Impact of Mergers on the Degree of Competition: Application to the Banking Industry

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Abstract: This paper analyses the relation between competition and concentration in a monopolistic competition model where banks compete in branching and interest rates and market structure is endogenous. The model is applied on individual bank data in Italy and France using a maximum likelihood approach to derive a measure of the degree of competition in each local market. We propose an empirical test to evaluate ex-ante the impact of horizontal mergers on this measure. Depending on the pre-merger market structure and geographic distribution of branches, we find either cases where the merger is pro-competitive or anti-competitive. It proves its relevance as a tool for competition policy analysis. In addition, thanks to its theoretical foundation, it encompasses more information than traditional measures of competition while it is parsimonious in terms of data requirements.

JEL classifications: G21 (Banks); L13 (Oligopoly); L59 (Regulation and industrial policy).
Keywords: Banking industry; Competition and market structure; Merger policy.

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Introduction

From a general perspective performing a comprehensive analysis of the relation between competition and concentration in the banking industry is critical in view to evaluate competition policies designed for this sector, as for instance the Second European Directive implemented in 1992. It is well admitted that, while this directive has instantaneously restored competition among banks after years of tight regulatory constraints, it has also indirectly prompted a wave of mergers within national borders. As a result, the degree of concentration, measured in terms of market shares, has risen in almost all European countries. Since deregulation was aimed at promoting competition, this rise in concentration raises the concern that the reverse objective obtains.

How do we measure the degree of competition in a market and what is its relation with concentration? It is well documented that the relation between competition and concentration cannot be reduced to the view that they are inversely related, as stated by the structure-conduct-performance (SCP) paradigm promoted by Bain (1956). As a matter of fact, when taking into account the changes in market structure, the relation may be reversed: Firms tend to exit competitive industries in the anticipation that profits will be lower than entry costs. This explains why tougher price competition may be followed by an increase in the degree of concentration, hence delivering a positive relation that contrasts with the SCP paradigm.

From a more specific perspective, the antitrust investigation of single cases of proposed mergers between dominant firms calls for an assessment of their likely impact on competition. To what extent a merger provides the new entity with the ability to raise prices at the detriment of consumers and rivals and creates the conditions favouring coordinated behaviour among firms is at the core of the merger policy. The literature provides contrasting evidence on the impact of mergers on competition in the banking system as discussed in Degryse and Ongena (2008) and Carletti and Vives (2009). In the short term, when the involved banks gain efficiency, due to economies of scale and scope, and pass on the benefits to consumers by reducing prices of banking products, competition is enhanced; however when merged banks exploit their greater market power in order to increase prices, rivalry may be reduced. (See Sapienza, 2002, for a discussion of these contrasting effects.) In the longer term, however changes in the incentive to enter or exit the industry may further affect competition and an empirical analysis is required to be able to assess the overall impact of mergers (as for instance in Focarelli and Panetta, 2003). When analysing the impact of mergers among incumbent banks it is therefore crucial to rely on a model where competition and market structure are simultaneously determined.

This paper proposes a measure of the degree of competition[1] for the banking industry originated from a model where entry is endogenous. The proposed measure is obtained from the econometric estimation of a monopolistic competition model, where banks compete in retail markets by setting interest rates and branches, and captures the ability of banks to translate an enlargement of their branching network into higher profits. A tougher rivalry in interest rates reduces this ability, thus revealing greater competition. This measure is affected by the structure of the local market, in particular by the dispersion of market shares and the number of large players in the market, together with other standard measures of concentration such as the Herfindahl–Hirschman Index (HHI, herein).

Our econometric model is exploited here to evaluate the impact of a merger on this proposed measure of competition. Indeed, after having obtained the branching network of the merged bank by summing the pre-merger networks, we can re-estimate the model in order to derive the new measure of competition. By comparing the pre- and post-merger measures of competition, we exhibit examples of mergers that are pro-competitive, even though the merger causes an obvious increase in concentration in market shares. This may occur when the asymmetry between market shares falls or when the number of large banks competing at the top in each local market rises as a result of mergers between mid-size players.

Our measure of competition is based on a parsimonious quantity of information since basically it only requires a measure of the size of local markets and data on branching market shares of individual banks in these local markets, without any knowledge of 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 commonly used in the antitrust analysis.

Our approach is not specific to banks as it can be easily exported to other retail industries which require a network to distribute their products and services, as for instance in insurance, grocery stores, car dealers, or in industries where firms enter with one branch such as doctors or lawyers.

This paper is related to the empirical literature in industrial organization based on game theoretical models with endogenous market structure inspired by Sutton (1991). We

[1] In the sequel, we often simplify the term “the measure of the degree of competition” in “the measure of competition.”

depart from the SCP paradigm by empirically investigating the relation between competition and concentration along the line of an approach initiated by Bresnahan and Reiss (1991a, 1991b), more recently re-examined by Berry and Tamer (2006), based on models of firms entry and in an application to product differentiated industries by Schaumans and Verboven (2011).

Their basic idea is that, by observing the presence of a firm in a market, it is possible to recover information about profits and sunk costs of entry as the decision to enter reveals that profits are larger than entry costs; otherwise the firm would have not entered. We thus apply the same logic to the choice of branching: By its presence in a market with a given number of branches, a bank reveals that it expects to recover the cost of a branching network of that size. Then we can derive information about the non-observable cost of branching by observing the branch presence in a market. In this literature there is a 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. Our paper exploits further this result to study the changes in market structure following a merger to measure the changes in the degree of competition.

Our results show that the impact of mergers cannot be fully captured by measuring the change in market concentration only: When for instance the market structure is fragmented with a single dominant firm, a horizontal merger between medium-size players might restore competitive conditions by generating a rival for the dominant firm in the market. In this case, greater concentration in market shares is accompanied by greater competition, breaking down the inverse relation between concentration and competition. (See also Cetorelli, 1999, and Berger *et al.*, 2004.)

The paper is based on preliminary articles where we consider, as the reference markets, respectively the Italian provinces between 1989 and 1995 in Cerasi *et al.* (2000) and the national industry for several European countries before and after the implementation of the Second European Directive in 1992 in Cerasi *et al.* (2002). Here we apply the same methodology for individual banks using local markets –namely "département" for France and "provincia" for Italy- as the reference markets between 2004 and 2007. We are here able to compare two countries on the same basis, i.e., with the same model and similar reference markets on data of higher quality. However the main novelty here is the use of the model to evaluate the effect of a merger on the average degree of competition in the industry. More specifically we study the effect of mergers in France, among which that of Crédit Agricole with Crédit Lyonnais, and the two most important mergers in the latest years in Italy, namely Intesa with San Paolo IMI and Unicredito with Capitalia. We find mergers with opposite effects on competition, pro-competitive in France, while anti-competitive in Italy. Their opposite impact is explained by the differences in the pre-merger structure of local markets, in particular in terms of dispersion of market shares and number of large banks in the market.

More specifically, this paper is related to studies measuring competition in retail markets using structural models of monopolistic competition. In a recent paper Schaumans and Verboven (2011) estimate a measure of change in competition within a model of product differentiated industries and apply it to local services markets. They estimate the ordered probit entry model, as in Bresnahan and Reiss (1991a, 1991b), jointly with an industry revenue function to obtain a competition measure that adds to the estimated change in per-firm profits due to new entry a new component linked to the elasticity of demand to new entry. Their approach is close in its objective to our *cci* measure, 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 firms or branches as in our case.

Based on the idea that firms in more competitive markets suffer a larger loss in profits when their costs increase, Boone (2008) and Boone *et al.* (2007) propose a measure of competition that coincides with the elasticity of profits to costs. We use a similar idea by proposing a measure of competition that captures the ability of banks to translate an increase in their branching network into profits, that is the elasticity of profits to branching: In contrast to the other papers however, our measure of competition does not require any knowledge of accounting data. Cohen and Mazzeo (2007) propose a model of monopolistic competition in branching to estimate the competitive response of banks. Our approach is similar, since we both estimate directly the structural equations in order to infer non-observable entry costs; however we move further in exploiting the model to simulate the impact on competition of horizontal mergers.

The exercise of simulation of mergers based on a structural model of monopolistic competition contrasts with other papers in the literature where the impact measurement is carried *ex post* on accounting data after banking mergers have occurred. (See the 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 mergers and then, using them to simulate a change in the ownership allocation of branches with the purpose of assessing their impact on competition (as surveyed in Budzinski and Ruhmer, 2008). Our objective is to derive an impact assessment before the merger occurs, without imposing heavy data requirements other than the information to compute the HHI at local market level. We believe that our method provides a useful guide to competition authorities to assess ex-ante the impact mergers.

In Section 1 we derive the econometric test from a theoretical model of bank branching behaviour and propose a measure of the degree of competition in local markets. The results of the econometric test applied to individual bank data in local markets in France and Italy are presented in Section 2. Section 3 is devoted to the evaluation of the *ex ante* impact of specific horizontal mergers on the degree of competition using our econometric model, while Section 4 discusses the relation between our estimated measure of competition and concentration in market shares. Finally Section 5 concludes the paper.

1. Definition and measure of the degree of competition

We first define the degree of competition within a reduced-form model of monopolistic competition where branching is a strategic competitive tool for banks in local markets.[2] Then we derive an econometric model to obtain an estimate of this measure of competition in the banking industry.

1.1. The model

In our model, banks compete on interest rates, given their choice of entry and branching in a specific local market.[3] Each bank enters a local market whenever its expected profits are large enough to recover entry costs and expands its branching network up to the point where marginal benefits equate marginal costs. We assume that banks instantaneously adjust their branching networks to the optimal size in each period and market. Box 1 provides

[2] Branching is important in retail markets since geographic proximity still represents a competitive advantage when monitoring opaque SMEs or when supplying current accounts, as argued in Petersen and Rajan (2002), Degryse and Ongena (2005), and Brevoort ans Hannan (2006).

[3] The model presented in this paper is a reduced form of a two stage model: in the first stage each bank decides to enter and the size of its branching network, while in the second stage it competes in interest rates. See Cerasi (1996) for the full characterization of the model.

the details of the functional form of profits, entry and branching costs for each bank *i* operating in market *j*.

Box 1 – Brief description of the theoretical model

Profit of bank *i* in local market *j*:	$\pi_{ij} = S_j \frac{k_{ij}^{cci_j}}{\sqrt{N_j}}$	(1)
Marginal benefit of branching:	$MB_{ij} = \frac{d\pi_{ij}}{dk_{ij}} = \frac{S_j k_{ij}^{cci_j - 1}}{\sqrt{N_j}} \left(cci_j - \frac{k_{ij}}{2N_j} \right)$	(2)
Branching costs:	$\sigma_{ij} = a_{ij} + b_{ij}\left(k_{ij} - 1\right)$	(3)
Marginal cost of branching:	$MC_{ij} = \frac{d\sigma_{ij}}{dk_{ij}} = b_{ij}$	(4)
Branching size decision:	$MB_{ij} = MC_{ij} \quad \Rightarrow \quad k_{ij}^* > 1$	(5a)
	$MB_{ij} < MC_{ij} \quad \Rightarrow \quad k_{ij}^* = 1$	(5b)
Entry decision:	$\pi_{ij} \geq \sigma_{ij}$	(6)

where k_{ij} is the number of branches of bank $i \in \{1,\ldots, n\}$ in local market $j \in \{1,\ldots,J\}$, S_j is the size of market *j* (total deposits), cci_j is the inverse of the degree of competition in market *j*, $N_j = k_{ij} + \sum_{o \neq i} k_{oj}$ is the total number of branches in local market *j*, σ_{ij} are total sunk costs of bank *i* in market *j* , a_{ij} is the cost for bank *i* of entering in market *j* with a first branch, b_{ij} is the marginal cost of branching for bank *i* in market *j*.

Disaggregate profits of bank *i* in local market *j* given by Equation (1) are a proportion of total market size *S*, which, in our case, is measured as the total deposits in that market. The constant of proportionality $\frac{k_{ij}^{cci_j}}{\sqrt{N_j}}$, which can rewritten $\frac{k_{ij}^{cci_j}}{\sqrt{N_j}} = \frac{k_{ij} k_{ij}^{cci_j - 1}}{N_j N_j^{-1/2}}$, is a function of the branching market share of the bank, measured by its number of branches over the total number of branches in that specific market. The parameter cci_j captures the ability of banks to translate an increase in their branching network in market *j* into larger profits. As such, this parameter cci_j is inversely related to the degree of competition in market *j*. We return on this point below.

Note that the profit of bank *i* only depends upon observable variables, that is, the number of branches owned by bank *i* in market *j*, the market size S_j and the total number of branches N_j in that market.

By using this specification, we are imposing several properties to the profit function. First, per-bank profit increases with total market size S_j since a fixed number of banks in a larger market manage to share greater revenues. Second, per-bank profit decreases with the overall number of branches in the market N_j: As the market becomes further crowded with branches, per-bank profit shrinks. Third, per-bank profit increases with own branches k_{ij} at a rate given by the parameter cci_j according to Equation (2): The more intense is the competition in interest rates in a given market, the smaller the per-bank profit and marginal gain of opening a new branch. This is why our parameter measures, although indirectly, competition in interest rates in market j through its effect on the elasticity of profits to branching.[4] If competition in interest rates becomes tougher then the additional gain from opening a new branch decreases. Hence a smaller cci_j captures greater competition in market j.

The optimal branching size is achieved when its marginal benefits equates its marginal costs of branching. From Equation (3), branching costs are linear in k_{ij} and therefore the marginal cost b_{ij} in Equation (4), is constant. Each bank sets its branching network size at $k_{ij}^* > 1$, according to Equation (5a) by equating the marginal benefit of an additional branch to the marginal cost; otherwise $k_{ij}^* = 1$ if Equation (5b) holds.

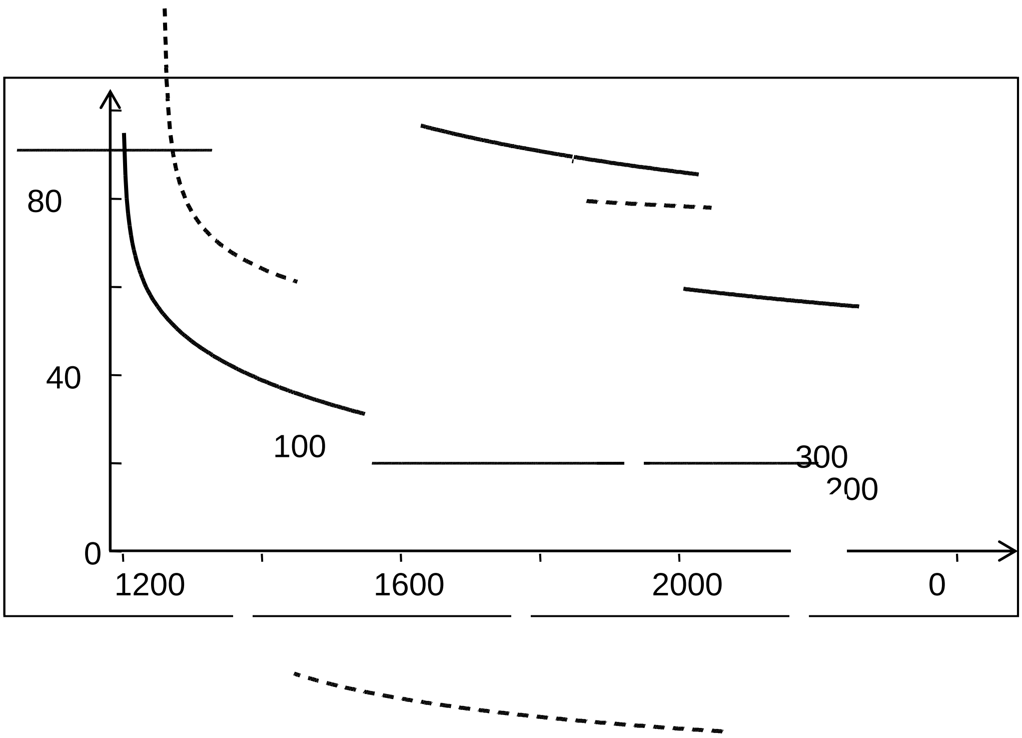
Dropping the subscripts, for given S and N, the optimal branching size increases with cci and decreases with marginal branching cost. For a given market size and number of competitors, if competition in the market becomes tougher (lower cci) the bank may end up closing branches (k^* will decrease) since the expected gains from a larger branching network shrink.

We may explain the choice of the optimal branching size with a numerical example. In Figure 1 we draw the constant marginal cost and marginal benefits as functions of k, given by Equations (2) and (4), for the values: $S=6000$, $N\text{-}k=300$, $b=75$. The dashed line represents the marginal cost MC, while the continuous line MB is the marginal benefit when cci is 0.9. The optimal branching size is given by the intersection between MB and MC in A at $k^* = 380$

[4] The parameter cci is defined as $\frac{\partial \ln \pi}{\partial \ln k} + \frac{k}{2N}$, which represents the elasticity of profits to an additional branch whenever $k/2N$ becomes negligible. Notice that the value cci in principle could change with the number of banks in the market, as indeed one might expect from a measure of competition. However as N becomes large relatively to k, it becomes independent.

approximately. If competition becomes tougher, that is when *cci* falls from 0.9 to 0.8, then MB shifts on the left (dotted line) so that the intersection is now reached in B and the optimal branching size shrinks to $k^{*'} = 100$. Clearly in our model, a tougher price competition has ceteris paribus a negative impact on branching size.

Figure 1 – Optimal branching size



A final component of the model is the free entry condition which requires banks to enter a market only if their expected profits are greater than entry costs for given branching size, as stated by Equation (6). Note that we can estimate the sunk costs as soon as we have an estimate of marginal costs.

1.2. The econometric model

To recover branching costs from observed choices of branching, we follow an approach initiated by Bresnahan and Reiss (1991 a, 1991b) and reinvigorated by Berry and Tamer (2006). Now we explain how to achieve this objective starting from the model presented in the previous section.

In equilibrium either one of two branching Conditions (5a) and (5b) must hold, since banks adjust their branching networks to the optimal size in each period and local market. As the data allows us to observe the change in the number of branches from one year to the other, we may exploit this additional information in the econometric model in order to retrieve the non-observable branching costs. We classify each observation, namely a bank *i* in period *t* and in local market *j,* according to either of the following four categories:

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

Notice that for multi-branch banks concerned by cases [a] to [c], Condition (5a) must hold, while for unit-branch banks in [d], Condition (5a) is replaced by Condition (5b).

Now we substitute the definition of MB_{ijt} in the branching Conditions (5a) and (5b) with the following quantity

$$A_{ijt} = \frac{S_{jt} k_{ijt}^{cci_{jt}}}{\sqrt{N_{jt}}} \left(cci_{jt} - \frac{k_{ijt-1}}{2N_{jt}} \right), \tag{7}$$

where, instead of the number of branches at time *t,* we use its lagged value $k_{ijt\text{-}1}$ inside the brackets. Notice that $A_{ijt} > MB_{ijt}$ when $\Delta k_{ijt} > 0$, while $A_{ijt} < MB_{ijt}$ when $\Delta k_{ijt} < 0$. Then we can say that for any bank in [a] it must be that $A_{ijt} > MB_{ijt}$, for banks in [b] and [d] it is $A_{ijt} = MB_{ijt}$, while for banks in [c] it is $A_{ijt} < MB_{ijt}$.

Finally, with respect to Conditions (5a) and (5b), we simplify the partitioning of all observations into two sub-sets:[5]

$$\begin{aligned} &E_{1t}\text{: all banks in [a] and [b] so that } A_{ijt} \geq MC_{ijt} \\ &E_{2t}\text{: all banks in [c] and [d] so that } A_{ijt} < MC_{ijt} \end{aligned} \tag{8}$$

The econometric test requires casting each observation into the probability space. Therefore we must make assumptions on the stochastic component of the model, that is to say, the non-observable branching cost. We assume that it is idiosyncratic, independent and

[5] Notice that we have made an arbitrary choice when choosing to classify the "static multi-branch" banks in the sub-set E_{1t}. We check the robustness of our results due to this classification criterion in the next section.

with known probability distribution. More specifically, we assume that the logarithm of the marginal cost is specified as:

$$\ln\left(MC_{ijt}\right) = mc_{ijt} + v_{ijt}\ , \tag{9}$$

where mc_{ijt} is the deterministic component and v_{ijt} is the stochastic term with standard normal distribution $\Phi(.)$.

According to the partitioning of observations defined by Equation (8) and our stochastic assumptions, the probability that each observation falls either in the subset E_{1t} (expanding or static multi-branch banks) or in E_{2t} (shrinking multi-branch or unit-branch banks) is given by:

$$\begin{aligned}\Pr\{(ij)\in E_{1t}\} &= \Pr\left(MC_{ijt} \le A_{ijt}\right) = \Pr\left(v_{ijt} \le \ln A_{ijt} - mc_{ijt}\right) = \Phi\left(\ln A_{ijt} - mc_{ijt}\right)\\ \Pr\{(ij)\in E_{2t}\} &= \Pr\left(MC_{ijt} > A_{ijt}\right) = \Pr\left(v_{ijt} > \ln A_{ijt} - mc_{ijt}\right) = 1-\Phi\left(\ln A_{ijt} - mc_{ijt}\right)\end{aligned} \tag{10}$$

Then the likelihood function for all observations in the dataset is obtained as

$$\ln L = \sum_{ij\in E_{1t}} \ln\Phi\left(\ln A_{ijt} - mc_{ijt}\right) + \sum_{ij\in E_{2t}} \ln\left[1-\Phi\left(\ln A_{ijt} - mc_{ijt}\right)\right] \tag{11}$$

The parameters cci_{jt} and mc_{ijt} are identifiable and estimated by maximizing the likelihood function. We further assume that the inverse measure of competition cci_{jt} and the marginal costs mc_{ijt} are specified as linear function of the market and bank specific variables W_{jt} and Z_{ijt} respectively.

2. Empirical analysis

In this section we measure the degree of competition in each local market based on the estimated values of the parameter *cci* from the econometric specification of the previous section. After a brief description of the dataset, we present the results.

2.1. The data

In the econometric model, the reduced form of profits, the marginal branching benefit and in particular the threshold value A_{ijt}, are all functions of observable variables either market specific variables such as the market size S_{jt} measured by the total amount of deposits, and the total number of branches N_{jt} in the market, or 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}.

Note that our analysis does not require any knowledge of accounting data. As a matter of fact disaggregated accounting measures of per-bank profit are not even available at the local level: accounting sources provide uniquely consolidated balance sheet data, that is, aggregate across all markets in which the bank operates. For instance, suppose that bank A owns branches in market *a* and *b*: From its accounting statements we would be able to recover only consolidated profits across the two markets, not the two separate profits, i.e. the profit of bank A in market *a* and profit of bank A in market *b,* as required by the analysis of the competitive behavior of banks at local level. Our theoretical model however provides a simple proxy for the profits on each market, as expressed by the reduced form given in Equation (1), which is a function of the market share of the bank in each local market computed in terms of the number of branches.

Our local markets are the 95 départements in France and the 103 provinces in Italy. Note that many brand-name banks share the same ownership. We assume that banks belonging to the same group tend to coordinate their decisions in terms of interest rates and branching. Thus groups and not banks should be the most appropriate unit of observation.[6] Each observation is therefore a banking group i operating in local market j at time t with given branching size k_{ijt}.[7]

We recovered the information on the number of branches for each individual banking group in each local market for 2005 and 2007 in France, and for 2004 and 2006 in Italy. We therefore have a cross-section for each country which allows us to compute Δk_{ijt}, i.e., the change in branching size for each group in each local market, taking 2005 (resp. 2004) as the initial year for France (resp. Italy).

[6] We consider that, on the one hand, smaller groups or independent banks have no strategic behavior as they are price takers and are marginally adapting their branching behavior. They are nevertheless included in the denominator N_j, representing the total number of branches in that market, since they nevertheless exert a competitive pressure on branches of the main groups in each local market behaving like a fringe. On the other hand, we include La Poste among banks 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 a similar role at the time of our analysis.

[7] 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.

For Italy, data on bank branches by "provincia" are taken from the public site of Bank of Italy.[8] For France data on bank branches by "départements" were provided directly by Crédit Agricole and Caisses d'Epargne. In France all banks have branches in each of the 95 departments, with the only exception of C.I.C. that has no branches in Corsica. In Italy six national banks have branches located in almost all 103 provinces, while the remaining groups have their branching networks geographically concentrated in few local markets. Descriptive statistics in Table 1 show that the two industries are similar only for what concerns the dispersion of branches within markets, measured by the standard deviation. We observe across markets smaller average and median branching sizes for Italy, implying that there are larger groups in France. The number of total branches in each market is larger in France, that is, there are several large players simultaneously in each market.

[Insert Table 1 here]

Our definition of bank's profits in each local market must be highly correlated with bank accounting profits, not available at this level of disaggregation. In support to this, we know that accounting profits are proportional to market shares in terms of deposits and, since these are highly correlated with branching market shares, we expect high correlation also between reduced profits computed in our model and observed accounting profits.

In the empirical specification for mc_i, we include the dummies to identify banking groups in the set of explanatory variables Z_{it}. The inverse measure of competition *cci* instead depends upon a set of market variables, W_{jt}, which comprises per-capita loans (LPC), the proportion of rural areas in each county (SHRUR) and a dummy indicating densely populated urban areas (DBIGPRO). These variables are taken from the Central Statistical Offices, INSEE for France and ISTAT for Italy. We expect to find tougher competition the higher per-capita loans and population density due to greater incentive to compete for the marginal client when demand is larger.

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

2.2 Econometric results

The parameter *cci* is estimated for 2006 in Italy and 2007 in France on cross-sections that we call the base models. All coefficients that result from the maximum likelihood estimation in Table 2 are significant, although their value is variable across markets capturing local differences. The signs of the coefficients associated to *cci* are in accordance with our intuition: in France in those Départments where there is a greater share of rural areas (SHRUR) banks face softer competition and, similarly, in Italy competition is tougher in those provinces where a big city is located (DBIGPRO). In addition, in both countries the degree of competition increases with the level of per-capita loans (LPC).

[Insert Table 2 here]

A measure of the performance of the model in fitting the data, defined as "goodness of fit", is obtained by comparing the predicted 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). Table 3 reports the percentage of observations whose behavior in terms of branching is correctly predicted by the model: this percentage is 84% for France and 75% for Italy.[9]

[Insert Table 3 here]

Table 4 provides evidence that the two industries differ in terms of competition, branching costs and profitability. The average value of *cci*, is higher in Italy, 1.17, compared to France, 0.68 (recall that lower values of *cci* imply tougher competition) indicating that local markets are on average more competitive in France than in Italy. Note that marginal costs are lower in France compared to Italy and moreover, represent a smaller share of our estimated per-branch profits: the French bank system is not only more competitive but more efficient.

[Insert Table 4 here]

Table 5 exhibits heterogeneity of estimated marginal branching costs across banking groups, in particular Crédit Agricole and La Poste have higher costs and considerably lower per-branch profits compared to the other French groups. These two groups are indeed characterized by large branching networks with branches distributed all over the country, even

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[9] To check the robustness of our partitioning we have re-estimated the model moving the static multi-branch banks (case [b] in sub-section 1.2) from subset E_1 to subset E_2 defined in Equation (8). Under this partitioning the percentage of observations correctly classified decreases significantly.

in less densely populated areas. In Italy instead, per-branch profits are relatively homogeneous across banking groups, with higher marginal costs for Unicredito. The heterogeneity of marginal costs across banking groups is smaller in Italy compared to France.

[Insert Table 5 here]

In Tables 9a and 9b (in Appendix), we report a ranking of local markets based on our estimated measure of competition. As already observed 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* assumes its smallest value. In Italy the overall variance of *cci* is greater. Notice that *cci* takes lower values in several 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, confirming previous empirical evidence. (See Cerasi *et al*., 2000 and Guiso *et al*., 2006, among others.)

3. Impact measurement of mergers on competition

We now use the econometric model to simulate the ex-ante impact of mergers on competition. For each merger, we undertake the following exercise: we sum the branches of the merging banks in each local market and re-estimate the model assuming that these new entities replace the old ones, without changing the distribution of branches across local markets. It yields the estimated post-merger degree of competition, which we compare to the pre-merger degree of competition (estimated from the actual situation). We expect that this measure provides a useful guide to competition authorities to assess the impact of banks' mergers on competition. However we recognize that our measure, which requires a very limited amount of information, cannot fully anticipate how rival banks adapt their branching networks after a merger as we keep as given the total number of branches.[10]

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[10] 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-merged firms and new entries in the market. (See for instance the discussion in Draganska *et al*., 2009.)

3.1 French mergers

Two among the most important mergers really occurred in France in the recent years, that is Credit Mutuel (CM) with Credit Industriel Commercial (CIC) in 1998 and Crédit Agricole (CA) with Crédit Lyonnais (CL) in 2004. Given that our French dataset includes the number of branches for each merger as separate banking group even after the merger, we can exploit this information to retrieve the pre-merger situation (which corresponds to our estimated base model) and simulate the impact of the merger "as if" the merger occurred in our observation period.

Table 6 reports the comparison of the relevant indicators between the base model and the model with the merger. The result of this exercise shows that these two mergers together improve competition in the industry. Table 9a (in Appendix) displays the impact of the two mergers in each single local market: the differences in the estimated values of the *cci* are significant and negative.

[Insert Table 6 here]

A further exercise is to add the merger between Banques Populaires (BP) and Caisses d'Epargne (CE), approved after 2007 to the previous simulation. Also in this case the parameter *cci* decreases compared to the base model (see last row in Table 6 for France). This result proves that the initial pro-competitive effect of the merger still remains.[11]

3.2 Italian mergers

A similar exercise can be performed for the two most relevant Italian mergers in the recent years, namely Intesa (IN) with San Paolo (SP) and Unicredito (UN) with Capitalia (CP). Notice that in our observed period the exercise is "virtual" since the merger actually occurred at the end of 2007. In Table 6 we summarize the changes of the main indicators as a result of the two mergers.

The two mergers have 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 6 for Italy). The differences in the two measures of competition are significant as Table 9b (in Appendix) shows.

[11] See Ivaldi (2006) for a detailed analysis of this merger, available upon request.

The difference between the impact of these mergers compared to the French case can be better interpreted by analyzing their effect on the local market structure, as we do in the last section.

4. Concentration and competition

In this section we first investigate the relation between our measure of competition and the usual measures of concentration at local market level, namely, the Herfindahl–Hirschman Index (HHI), the GINI index and the number of large undertakings in each local market. The idea behind these traditional measures is that, when market shares are uniformly distributed, the 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 local market level: this index gives more weight to changes in market shares of largest banks since large banks have greater shares. The GINI index measures the distance between the actual distribution and the case of uniform market shares: this index increases 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. [12]

What we would like to explore is whether our measure of degree of competition is similar to these usual concentration measures or conveys additional and more accurate information. To do so, we compute the correlations between our and the traditional measures at local market level. The results in Table 7 show that these correlations are not null, meaning that our degree of competition is indeed related to market structure as it falls with the HHI and it increases with the number of large banks in the market. For the GINI index, we observe that the correlation has opposite effects in the two countries: greater equality in the distribution of market shares increases competition in France, but not in Italy.

[Insert Table 7 here]

[12] 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."

Note that none of these traditional measures in isolation captures the degree of competition in a market, because they only focus on the supply side of the market, while we consider also the demand side when we measure the elasticity of profits to the number of branches through our index *cci*.

To understand the impact of mergers on competition we analyze how they affect market structure at the local level. Table 8 shows that the two mergers of CA with CL and CM with CIC in France have a pro-competitive effect, since the average *cci* across Departments falls from 0.68 to 0.54. Although the two mergers generate 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 though concentration rises as measured by the HHI due to the increase in the market shares of the top largest banks, according to our measure of the degree of competition the two French mergers promote competition. This positive impact on competition can be explained by the fact that they reduce the asymmetry in the distribution of market shares. The merger between CA and CL, two large players with complementary branching networks, and the merger between two medium players such as CM with CIC, increase the presence of several large banks in all Departments and this benefits competition.

[Insert Table 8 here]

In Italy instead, the mergers of IN with SP and UN with CP have a negative impact on competition, as evident from the increase in the value of *cci* across provinces from 1.17 to 1.27. In contrast with the French exercise, in Italy the asymmetry between 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 local market level: they in fact take place among the top players in the market and the overall effect is a reinforcement of their previous strong local market power.

Our econometric test shows how 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 in merger policy before the reforms in Europe and in the U.S, which have limited the use of the dominance criteria as the sole test in merger assessment[13]. In our simulation for instance, this rule would

[13] 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.

imply rejecting the French mergers, while we have shown their role in enhancing competition. At the same time, note that the data required to implement our measure is similar to those required to compute local market concentration indexes such as the HHI.

Conclusion

This paper addresses the question of how to measure the impact of mergers on competition in the banking sector. This question is relevant both from a positive and a normative point of view.

We provide a measure of competition in retail banking markets, derived from a model where branching decisions are modelled together with market structure. This measure is based on the elasticity of profits with respect to branching: the smaller the elasticity the higher the degree of competition. Our evidence indicates that the retail banking industry in France is more competitive than in Italy.

In addition we propose an empirical test to be used in the antitrust analysis for the ex-ante impact assessment of mergers on competition. This test is parsimonious in terms of data requirements and is grounded on a theoretical model where competition is analysed together with market structure. In our simulated examples we exhibit either cases of pro- and anti-competitive mergers.

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

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Appendix – Tables

Table 1- Descriptive statistics on observable variables (local market values; for France in 2006, for Italy in 2007)

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.

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 2 – 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
	% correct predictions*		84.1

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

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
	% correct predictions*		75.4

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

* % correct predictions is derived by summing the percentages along the diagonal in Table 3.

Table 3 – Goodness of fit (comparison of 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

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

Table 4 – 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

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 5 – 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

ITALY	MC	Per-branch profit	N. branches
BANCA ANTONIANA - POPOLARE	254.5	387.52	1007
BANCA INTESA	150.99	369.59	3029
BANCA LOMBARDA E PIEMONTESE	254.5	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	254.5	446.76	524
BANCA POPOLARE EMILIA ROMAGNA	254.5	410.12	1175
BANCHE POPOLARI UNITE (IN FORMAZIONE)	216.9	427.57	1205
BANCO POPOLARE DI VERONA	254.5	450.27	1221
BIPIEMME	446.58	540.84	713
CAPITALIA	200.53	371.07	2013
CARIGE	254.5	422.8	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 6- Changes in the estimated values as a result of mergers

FRANCE	*cci*	*MC*
Base model	0.68	42.67
CA+CL and CM+CIC	0.54	18.45
CA+CL and CM+CIC and CE+BP	0.55	19.08

Note: CA=Credit Agricole, CL=Credit Lyonnais, CM=Credit Mutuel, CIC= Crédit Industriel Commercial, CE=Caisses d'Epargne, BP=Banques Populaires

ITALY	*cci*	*MC*
Base model	1.17	242.51
IN+SP and UN+CP	1.27	335.54

Note: IN=Intesa, SP=San Paolo IMI, UN=Unicredito, CP= Capitalia

Table 7- 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	0.54	1.00	0.93	-0.72
GINI	0.59	0.93	1.00	-0.70
N. Large banks	-0.49	-0.72	-0.70	1.00

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

Table 8 – Impact of mergers on the inverse measures of competition and measures of market structure

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

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

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

Table 9a – Descriptive statistics on estimated indicators (local market values)

FRANCE	Base model				CA+CL and CM+CIC					CA+CL and CM+CIC and CE+BP				
Name	*cci*	Gini	HHI	N_large	Δcci		Gini	HHI	N_large	Δcci		Gini	HHI	N_large
Paris	0.32	0.29	0.07	5	-0.03		0.24	0.10	4	-0.01		0.13	0.11	5
Hauts-de-Seine	0.51	0.29	0.10	5	-0.07		0.24	0.13	4	-0.06		0.17	0.14	5
Val-de-Marne	0.63	0.29	0.10	6	-0.10		0.21	0.13	5	-0.09		0.18	0.14	5
Bouches-du-Rhône	0.64	0.37	0.12	4	-0.11		0.34	0.15	3	-0.10		0.30	0.16	3
Seine-Saint-Denis	0.64	0.34	0.11	5	-0.10		0.23	0.13	4	-0.09		0.20	0.15	5
Bas-Rhin	0.64	0.53	0.20	2	-0.13	*	0.51	0.24	3	-0.12		0.49	0.25	4
Haute-Savoie	0.65	0.47	0.16	2	-0.13	*	0.39	0.19	3	-0.12		0.36	0.20	4
Rhône	0.65	0.34	0.13	3	-0.13	*	0.33	0.16	4	-0.12		0.30	0.18	4
Marne	0.66	0.54	0.22	3	-0.14	*	0.52	0.25	3	-0.13		0.49	0.26	3
Haut-Rhin	0.66	0.56	0.22	2	-0.13	*	0.53	0.25	3	-0.12		0.52	0.27	4
Essonne	0.66	0.31	0.14	4	-0.12		0.26	0.16	5	-0.11		0.27	0.18	5
Nord	0.66	0.41	0.14	4	-0.12		0.33	0.18	5	-0.12		0.27	0.19	5
Loire-Atlantique	0.66	0.43	0.16	3	-0.13	*	0.41	0.19	3	-0.12		0.36	0.21	4
Yvelines	0.66	0.34	0.13	4	-0.13	*	0.26	0.15	5	-0.12		0.26	0.17	5
Ille-et-Vilaine	0.67	0.51	0.18	3	-0.14	*	0.43	0.21	3	-0.13		0.38	0.22	4
Territoire de Belfort	0.67	0.49	0.18	3	-0.13	*	0.46	0.21	3	-0.12		0.43	0.22	4
Seine-et-Marne	0.67	0.42	0.18	3	-0.13	*	0.38	0.20	4	-0.13		0.34	0.21	5
Finistère	0.67	0.55	0.19	3	-0.13	*	0.51	0.21	3	-0.13		0.46	0.22	4
Loiret	0.67	0.45	0.17	3	-0.14	*	0.44	0.20	4	-0.13		0.42	0.21	4
Gironde	0.67	0.45	0.18	4	-0.13	*	0.41	0.19	4	-0.13		0.40	0.21	4
Val-d'Oise	0.67	0.39	0.15	5	-0.13		0.34	0.17	5	-0.12		0.31	0.19	5
Vendée	0.67	0.62	0.23	3	-0.14	*	0.57	0.25	3	-0.13		0.52	0.25	3
Var	0.67	0.45	0.16	3	-0.13	*	0.41	0.18	3	-0.12		0.39	0.19	3
Hérault	0.68	0.56	0.18	4	-0.14	*	0.49	0.19	3	-0.13		0.48	0.20	3
Haute-Garonne	0.68	0.40	0.15	3	-0.14	*	0.32	0.17	3	-0.13	*	0.34	0.20	3
Morbihan	0.68	0.55	0.20	3	-0.14	*	0.49	0.22	3	-0.13	*	0.44	0.23	4
Moselle	0.68	0.51	0.20	3	-0.14	*	0.50	0.23	4	-0.13	*	0.48	0.25	4
Maine-et-Loire	0.68	0.60	0.23	3	-0.14	*	0.54	0.25	3	-0.13	*	0.49	0.26	4
Isère	0.68	0.50	0.20	3	-0.14	*	0.44	0.22	3	-0.13	*	0.43	0.24	3
Doubs	0.68	0.54	0.23	2	-0.14	*	0.51	0.25	3	-0.14	*	0.49	0.26	4
Vaucluse	0.68	0.55	0.17	4	-0.13	*	0.50	0.19	3	-0.13		0.47	0.20	3
Côte-d'Or	0.68	0.54	0.22	4	-0.14	*	0.50	0.24	4	-0.14	*	0.47	0.25	4

Name	*cci*	Gini	HHI	N_large	∆cci		Gini	HHI	N_large	∆cci		Gini	HHI	N_large
Alpes-Maritimes	0.68	0.38	0.13	4	-0.14	*	0.35	0.16	4	-0.13	*	0.34	0.17	4
Pyrénées-Orientales	0.68	0.62	0.24	3	-0.14	*	0.56	0.26	3	-0.13	*	0.56	0.28	3
Mayenne	0.68	0.67	0.27	3	-0.14	*	0.61	0.28	3	-0.14	*	0.56	0.29	3
Gard	0.68	0.63	0.25	3	-0.14	*	0.57	0.26	3	-0.13		0.56	0.27	3
Meurthe-et-Moselle	0.68	0.44	0.20	3	-0.14	*	0.46	0.23	4	-0.13	*	0.41	0.24	4
Indre-et-Loire	0.68	0.58	0.26	3	-0.14	*	0.55	0.28	3	-0.13	*	0.55	0.29	3
Savoie	0.68	0.63	0.22	3	-0.14	*	0.56	0.23	2	-0.13	*	0.56	0.24	3
Côtes d'Armor	0.68	0.66	0.26	3	-0.14	*	0.57	0.27	3	-0.14	*	0.53	0.27	3
Pyrénées-Atlantiques	0.68	0.48	0.15	4	-0.14	*	0.43	0.18	3	-0.13	*	0.42	0.19	3
Aveyron	0.68	0.69	0.34	3	-0.14	*	0.66	0.35	3	-0.14	*	0.65	0.36	3
Deux-Sèvres	0.69	0.58	0.22	4	-0.14	*	0.52	0.24	4	-0.14	*	0.48	0.25	4
Loire	0.69	0.48	0.19	3	-0.14	*	0.46	0.22	3	-0.13	*	0.44	0.23	3
Charente-Maritime	0.69	0.58	0.24	2	-0.14	*	0.55	0.25	3	-0.14	*	0.53	0.26	4
Vosges	0.69	0.51	0.22	3	-0.14	*	0.46	0.23	4	-0.13	*	0.43	0.25	4
Calvados	0.69	0.48	0.20	2	-0.14	*	0.47	0.22	3	-0.14	*	0.40	0.23	4
Seine-Maritime	0.69	0.43	0.16	3	-0.14	*	0.40	0.18	4	-0.14	*	0.34	0.19	4
Oise	0.69	0.54	0.21	3	-0.14	*	0.49	0.23	3	-0.13	*	0.44	0.24	3
Sarthe	0.69	0.57	0.24	4	-0.14	*	0.55	0.26	4	-0.14	*	0.49	0.27	4
Ain	0.69	0.58	0.25	2	-0.14	*	0.56	0.27	3	-0.14	*	0.53	0.28	4
Aube	0.69	0.57	0.25	2	-0.15	*	0.51	0.27	2	-0.14	*	0.52	0.28	3
Pas-de-Calais	0.69	0.54	0.19	3	-0.14	*	0.46	0.21	4	-0.13		0.39	0.22	4
Tarn	0.69	0.58	0.22	4	-0.14	*	0.51	0.24	4	-0.14	*	0.50	0.26	3
Haute-Vienne	0.69	0.66	0.28	3	-0.14	*	0.56	0.29	3	-0.14	*	0.55	0.31	3
Landes	0.69	0.62	0.26	2	-0.14	*	0.58	0.28	2	-0.14	*	0.57	0.29	3
Drôme	0.69	0.57	0.24	3	-0.14	*	0.55	0.25	3	-0.14	*	0.53	0.27	3
Lot-et-Garonne	0.69	0.66	0.28	2	-0.14	*	0.61	0.29	2	-0.14	*	0.60	0.31	3
Tarn-et-Garonne	0.69	0.67	0.31	2	-0.14	*	0.61	0.32	2	-0.14	*	0.60	0.33	3
Manche	0.69	0.53	0.20	4	-0.14	*	0.49	0.22	4	-0.14	*	0.43	0.23	4
Puy-de-Dôme	0.69	0.64	0.26	2	-0.14	*	0.58	0.29	2	-0.14	*	0.57	0.30	3
Eure-et-Loir	0.69	0.54	0.20	4	-0.14	*	0.49	0.22	4	-0.14	*	0.43	0.23	4
Loir-et-Cher	0.69	0.63	0.29	2	-0.14	*	0.61	0.30	2	-0.14	*	0.58	0.31	3
Vienne	0.69	0.65	0.29	3	-0.14	*	0.61	0.31	3	-0.14	*	0.60	0.31	3
Charente	0.69	0.64	0.31	2	-0.15	*	0.61	0.33	2	-0.14	*	0.58	0.33	3
Jura	0.70	0.61	0.28	3	-0.15	*	0.56	0.29	4	-0.14	*	0.58	0.31	4

Name	*cci*	Gini	HHI	N_large	Δcci		Gini	HHI	N_large	Δcci		Gini	HHI	N_large
Somme	0.70	0.65	0.25	3	-0.14	*	0.57	0.27	3	-0.14	*	0.50	0.27	3
Aude	0.70	0.76	0.41	2	-0.15	*	0.72	0.41	2	-0.14	*	0.71	0.42	3
Orne	0.70	0.58	0.22	3	-0.15	*	0.52	0.24	3	-0.14	*	0.47	0.25	4
Hautes-Alpes	0.70	0.73	0.34	2	-0.15	*	0.68	0.35	2	-0.14	*	0.67	0.36	3
Gers	0.70	0.70	0.30	2	-0.15	*	0.65	0.32	2	-0.14	*	0.64	0.33	3
Cantal	0.70	0.77	0.38	2	-0.15	*	0.72	0.39	2	-0.14	*	0.71	0.40	3
Aisne	0.70	0.62	0.27	3	-0.14	*	0.57	0.28	3	-0.14	*	0.52	0.29	3
Corrèze	0.70	0.73	0.34	2	-0.15	*	0.66	0.35	2	-0.14	*	0.66	0.36	3
Saône-et-Loire	0.70	0.57	0.26	3	-0.15	*	0.54	0.28	3	-0.14	*	0.52	0.29	3
Eure	0.70	0.52	0.21	3	-0.14	*	0.49	0.23	3	-0.14	*	0.43	0.24	3
Haute-Loire	0.70	0.69	0.29	3	-0.15	*	0.64	0.30	3	-0.14	*	0.61	0.31	3
Indre	0.70	0.70	0.31	3	-0.15	*	0.64	0.32	3	-0.14	*	0.62	0.33	3
Cher	0.70	0.67	0.28	2	-0.15	*	0.64	0.29	2	-0.14	*	0.63	0.30	3
Yonne	0.70	0.65	0.30	3	-0.15	*	0.61	0.31	3	-0.14	*	0.61	0.32	3
Haute-Saône	0.70	0.66	0.35	2	-0.15	*	0.65	0.36	3	-0.14	*	0.63	0.37	4
Allier	0.70	0.65	0.30	3	-0.15	*	0.59	0.31	3	-0.14	*	0.58	0.33	3
Lozère	0.70	0.76	0.40	2	-0.15	*	0.74	0.41	2	-0.14	*	0.73	0.42	3
Ardennes	0.70	0.62	0.27	2	-0.15	*	0.61	0.30	3	-0.14	*	0.56	0.30	4
Lot	0.70	0.69	0.31	3	-0.15	*	0.66	0.33	3	-0.14	*	0.65	0.35	3
Corse A	0.70	0.74	0.45	1	-0.15	*	0.74	0.46	2	-0.14	*	0.73	0.46	2
Nièvre	0.70	0.69	0.32	3	-0.15	*	0.65	0.33	3	-0.14	*	0.64	0.34	3
Hautes-Pyrénées	0.70	0.62	0.28	2	-0.15	*	0.58	0.30	2	-0.14	*	0.58	0.31	3
Dordogne	0.71	0.75	0.38	2	-0.15	*	0.69	0.38	2	-0.14	*	0.68	0.39	2
Meuse	0.71	0.72	0.38	2	-0.15	*	0.71	0.39	2	-0.14	*	0.69	0.40	3
Ariège	0.71	0.72	0.39	2	-0.15	*	0.68	0.40	2	-0.14	*	0.67	0.41	3
Ardèche	0.71	0.69	0.33	3	-0.15	*	0.68	0.35	3	-0.14	*	0.65	0.35	3
Corse B	0.71	0.78	0.50	1	-0.15	*	0.77	0.50	2	-0.14	*	0.75	0.51	2
Haute-Marne	0.71	0.72	0.40	2	-0.15	*	0.69	0.41	2	-0.14	*	0.67	0.41	3
Alpes-haute-Provence	0.71	0.71	0.33	2	-0.15	*	0.67	0.34	2	-0.14	*	0.66	0.35	3
Creuse	0.71	0.74	0.39	2	-0.15	*	0.71	0.40	2	-0.15	*	0.69	0.41	3

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

Table 9b – Descriptive statistics on estimated indicators (local market values)

ITALY	Base model				IN+SP and UN+CP				
Name	cci	Gini	HHI	N large	Δcci		Gini	HHI	N large
MILANO	0.64	0.50	0.10	5.00	0.05		0.59	0.15	4.00
ROMA	0.76	0.53	0.10	6.00	0.08		0.64	0.16	4.00
TORINO	0.84	0.70	0.28	4.00	0.10		0.77	0.43	2.00
NAPOLI	0.88	0.57	0.27	6.00	0.11		0.69	0.42	4.00
FIRENZE	1.11	0.64	0.14	2.00	0.08	*	0.67	0.15	4.00
SIENA	1.12	0.77	0.42	2.00	0.08	*	0.75	0.42	2.00
BERGAMO	1.13	0.60	0.18	5.00	0.09	**	0.64	0.22	4.00
BOLZANO	1.13	0.65	0.04	1.00	0.09	**	0.71	0.04	0.00
BOLOGNA	1.13	0.59	0.14	4.00	0.09	**	0.64	0.17	3.00
BRESCIA	1.14	0.59	0.16	4.00	0.09	**	0.66	0.19	4.00
PADOVA	1.14	0.70	0.30	6.00	0.09	**	0.75	0.39	4.00
MODENA	1.15	0.61	0.14	4.00	0.09	**	0.65	0.16	4.00
TRENTO	1.15	0.74	0.21	3.00	0.09	**	0.74	0.23	2.00
RIMINI	1.15	0.54	0.07	2.00	0.09	**	0.61	0.10	3.00
MANTOVA	1.15	0.56	0.17	4.00	0.09	**	0.61	0.19	4.00
PARMA	1.15	0.59	0.17	7.00	0.09	**	0.67	0.22	4.00
PRATO	1.15	0.61	0.13	5.00	0.09	**	0.61	0.14	5.00
REGGIO EMILIA	1.15	0.58	0.13	6.00	0.09	**	0.63	0.17	6.00
FORLI'-CESENA	1.15	0.61	0.08	2.00	0.09	**	0.64	0.09	2.00
VICENZA	1.16	0.64	0.17	6.00	0.09	**	0.67	0.21	5.00
VERONA	1.16	0.68	0.18	5.00	0.09	**	0.73	0.21	4.00
ANCONA	1.16	0.46	0.07	2.00	0.09	**	0.51	0.09	3.00
TREVISO	1.16	0.62	0.13	5.00	0.09	**	0.69	0.17	4.00
UDINE	1.16	0.60	0.23	5.00	0.09	**	0.71	0.38	4.00
RAVENNA	1.16	0.62	0.08	4.00	0.09	**	0.65	0.09	3.00
BIELLA	1.16	0.66	0.19	2.00	0.09	**	0.72	0.24	1.00
SONDRIO	1.17	0.57	0.01	0.00	0.10	**	0.66	0.02	0.00
LODI	1.17	0.58	0.30	3.00	0.10	**	0.67	0.45	3.00
LUCCA	1.17	0.61	0.16	4.00	0.10	**	0.58	0.16	4.00
MACERATA	1.17	0.38	0.04	1.00	0.10	**	0.38	0.05	1.00
PESARO E URBINO	1.17	0.59	0.09	5.00	0.10	**	0.70	0.15	4.00
PIACENZA	1.17	0.57	0.21	3.00	0.10	**	0.65	0.26	2.00

Name	cci	Gini	HHI	N large	Δcci		Gini	HHI	N large
LECCO	1.17	0.54	0.07	3.00	0.10	**	0.61	0.10	2.00
CREMONA	1.18	0.62	0.22	3.00	0.10	**	0.68	0.31	2.00
VARESE	1.18	0.61	0.14	4.00	0.10	**	0.66	0.18	4.00
COMO	1.18	0.63	0.16	4.00	0.10	**	0.71	0.29	4.00
PORDENONE	1.18	0.61	0.25	4.00	0.10	**	0.73	0.44	3.00
AREZZO	1.18	0.70	0.14	2.00	0.10	**	0.69	0.14	2.00
PISTOIA	1.18	0.62	0.19	2.00	0.10	**	0.60	0.19	2.00
VENEZIA	1.18	0.62	0.31	7.00	0.10	**	0.74	0.50	4.00
PESCARA	1.18	0.55	0.15	2.00	0.10	**	0.63	0.18	3.00
PERUGIA	1.18	0.63	0.16	3.00	0.10	**	0.64	0.19	3.00
ALESSANDRIA	1.18	0.54	0.15	6.00	0.10	**	0.59	0.19	5.00
CUNEO	1.18	0.70	0.20	4.00	0.10	**	0.70	0.22	4.00
GENOVA	1.19	0.56	0.14	6.00	0.10	**	0.63	0.17	4.00
PISA	1.19	0.62	0.12	2.00	0.10	**	0.63	0.12	2.00
NOVARA	1.19	0.58	0.14	4.00	0.10	**	0.62	0.18	3.00
LIVORNO	1.19	0.65	0.19	2.00	0.10	**	0.64	0.20	3.00
ASCOLI PICENO	1.19	0.53	0.12	4.00	0.10	**	0.61	0.17	4.00
ASTI	1.19	0.65	0.06	3.00	0.10	**	0.67	0.06	3.00
ROVIGO	1.19	0.68	0.61	4.00	0.10	**	0.72	0.78	3.00
SAVONA	1.19	0.60	0.25	4.00	0.10	**	0.63	0.28	4.00
VERBANO-CUSIO-OSSOLA	1.20	0.60	0.12	2.00	0.10	**	0.65	0.15	2.00
BELLUNO	1.20	0.68	0.21	3.00	0.10	**	0.72	0.25	2.00
GROSSETO	1.20	0.67	0.28	2.00	0.10	**	0.67	0.28	2.00
FERRARA	1.20	0.58	0.05	2.00	0.10	**	0.61	0.06	3.00
PAVIA	1.20	0.53	0.17	4.00	0.10	**	0.61	0.28	4.00
VERCELLI	1.20	0.68	0.26	4.00	0.10	**	0.75	0.36	3.00
GORIZIA	1.20	0.51	0.39	4.00	0.10	**	0.63	0.61	2.00
TRIESTE	1.20	0.48	0.21	4.00	0.10	**	0.61	0.31	3.00
MASSA	1.20	0.56	0.17	4.00	0.10	**	0.48	0.17	3.00
TERAMO	1.20	0.53	0.11	1.00	0.11	**	0.63	0.17	1.00
TERNI	1.20	0.69	0.23	4.00	0.11	**	0.66	0.25	4.00
AOSTA	1.20	0.65	0.34	2.00	0.11	**	0.69	0.43	2.00
LA SPEZIA	1.20	0.58	0.23	3.00	0.11	**	0.59	0.25	3.00
SASSARI	1.20	0.76	0.46	2.00	0.11	**	0.78	0.48	2.00

Name	cci	Gini	HHI	N large	Δcci		Gini	HHI	N large
IMPERIA	1.21	0.56	0.18	5.00	0.11	**	0.63	0.25	3.00
VITERBO	1.21	0.57	0.19	4.00	0.11	**	0.53	0.21	3.00
CAGLIARI	1.21	0.72	0.35	4.00	0.11	**	0.76	0.38	3.00
CHIETI	1.21	0.48	0.10	2.00	0.11	**	0.52	0.12	2.00
RAGUSA	1.21	0.48	0.08	1.00	0.11	**	0.56	0.11	2.00
BARI	1.21	0.49	0.11	7.00	0.11	**	0.61	0.17	5.00
L'AQUILA	1.21	0.68	0.21	3.00	0.11	**	0.66	0.22	4.00
CATANIA	1.21	0.48	0.10	3.00	0.11	**	0.55	0.12	3.00
PALERMO	1.22	0.54	0.18	1.00	0.11	**	0.61	0.22	2.00
CAMPOBASSO	1.22	0.50	0.16	4.00	0.11	**	0.60	0.25	3.00
RIETI	1.22	0.69	0.19	3.00	0.11	**	0.73	0.23	2.00
TRAPANI	1.22	0.41	0.11	4.00	0.11	**	0.43	0.14	4.00
LATINA	1.22	0.54	0.18	3.00	0.11	**	0.56	0.22	3.00
SALERNO	1.22	0.57	0.18	6.00	0.11	**	0.60	0.23	5.00
SIRACUSA	1.22	0.52	0.12	2.00	0.11	**	0.61	0.16	3.00
MATERA	1.22	0.60	0.25	3.00	0.11	**	0.53	0.26	3.00
LECCE	1.22	0.50	0.08	3.00	0.11	**	0.58	0.11	3.00
FOGGIA	1.22	0.47	0.11	6.00	0.11	**	0.53	0.14	6.00
MESSINA	1.22	0.46	0.12	3.00	0.11	**	0.53	0.16	4.00
CATANZARO	1.22	0.29	0.13	6.00	0.11	**	0.30	0.16	5.00
FROSINONE	1.22	0.63	0.22	3.00	0.11	**	0.69	0.26	2.00
CALTANISSETTA	1.22	0.56	0.20	3.00	0.11	**	0.56	0.21	4.00
TARANTO	1.22	0.39	0.14	5.00	0.11	**	0.45	0.19	5.00
COSENZA	1.23	0.52	0.21	4.00	0.11	**	0.55	0.23	3.00
POTENZA	1.23	0.54	0.10	3.00	0.11	**	0.53	0.11	3.00
ORISTANO	1.23	0.83	0.63	1.00	0.11	**	0.83	0.63	1.00
AGRIGENTO	1.23	0.52	0.20	4.00	0.11	**	0.61	0.26	3.00
NUORO	1.23	0.85	0.70	1.00	0.11	**	0.86	0.71	1.00
AVELLINO	1.23	0.65	0.27	3.00	0.11	**	0.68	0.31	3.00
CASERTA	1.23	0.63	0.52	5.00	0.11	**	0.72	0.74	4.00
ISERNIA	1.23	0.41	0.24	4.00	0.11	**	0.56	0.40	3.00
CROTONE	1.23	0.47	0.26	4.00	0.11	**	0.46	0.28	4.00
ENNA	1.23	0.50	0.24	4.00	0.11	**	0.51	0.25	4.00
BENEVENTO	1.23	0.51	0.17	3.00	0.11	**	0.52	0.20	3.00

BRINDISI	1.23	0.44	0.13	3.00	0.11	**	0.51	0.19	2.00
REGGIO CALABRIA	1.23	0.47	0.20	5.00	0.11	**	0.47	0.23	4.00
VIBO VALENTIA	1.23	0.51	0.28	5.00	0.11	**	0.51	0.30	5.00

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