CUNEO	1.18	0.7	0.2	4	0.1	**	0	0.02	0
GENOVA	1.19	0.56	0.14	6	0.1	**	0.07	0.03	-2
PISA	1.19	0.62	0.12	2	0.1	**	0.01	0	0
NOVARA	1.19	0.58	0.14	4	0.1	**	0.04	0.04	-1
LIVORNO	1.19	0.65	0.19	2	0.1	**	-0.01	0.01	1
AS. PICENO	1.19	0.53	0.12	4	0.1	**	0.08	0.05	0
ASTI	1.19	0.65	0.06	3	0.1	**	0.02	0	0
ROVIGO	1.19	0.68	0.61	4	0.1	**	0.04	0.17	-1
SAVONA	1.19	0.6	0.25	4	0.1	**	0.03	0.03	0
VERB.CUS..OSS	1.2	0.6	0.12	2	0.1	**	0.05	0.03	0
BELLUNO	1.2	0.68	0.21	3	0.1	**	0.04	0.04	-1
GROSSETO	1.2	0.67	0.28	2	0.1	**	0	0	0
FERRARA	1.2	0.58	0.05	2	0.1	**	0.03	0.01	1
PAVIA	1.2	0.53	0.17	4	0.1	**	0.08	0.11	0
VERCELLI	1.2	0.68	0.26	4	0.1	**	0.07	0.1	-1
GORIZIA	1.2	0.51	0.39	4	0.1	**	0.12	0.22	-2
TRIESTE	1.2	0.48	0.21	4	0.1	**	0.13	0.1	-1
MASSA	1.2	0.56	0.17	4	0.1	**	-0.08	0	-1
TERAMO	1.2	0.53	0.11	1	0.11	**	0.1	0.06	0
TERNI	1.2	0.69	0.23	4	0.11	**	-0.03	0.02	0
AOSTA	1.2	0.65	0.34	2	0.11	**	0.04	0.09	0
LA SPEZIA	1.2	0.58	0.23	3	0.11	**	0.01	0.02	0
SASSARI	1.2	0.76	0.46	2	0.11	**	0.02	0.02	0

Province	cci	Gini	HHI	N large	Δcci		ΔGini	ΔHHI	ΔN large
IMPERIA	1.21	0.56	0.18	5	0.11	**	0.07	0.07	-2
VITERBO	1.21	0.57	0.19	4	0.11	**	-0.04	0.02	-1
CAGLIARI	1.21	0.72	0.35	4	0.11	**	0.04	0.03	-1
CHIETI	1.21	0.48	0.1	2	0.11	**	0.04	0.02	0
RAGUSA	1.21	0.48	0.08	1	0.11	**	0.08	0.03	1
BARI	1.21	0.49	0.11	7	0.11	**	0.12	0.06	-2
L'AQUILA	1.21	0.68	0.21	3	0.11	**	-0.02	0.01	1
CATANIA	1.21	0.48	0.1	3	0.11	**	0.07	0.02	0
PALERMO	1.22	0.54	0.18	1	0.11	**	0.07	0.04	1
CAMPOBASSO	1.22	0.5	0.16	4	0.11	**	0.1	0.09	-1
RIETI	1.22	0.69	0.19	3	0.11	**	0.04	0.04	-1
TRAPANI	1.22	0.41	0.11	4	0.11	**	0.02	0.03	0
LATINA	1.22	0.54	0.18	3	0.11	**	0.02	0.04	0
SALERNO	1.22	0.57	0.18	6	0.11	**	0.03	0.05	-1
SIRACUSA	1.22	0.52	0.12	2	0.11	**	0.09	0.04	1
MATERA	1.22	0.6	0.25	3	0.11	**	-0.07	0.01	0
LECCE	1.22	0.5	0.08	3	0.11	**	0.08	0.03	0
FOGGIA	1.22	0.47	0.11	6	0.11	**	0.06	0.03	0
MESSINA	1.22	0.46	0.12	3	0.11	**	0.07	0.04	1
CATANZARO	1.22	0.29	0.13	6	0.11	**	0.01	0.03	-1
FROSINONE	1.22	0.63	0.22	3	0.11	**	0.06	0.04	-1
CALTANISSETTA	1.22	0.56	0.2	3	0.11	**	0	0.01	1
TARANTO	1.22	0.39	0.14	5	0.11	**	0.06	0.05	0
COSENZA	1.23	0.52	0.21	4	0.11	**	0.03	0.02	-1
POTENZA	1.23	0.54	0.1	3	0.11	**	-0.01	0.01	0
ORISTANO	1.23	0.83	0.63	1	0.11	**	0	0	0
AGRIGENTO	1.23	0.52	0.2	4	0.11	**	0.09	0.06	-1
NUORO	1.23	0.85	0.7	1	0.11	**	0.01	0.01	0
AVELLINO	1.23	0.65	0.27	3	0.11	**	0.03	0.04	0
CASERTA	1.23	0.63	0.52	5	0.11	**	0.09	0.22	-1
ISERNIA	1.23	0.41	0.24	4	0.11	**	0.15	0.16	-1
CROTONE	1.23	0.47	0.26	4	0.11	**	-0.01	0.02	0
ENNA	1.23	0.5	0.24	4	0.11	**	0.01	0.01	0
BENEVENTO	1.23	0.51	0.17	3	0.11	**	0.01	0.03	0
BRINDISI	1.23	0.44	0.13	3	0.11	**	0.07	0.06	-1

Province	cci	Gini	HHI	N large	Δcci		ΔGini	ΔHHI	ΔN large
REGGIO CALABRIA	1.23	0.47	0.2	5	0.11	**	0	0.03	-1
VIBO VALENTIA	1.23	0.51	0.28	5	0.11	**	0	0.02	0

Note: Difference in *cci* relative to base model significant at 10% level (*) or at 5% level (**)