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LOCAL AND GLOBAL AGGLOMERATION PATTERNS IN THE BANKING SECTOR: THE CALM IN THE MID OF A STORM

by Valter Di Giacinto* and Marcello Pagnini*

Abstract

We compare the spatial agglomeration of banks' branches in Italy across local areas (as identified by local labor market areas) to that of other services. Banks branches appear to be only weakly spatially agglomerated, their spatial distribution being similar to that of other services and to that of the firms from whom the demand for banking services is most likely to stem from. These findings have been stable throughout the period 1991-2015, despite the dramatic changes occurring in that time span (liberalization, ICT and the great recession). On the other hand, local areas with a higher (lower) presence of banking branches tend to be geographically clustered, displaying also a moderately decreasing pattern in this polarization. IC technologies partially contributed to this trend.

JEL Classification: R12, G21, C19.
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Contents

* Bank of Italy, L'Aquila Branch. ** Bank of Italy, Bologna Branch.

1. Introduction[1]

The economic geography literature detects three major potential benefits from spatial concentration that can be respectively defined as: a) knowledge or technological spillovers that are generated from face to face interactions between workers and firms in the same local market; b) natural advantages, i.e. some peculiar characteristics that make a given local market a suitable place for some specific economic activities; c) pecuniary externalities arising from the proximity to both the local inputs and output markets. Centrifugal forces may however arise because of congestion costs and the need for firms to avoid fierce competition at local level.

Empirical studies on spatial concentration have usually been focused on the manufacturing sector.[2] Contributions investigating the spatial distribution of activities within the service sectors are less frequent.[3] First, it is generally held that most services are non tradable in nature and as such location of production in those sectors should simply follow the spatial distribution of the sources of demand (i.e. population). Second, some of the main drivers of spatial concentration, for instance knowledge spillovers, are usually gauged to be less relevant in the service sector.

Nonetheless, services encompass a huge variety of economic activities, possibly denoted by different and specific locational patterns. In this paper we focus on spatial concentration in the banking sector in Italy from 1991 to 2015. Our questions concern the intensity of spatial concentration in the banking sector as compared to other service activities, the dynamics of concentration following the liberalization process at the beginning of the nineties and again the comparison of the evolution of spatial concentration in the banking sector with the corresponding trends observed in other service activities (mainly the retail trade sector).

An analysis of the patterns of spatial concentration in the banking sector can offer useful insights under several respects. Assessing the degree of the agglomeration of bank branches in a few core local markets might have relevant implications for the access to banking services by customers localized in peripheral areas. On the consumer's side, for instance, old and less educated people could suffer from the retreat of the banking sector from small and relatively peripheral local markets, on the grounds that those are the categories displaying a lower propensity to use information and communication technologies (more on this later). The local community of small sized business in small and peripheral local markets could also suffer in

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[1]This work is part of a Bank of Italy research project on "The agglomeration and the geographical relocation of the Italian banking system". The authors are grateful to Valentina Nigro, Paola Rossi, Carlotta Rossi, Paolo Sestito and Federico Signorini for very useful suggestions on previous drafts of this paper. We are also in debt to the participants to several workshops held at the Bank of Italy for comments. The views expressed in this paper are our own and do not necessarily reflect those of the Bank of Italy.

[2]For a review of the paper estimating the productivity advantages from spatial concentration, see Melo et al. (2009). On technological spillovers and on the empirical methods trying to measure them, see the seminal paper by Jaffe et al (1993). The relevance of natural advantages are estimated in Ellison and Glaeser (1999).

3Among the few exceptions, see Combes et al (2011) for France, Di Giacinto and Pagnini (2011) for Italy and Kolko (1999 and 2010) for the US.

terms of credit access if the banks closed branches. A huge stream of literature showed for instance that both the distance between a bank corporate headquarters and its local branches and the distance between local branches and their customers play a crucial role as far credit allocation is concerned.[4] Related to that is the topic whether the new information and communication technologies (ICT) can at least partially substitute for the traditional way of delivering banking services through a network of local branches allowing people to carry out their banking operations through the web and at distance.

Before going deeper into the analysis of those issues, we make three important statements. In the first place, despite the advent of ICT, many banking services are still delivered, albeit at a declining rate, through face to face interactions with customers, due to the presence of distance-related costs in carrying out these transactions. This holds particularly true for the payment system and asset management services to the household sector as well as for the lending activity toward small sized firms. In response to that, banks are usually organized through a geographical network of local establishments (branches) aimed at capturing the sources of local demand for banking services. On these grounds, we choose to study spatial concentration in the banking sector at the branch level and not at the bank corporate headquarters level.

In the second place, in this paper we assume through out that the market for banking services is segmented into many geographical units that are in turn identified with the local labor market areas (LLMAs) in which the Italian territory can be subdivided according to travel to work mobility flows. That will represent the spatial scale at which we aggregate data on branch counts. This choice is partially driven by the data at our disposal (the maximum degree of granularity of these data is at municipality level and this rules out the possibility of working with data mimicking a continuous space). In any case, we find that the aforementioned zoning is particularly appropriate when analyzing the local banking service markets, as LLMAs are, by construction, characterized by a high degree of self-containment with respect to people's daily mobility flows. By locating a branch in a given LLMA a bank can thus be deemed to have access to most of the demand for banking services expressed by customers residing in that area.

In the third place, we investigate the spatial concentration of bank branches along two dimensions: the propensity of bank branches to concentrate in specific local markets, what we define henceforth as "agglomeration", and the tendency of bank establishments to be located in different markets that are, however, geographically close and sometimes contiguous in space, a spatial pattern that we refer to as "polarization". As shown in Di Giacinto and Pagnini (2011), spatial concentration of economic activity can actually be observed *both* at the agglomeration (local) *and* polarization (global) level.

As we will explain in the next section, while the first indicator can shed light on the main drivers of branch localization (e.g. catching up with customers locations), the second indicator

4For the effect of the first type of distance on bank entry strategies, see Felici and Pagnini (2008). Alessandrini et al (2005) coined the term of 'functional distance'. For the effects of the lender-borrower distance on interest rates or credit availability see Degryse and Ongena (2005) and Agarwal and Hauswald (2010).

can offer insights on the tradeoff that banks have to face in designing their own multimarket geographical networks (i.e. comparing the benefits from credit risk geographic diversification to the costs related to a wide span of control).

In the empirical analysis carried out in what follows, the strength of agglomeration and polarization forces underlying the observed spatial distribution of bank branches, as well their evolution through time, will be discussed and properly measured by resorting to a methodology that we proposed in a recent paper (see Di Giacinto and Pagnini, 2011).The latter was shown to be able to cope with biases affecting indicators that are quite commonly used in the literature (eg, Ellison and Glaeser and the Moran indexes) when both local and global agglomeration forces are simultaneously shaping the observed spatial pattern of economic activity in a given sector.

Our findings are as follows:

1) even when properly assessed, the degree of spatial concentration of bank branches in Italy is quite modest if compared with other service activities and with the manufacturing sector. We interpret this result as due to the minor role that some sources of spatial agglomeration forces play in the banking sector (specifically natural advantages or cross-branch knowledge spillovers).

2) In general, branch locations tend to reproduce locational patterns of the sources of local demand for banking services, especially with respect to the spatial distribution of business sector activity.

3) Between 1991 and 2015, the degree of agglomeration remained stable or had a modest reduction following the liberalization at the beginning of the nineties, the development of ICT throughout the period and the 2008-09 great recession. This contrasts with the reaction to the liberalization process observed in the retail sector, where agglomeration increased significantly after the reduction of barriers to market entry but appears to be in line with the stability over time of the size distribution of bank branches employment.

4) Bank branches tend to cluster in nearby local markets and this spatial polarization is stronger compared to other tertiary activities. This piece of evidence might be explained by the fact that in the Italian banking sector costs related to the span of control are prominent as compared to the benefits stemming from geographic risk diversification. Furthermore, a declining tendency in the degree of spatial polarization in the sector between 1991 and 2011 can be detected. A possible explanation for this evidence is that, while banks tend generally to expand the branch network by opening new establishments in markets that are close to their pre entry locations, the accumulation of ICT capital partially eroded distance related entry costs, thereby facilitating entry into more remote local markets.

The strong effort on the methodological aspects of the agglomeration measures produced in the paper is justified by the heuristic relevance of its main findings. For instance, the results on the stability of spatial concentration in the banking sector did emerge only once the biases affecting the other concentration indexes were properly controlled for by resorting to

our proposed alternative indicator. As for polarization, it clearly does emerge even by a simple inspection of figures like those reported in Section 4. However, those figures might generate the false impression that spatial trend in the data can amount only to a north-south divide, i.e. all local markets with extra concentration of bank branches are located in the North of Italy while the others are located in the South. This consideration hides the importance of many other and more complex spatial patterns featuring the data that can be properly assessed only by resorting to an appropriate synthetic index as that proposed in our work.

The rest of the paper is organized as follows. In section 2, we provide an economic rationale for using the two spatial concentration indexes. Some different measures of spatial concentration are initially briefly reviewed in section 3. Section 4 is then devoted to illustrate the dataset utilized in the analysis. Sections 5 and 6 discuss the evidence provided by agglomeration indexes. Section 7 subsequently deals with the analysis of polarization indexes. Several robustness checks are illustrated in Section 8 and Section 9 concludes.

2. What do agglomeration and polarization indexes measure?

As regards the rationale underlying our choice of providing a separate assessment of agglomeration and polarization, it relies on the assumption that different economic forces may be reasonably expected to underlie the two dimensions of spatial concentration.

With the first type of indicator, we are able to measure the relevance of benefits from spatial concentration that are generated, and fully exert their effects, within the borders of each local market. In a sense, in this type of analysis local markets are considered as they were 'freely floating islands', since the interregional interdependencies are ruled out by assumption.[5] The second indicator, on the other way round, specifically addresses the benefits from spatial concentration that might be generated by the interlinkages between different local markets. As an example, a firm could choose to locate in a specific region not only for its attractiveness per se but also due to its linkages with other local markets in the economy. In this case it is typically assumed that the intensity of these locational advantages increases both with the proximity to other regions and with the size of the latter (see the literature on market potential models). In this framework, while the agglomeration index picks up centripetal forces that are strictly *local* (i.e. they cut off abruptly at the local market's borders), the polarization index captures centripetal forces that are *global*, in the sense that they originate in a given location but then affect all remaining locations, although with a strength decaying with distance.

Under the hypothesis that bank services are mostly deliverable to customers residing in the area where the branch is located (an assumption that is reasonable in the case of the LLMAs, due to their self-containment), the size of the LLMA represents a strictly local factor influencing bank branching choices. In fact, when a bank decides the location for a given branch, it will preeminently take into account the size of the local potential pool of customers and,

5See Fujita and Mori (2005).

consequently, larger LLMAs can be expected to attract a proportionally greater number on bank branches compared to smaller ones. However, when the spatial distribution of plants in a given sector matches perfectly the spatial distribution of general economic activity across LLMAs, the sector on the whole displays no agglomeration.

Hence, in order for a positive degree of agglomeration to be observed, some other centripetal forces must be at work. A channel through which agglomeration economies have been shown to operate in the literature, and that is also relevant to bank branching decisions, is labor market pooling. By locating their branches in an area where banking activity is relatively highly developed, banks are in fact able to reduce search costs and get better job-skill matches through the access to a deeper pool of labor with the specific skills they require. Since these type of externalities operate via interactions on the local labor market, they only exert their effect within LLMAs and cannot expand their influence across LLMAs. As a consequence they may induce exactly the type of spatial concentration that is measured by agglomeration indexes.

Apart from considerations pertaining to local demand for banking services and those related to the local labor supply, when they decide where to locate their branches banks also face the following trade off (see Levine et al (2016) and Aguirregabiria (2016) et al, among others). On the one hand, they might benefit from geographic risk diversification by opening branches in local markets that are relatively far away from each other.[6] On the other hand, this might increase agency costs and problems in the span of control due to the severe problems a bank's corporate headquarter might encounter in directing the activity of distant peripheral units. In the latter case, banks might hence prefer to expand their own geographical network by entering into local markets that are close to their pre-entry locations (Felici and Pagnini, 2008), albeit at the cost of achieving a smaller degree of spatial diversification of their business.

Spatial diversification of risk implies, in its own nature, a locational problem that crosses the borders of any given local market and, as such, cannot be properly accounted for by agglomeration measures. On the contrary, polarization indexes, which explicitly aim at assessing the importance of distance-related interdependencies between local markets, can provide useful indications about the fundamental trade-off between the benefits of diversification versus the costs of a looser headquarter control and its evolution over time. If risk diversification benefits prevail one should observe a lack of polarization, alternatively if problems with the span of control are more acute one should observe positive polarization, as banks tend now to locate their branches into geographically close local markets (see Figure 1 for an example).

3. Measuring agglomeration and polarization of economic activity

Ellison and Glaeser (also referred to as EG in what follows) or Gini Locational indexes provide two well-known agglomeration indexes, while polarization is usually measured by

6As it is usual in the literature on diversification, we are assuming that the farthest are two local markets the less correlated are their respective local economic cycles. Moreover, banks might benefit from geographic expansion into distant local markets if it adds assets to a bank's portfolio that are imperfectly correlated with existing ones.

means of indexes of spatial autocorrelation, like Moran's I (Arbia, 2001; Lafourcade and Mion, 2007).

To state formally the two indexes, let us assume as usual that the economy is made of several sectors. In a given industry, indexed by q=1,…,Q, operate K plants, located within a finite set of regions, indexed by i=1,…,M. Letting k_{qi} denote the number of plants operating in the q-th industry that are located in region i we define $s_i = k_{qi} / \sum_i k_{qi}$ and $x_i = \sum_q k_{qi} / \sum_q \sum_i k_{qi}$. According to this definition s_i measures the region i's share of the total number of plants operating in industry q (we drop the reference to the industry in the notation as it is not strictly required to state the following results) and x_i represents the region share of plants considering jointly all the Q industries in the economy.

The assumption that the economy can be partitioned into a finite set of regions or local markets is quite common in the literature on agglomeration. By doing so dots on a map (plants) are transformed into units in a box (these are the spatial units defined at a given level of aggregation).[7] As already anticipated in the introduction, the choice of using a partition based on local markets is partially driven by the availability of the data, on the one hand, and also by the fact that markets for banking services are actually fragmented into many units and are usually self- contained in terms of demand and supply, on the other.

Returing to the model, the difference s_i - x_i represents how much the location pattern in the q-th sector deviates from the spatial distribution of the overall economic activity. When this difference is positive (negative) the region is specialized (despecialized) in industry q.

Moving from this setup, Ellison and Glaeser (1997) propose the following agglomeration index:

$$\gamma_{EG} = \frac{G - (1 - \sum_i x_i^2) \cdot H}{(1 - \sum_i x_i^2) \cdot (1 - H)} \qquad (1)$$

where $G = \sum_{i=1}^{M} (s_i - x_i)^2$ represents a relative geographic concentration index and H is the Herfindahl index at plant level in that particular industry. Positive values of the γ_{EG} index indicate that plants in an industry tend to agglomerate beyond the level of concentration that would be generated by plant size and by the randomness in plant distribution across regions.

Following Di Giacinto and Pagnini (2011)[8], we make the choice of computing all indexes on plant counts. When focusing on plant counts, H will be equal to $1/K$ and hence it will also be

7Marcon and Puech (2003) and Duranton and Overman (2005), take a different route by treating space as continuous and measuring the distribution of geographical distances between all individual pairs of plants in an industry.

[8]First, a recent literature on firm sorting shows that large enterprises may benefit more from locating in denser areas than small firms (see Holmes and Stevens, 2002; Baldwin and Okubo, 2006). This effect introduces an upward bias in the measure of agglomeration and in order to avoid it we decided to derive our indexes using plant counts rather

true that $H \rightarrow 0$ as the number of plants K grows large. Consequently, the EG index formula, in this case, simplifies to:

$$\gamma_{EG} = \frac{G}{(1-\sum_i x_i^2)} = \frac{\sum_i (s_i - x_i)^2}{(1-\sum_i x_i^2)} \tag{2}$$

Moran's I represents the most widely used index of polarization. Define $div_i = s_i - x_i$, the index expression reads as:

$$I = \frac{(N / S_o)\sum_i \sum_j w_{ij} \cdot t_i t_j}{\sum_i t_i^2} \tag{3}$$

where $t_i = div_i - mean(div_i)$, $S_o = \Sigma_{ij} w_{ij}$ and w_{ij}, i,j=1,…M, is an element of a properly specified spatial weights matrix. Moran's I index, whose range of variation depends on the chosen spatial weighting scheme, takes on positive and increasing values whenever regions with similarly high or low levels of specialization in a given sector tend to cluster together in space. Alternatively, this index takes on negative values when neighboring regions are dissimilar, i.e. highly specialized regions alternate with despecialized regions.

As shown in Di Giacinto and Pagnini (2011), both the EG and Moran's I indexes above reviewed, being designed to cope with the existence of *only one type* of spatial pattern (agglomeration vs. polarization), are equally expected to yield biased results when applied to empirical settings where spatial concentration of economic activity can be observed *both* at the agglomeration (local) and polarization (global) level.

To overcome these shortcomings, Di Giacinto and Pagnini (2011) proposed two new indexes that are expressly designed to cope with complex spatial patterns where both agglomeration and polarization forces are assumed to coexist.

To derive the indexes it is assumed that the difference s_i-x_i can be decomposed into two components:

- a purely local unobservable random term, gauging the influence exerted by strictly localized agglomeration forces on firms choice to locate in region *i;*
- a second unobservable stochastic term, accounting for the influence of polarization forces whose intensity depends on distance and that spread their influence across different regions.

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than employment shares (Lafourcade and Mion, 2007). Furthermore, building on Maurel and Sedillot (1999), Guimaraes et al. (2007) show that an EG agglomeration index based on plant counts has the same expected value as the EG index based on employment shares but a lower variance.

Formally:

$$s_i - x_i = \eta_i + \zeta_i \tag{4}$$

where η_i and ζ_i represent the *local* and *global* random model components (see the spatial error component model (SEC) in Kelejian and Robinson, 1993).

To complete the model set up, some additional assumptions complement expression (4). More specifically, in order to account for excess concentration of economic activity related to the existence of strictly localized agglomeration forces, and in close analogy with the natural advantage firm location model set forth in Ellison and Glaeser (1997), the η_i component is modelled as a zero mean random variable with variance $E[\eta_i^2] = \gamma x_i(1-x_i)$ and covariance $E[\eta_i \eta_r] = 0$ for $i \neq r$, the latter assumption reflecting the hypothesis that localized advantages do not extend their effects outside the borders of each region.

In close analogy to the EG model, the non negative γ parameter provides a model-based measure of the strength of localization forces acting strictly within regions boundaries. When γ>0 the local model component vanishes, denoting the absence of strictly localized advantages. When γ>0 the η_i process will feature heteroskedasticity. In this case, as γ increases empirical realizations of s_i will more likely feature outliers (abnormally high or low values), that provide an indication for the existence of localized agglomeration (dis)economies.

Finally, the global component ζ_i is modeled as a process of spatial diffusion of local disturbances u_i, assumed to be homoscedastic and uncorrelated across space. More specifically, it is set:

$$\zeta_i = \sum_{m=1}^{M} w_{im} u_m \tag{5}$$

$$E(u_i) = 0,\ E(u_i^2) = \psi \geq 0,\quad E(u_i, u_m) = 0 \text{ when } i \neq m \tag{6}$$

where w_{im} is a non negative non stochastic weight measuring the degree of interaction between regions *i* and *m*.

When $\psi > 0$, differently from the local component η_i, the ζ_i term exhibits positive correlation across regions, its autocovariance function being given by:

$$E[\zeta_i \zeta_j] = \psi \sum_{m=1}^{M} w_{im} w_{jm}, \qquad i, j = 1,...,M \tag{7}$$

and, as such, it can account for the smoothness that is displayed by many empirical industry location patterns showing how nearby regions tend to attain similar plant density values.

Letting d_{ij} denote geographical distance between locations *i* and *j,* the spatial weights are defined as follows:

$$w_{ij} = d_{ij}^{-\delta} / \sum_{r=1}^{M} d_{ir}^{-\delta}, \qquad i, j = 1,...,M \tag{8}$$

where the coefficient δ, measuring the rate of spatial decay of distance-related interactions, can be set a priori or estimated from observed data.

In equation (8), spatial weights decrease with the geographical distance separating two regions, taking strictly positive values for each couple of locations and converging to zero in the limit as distance between locations grows large. This specification, departing from the contiguity-based weighting scheme used in Kelejian and Robinson (1993) qualifies the global nature of this component, since all regions, and not only strictly contiguous ones, are allowed to interact with each other, albeit with an intensity that is decreasing with distance.

For any given value of γ, increasing values of ψ result in a larger fraction of the variance of industry plant location being attributable to the global component of the model. At the same time, decreasing values of δ will induce a progressively smoother trending behavior of the process across regions, i.e. a stronger positive spatial autocorrelation.

The SEC model specification is completed by the following two assumptions:

$$(\eta_i \perp u_i) \tag{9}$$

$$\sum_{i=1}^{M} (\eta_i + \zeta_i) = 0 \tag{10}$$

respectively stating the orthogonality between the two model components and imposing the constraint that plant shares predicted by the model sum to unity over the set of regions considered.

Under the modeling assumptions described above, the variance-covariance matrix of the vector $(s - x)$, $s = [s_1,...,s_M]'$, $x = [x_1,...,x_M]'$, can be readily shown to take the following form:

$$\Sigma = \gamma \Xi + \psi W W' \tag{11}$$

where:

$$\Xi = diag\{[x_1(1-x_1),...,x_M(1-x_M)]\} \tag{12}$$

and where W is the MxM matrix whose elements are the w_{ij} as referred to in (5).

For analytical purposes, the model can be more conveniently reparameterized as:

$$\Sigma = \lambda[(\Xi^* + \tau W^* W^{*\prime}] = \lambda \Omega \tag{13}$$

$$\lambda = \gamma\kappa_x \tag{14}$$

$$\tau = (\psi / \gamma)(\kappa_w / \kappa_x) \tag{15}$$

$$\Xi^* = \kappa_x^{-1}\Xi\,;\; W^* = \kappa_w^{-1/2}W \tag{16}$$

where κ_x and κ_w denote, respectively, the median values of the diagonal terms of Ξ and WW' .

The non negative model parameters, γ_W and τ, respectively measure the strength of local (agglomeration) and global (polarization) interactions in the Di Giacinto and Pagnini (2011) model. The first, as already noted above, is closely related to the EG's γ index. As regards the polarization measure τ, it differs substantially from the Moran's *I* index. The statistic takes only non negative values and when it approaches 0 the contribution of the global component to the total process variance becomes negligible, i.e. no polarization is observed. Positive values provide evidence of the existence of polarization and, in particular, a value of the index equal to 1 implies that, when evaluated at the center of the respective cross-sectional distributions, the polarization and agglomeration components in the model equally contribute to the spatial variation of the process under study. When both parameters γ_W and τ are equal to zero no industry-specific spatial concentration forces are detected and, consequently, plants location in the industry will reproduce the spatial pattern observed for aggregate economic activity.

4. The framework of the empirical analysis

The empirical analysis was carried out on a database pooling information on the location and on the number of employees of bank branches, from the Bank of Italy banking statistics, and data from the last three Censuses of the Italian business sector, respectively referring to the years 1991, 2001 and 2011, as distributed by the Italian National Institute of Statistics (Istat).[9]

The geographical partition utilized in the analysis was selected to closely match the spatial range of operations of a typical bank branch. More specifically, we opted to base the analysis of spatial concentration on the map of local labor market areas (LLMAs) in which the Italian territory can be subdivided according to travel to work mobility flows. Being based on economic rather than administrative criteria, the LLMA's partition should provide a proper reference in order to identify the pool of customers to which a given bank branch can be expected to provide the majority of its services. In fact, by definition, a branch located in a given LLMA can be

[9] On the definition of LLMA in Italy, see Franconi et al (2016) and Sforzi (2012).

reached by customers dwelling in same LLMA without requiring them to travel a longer distance compared to their typical daily journey to work.[10]

Our indexes of local and global agglomeration patterns are clearly dependent on the choice of a specific zoning system, as the distinction can only be accomplished conditional on a given set of regional boundaries. Hence our results are expected to change somewhat in response to a modification in the shape and the size of the geographical units (the so called MAUP, see Briant et al., 2010). In particular, while the simultaneous identification of the local and global model components can generally be achieved at different spatial scales, parameter values and the balance between the two components will clearly be affected.

In this respect our model-based indicators are not different from other agglomeration or polarization measures that rely on data collected over a discrete partition of the geographical space. Nonetheless, in the context of the present empirical analysis, the consequences of MAUP should be relatively modest. First, a zoning based on LLMA's reduces the risk of creating artificial borders between the different areas, as this spatial partition is based on commuting flows defining local labor markets that are mostly self-contained, as far as the local supply and demand of both banking services and labor are concerned. Second, given that this partition is not industry specific, it meets one of the requirements requested to a zoning system to guarantee a good comparability of agglomeration indexes across sectors. In any case, we will return to the spatial scale problem in the section on robustness checks.

The most recent LLMA map released, which refers to the year 2011, was considered to this purpose and the same spatial partition was applied to data for the years 1991 and 2001, in order to allow the analysis to be performed with reference to a common geographical partition.

Spatial concentration in the banking industry is compared to that observed for the retail trade and insurance sectors. The latter are defined by the NACE Rev. 2 sectorization for the years 2001 and 2011 and by the NACE rev. 1.1 classification for the year 1991. In order to allow for a better comparability with the activity of bank branches, we adopted a broad definition of the insurance sector that includes also financial auxiliaries operating in the same sector.

In Fig. 2 the LLMA share of total bank branches relative to the share of the overall local service sector productive units is plotted with reference to the LLMAs map for the 1991 and 2011 years. The strong tendency of LLMAs located in close areas to attain similar intensities with respect to the relative diffusion of aggregate service sector appears to stand out neatly in 1991, a spatial trend along the north-south direction is also rather evident, although Sicily appears to represent an exception, as it displays a relatively strong presence of bank branches as well. In the next Sections, we will show that the visual evidence of polarization in the banking sector is confirmed by using other indicators, moreover we will argue that this evidence can be explained by the existence of costs for controlling the geographical network of bank branches. Twenty

10 Using Italian data, Arnaudo and Rossi (2018) propose a partition of local credit markets that is defined in terms of self-containment of credit demand and supply.

years later the map provides quite a similar picture, although the Sicilian exception now is no longer detected and Milan, that displayed one of the highest levels of relative bank branch diffusion in 1991, in 2011 exhibits now the lowest values together with other metropolitan areas like Rome, Turin and Naples.

A similar evidence, possibly with a smoother spatial trend, is gained when local bank branch counts are measured with respect to the LLMAs' population (Fig. 3).

5. Agglomeration relative to overall economic activity

In this Section, we will assess how the degree of agglomeration of bank branches has evolved over the 1991-2011 period and will compare it with the level observed in the retail trade and insurance sectors. The former represents a sort of benchmark as the spatial distribution of productive units within the retail sector follows quite closely the geographical concentration of demand. As for the latter, it presents similarities with the banking sector, although it may also be expected to displays some peculiar features as well.

It is worth noticing that all our agglomeration and polarization indexes are computed in relative terms, i.e. they are measured as deviations from the x_i*'s* , in turn indicating region i's share in terms of aggregate economic activity, as is done in this Section, or of demand (in the following Sections). Hence, when we carry out a *comparison* of one of our index between two specific industries (eg banking sector vs retail sector) we are actually comparing two *relative* indexes where 'relative' means that they are both computed as deviations from the same x_i*'s* acting as a reference point.

Following the assumptions outlined in the methodological section, our analysis will be mainly based on our index, henceforth denoted by γ_W ,although we will mention the EG index (denoted by γ_{EG}) as well for comparison. To compute the indexes we assume that s_i, i.e. the *i*-th LLMA's share of activity in the banking sector, is measured by the share of bank branches that are located in the LLMA. At the same time, x_i , i.e. the *i*-th LLMA's share of overall economic activity in the country, is measured by the share of all service sector plants that are located in the LLMA.

The choice of restricting the attention to the tertiary sector in order quantify overall economic activity in a given area is motivated by the fact that locational patterns in the primary and secondary sectors may respond to drivers that are entirely different from those relevant for service sector industries and may consequently provide an inappropriate reference distribution for the tertiary activities addressed in our analysis.

Based on this operational setup, in 2011, spatial concentration in the banking sector was found out to be equal to 0.00010 according to our index and to 0.00088 when using EG indicator (Table 1a and Figure 4a). To provide a comparison, Di Giacinto and Pagnini (2011) obtained the mean values of 0.02033 (0.02336 for the EG index) and 0.00670 (0.01380) for the economic activities included in, respectively, manufacturing and service sectors in 2001.

This evidence indicates that the spatial distribution of bank branches is less agglomerated than that in the manufacturing sector; the same holds considering the average agglomeration of other activities within the service sector. Nonetheless, there is still some evidence of a tendency for the sector to agglomerate, as the index is significantly different from zero.

As for the dynamics, our indicator displays a strong stability in the time span between 1991 and 2011. This contrasts somewhat with the evidence based on the EG index, featuring a significant increase in spatial concentration. As the latter index may be biased when strong polarization is found out in the observed spatial pattern, a feature that is subsequently documented for the spatial distribution of bank branches in Section 7, we are inclined to be more reliant on the evidence yielded by the γ_W index that is robust to polarization by construction.

The evidence of a stability of spatial concentration in the banking sector may come as a surprise considering the liberalization process that interested this field of activity at the beginning of the nineties.[11] Actually, liberalization spurred a wave of openings of new branches that might have had a deep impact on the spatial equilibrium in the banking sector. But in this respect two additional considerations are in order. First, the liberalization process did not come as one shot process, as several constraints on the branching activity of the banks were lifted before the nineties. Hence, it might be possible that bank location decisions were already aimed at achieving the unrestricted spatial equilibrium before the final reform in the nineties took place Second, as shown in Duranton (2007), a spatial equilibrium configuration can be compatible with a lot of churning involving lots of plant entries and exits.

Our evidence on the stability of agglomeration patterns in the banking sector can be compared with the empirical literature detecting an increase in the distance between the local branches and their customers, mainly due to the spreading of ICT and of the on line banking services.[12] [13] In principle, if banks are less in need to have branches located near to the sources of demand, branch locations become footloose and hence this might favor an increase in spatial concentration. At the same time, an increasing distance might also imply that banks could choose branch locations in order to avoid local competition in markets featuring a high concentration of bank branches– absent strong gains from labor market pooling and localized knowledge spillovers – and this fact might induce branches to disperse in space, thereby determining a lower level of spatial concentration.[14] Hence, an increasing branch-customer distance can be

11The process of branching deregulation was started by the Bank of Italy in the late 1980's. In particular, from March 1990 on, entry through a new branch could not be denied on discretionary economic grounds.

12For evidence on the increasing borrower-lender distance and the role of ICT and of the credit scoring technologies see Petersen and Rajan (2002), DeYoung et al (2011) and the literature that followed. Carmignani et al (2020) find that diffusion of the on line services at local market-bank level had a negative impact on the dynamics of the number of branches three years later.

13 Since 2008 onwards, the increasing distance might also be due to closing of several bank branches decided by the banks under the pressure of a falling demand for banking services and by the need for restructuring induced by the advent of the great recession.

14 Mistrulli et al (2017) show that a bank is more likely to close a branch when there are more competitors' branches in the surroundings.

compatible with the stability in the agglomeration index provided that the described contrasting effects may compensate out.

In any case, our results on a stable agglomeration pattern are confirmed by the additional evidence obtained when spatial concentration is measured with respect to the distribution of the sources of local demand (mainly firm locations, see Section 6). Finally, as far as the context of the Italian banking sector is concerned, the spreading of the on-line banking services is still a relatively recent phenomenon (see Carmignani et al., 2020); it might hence be the case that we will have to wait to observe a significant impact of this driver on the banking sector spatial configuration.

According to the value of the γ_W index, it turns out that agglomeration in 2011 amounted to 0.00011 in the retail sector and to 0.00004 in the broad insurance sector (Table 1a). Interestingly enough, concentration increased in the retail sector during the period covered by our analysis. Moreover, this trend is confirmed when switching to the EG index. As for the insurance sector, it displays a lower degree of agglomeration compared to the banking sector and a similar evolution through time when the γ_W index is used.

In 2011 the degree of spatial concentration of bank branches is thus found out to be comparable to that observed in the retail sector, that is traditionally considered as one of the least agglomerated fields of activities, due to the need for the sellers to be close to consumers' locations. Based on the present evidence we can then conclude that agglomeration forces (i.e. those related to technological spillovers and natural advantages) are quite moderate in the banking sector, at least for the range of activities typically performed by bank branches.

Another important difference between the two sectors consists in the way they reacted to liberalization.[15] While the retail sector became more spatially concentrated following liberalization, the banking sector did not show up a clear cut trend in this respect.

We interpret this evidence as due to the differences denoting the two fields of activity at the beginning of the century. Consider the size distribution of employment in the retail sector in 2001 (see the Figure 5). Even at a coarse examination, it becomes evident how a huge share of activity is concentrated in small shops (those hiring 5 employees or less covered nearly 68 per cent of the total employment in the sector). Ten years later, this share dropped to 58 per cent, a significant decline that can be related to the already mentioned liberalization process in the sector, that spurred a reshuffling of market shares from small sized and inefficient units towards medium and large sized stores (see Schivardi and Viviano, 2011). Apart from its consequences in terms of the evolution of the size distribution of employment in that industry, this change is likely to have induced also an increase in agglomeration: larger and more efficient stores are in fact able to attract customers from a broader area and hence their location need not follow strictly the

15The liberalization process for the Italia retail trade sector started in 1998 with the so called "Bersani law" that eliminated several preexisting entry barriers.

spatial distribution of potential demand, making it possible to concentrate the activity in some specific locations.[16]

Differently from the retail sector, in the banking system the share of activity covered by small sized branches appears to be relatively modest (amounting to 17 per cent of total employment in 2001) and, more crucially, it remained stable between 2001 and 2011. This happened despite the aforementioned liberalization process taking place at the beginning of the nineties and the large number of mergers and acquisitions that involved Italian intermediaries during the period. In other words, in the banking sector it did not take place the process of market shares reshuffling from small sized to medium-large sized establishments that occurred in the retail sector and that may be deemed to have clearly contributed to the increase in agglomeration observed in that industry.

6. Agglomeration relative to customers' locations

In the previous section, following the standard approach in the related literature, agglomeration in the banking sector was measured with reference to a supply-side measure of local economic activity. If a specific local area is particularly attractive for tertiary activities, under the 'dartboard approach' it is expected to attract a proportionally equal amount of bank branches. Consequently, agglomeration in the banking industry will be detected if in some specific areas the local share of bank branches is larger than the local share of total service sector plants.

In this section we exploit the flexibility inherent in the Di Giacinto and Pagnini (2011) methodology (a feature that is not shared by the EG index, that is only defined with the reference given by the supply-side indicators of local economic activity above discussed) to expand further the analysis by utilizing a demand-based approach in defining the reference spatial distribution of economic activity. More specifically, in what follows we will alternatively measure the x_i variables as the i-th LLMA's share in terms of either population or of the total business sector firms. By doing so, agglomeration in the banking sector will be detected if the local share of bank branches exceeds the level that could be expected according to the local incidence of potential demand for banking services.

Defining the s_i's as above in terms of bank branch counts and the x_i's in terms of population shares, it turns out that our indicator displays now a higher level of spatial concentration for the banking sector compared to the retail sector. However, while for the banking sector the value of γ_W moderately declined between 1991 and 2011, it increased for the retail sector between 2001 and 2011 (Tab. 1.b).

16Notice that large stores could enter local markets with a large concentration of competitors, as they could be confident of being able to gain market shares at expenses of small and inefficient shops. This implies that, in their entry strategies, they did not need to avoid competition at local level, a force that could have compensated the centripetal forces described in the text.

The availability of data on municipality population counts and branch counts for the most recent years allowed us to compute the γ_W index also for the year 2015 in the banking sector. The estimated value in this case does not show any appreciable change with respect to level estimated for 2011, confirming the picture of an overall stability of the strength of spatial agglomeration in the banking sector.

Branch localization patterns may follow not only those chosen by consumers but also those related to the places where the non financial firms establish their corporate headquarters. To investigate this issue we redefine the x_i's in terms of firm count shares for all economic activities. According to our γ_W index, apart from 1991, the banking sector was less spatially concentrated than the retail sector (Tab. 1c).

All in all these findings point to the fact that establishments in the retail sector follow more closely the spatial distribution of consumers while the bank branches localization pattern is more strongly related to the spatial distribution of productive firms. This evidence appears hence to provide an indirect confirmation that banks may benefit from proximity to their borrowing firms, as emphasized in the literature on lending relationships (see Boot, 2000, for a survey).

Evolution through time of the indicators measured with respect to firm counts are similar to those based on population. Between 1991 and 2011 the retail sector became more spatially concentrated while the banking sector marginally reduced its propensity to agglomerate. The latter piece of evidence can be interpreted as the fact that the value for the banks of proximity to their borrowing firms was only partially eroded by the advent of information and communication technologies. Confirming the importance of the geographical network even in the internet era, Forman et al (2009) showed that when a store opens locally, people substitute away from online purchasing, even when controls for product-specific preferences are present. At the same time, in another recent paper, Gilje et al (2016) showed that positive liquidity shocks in bank deposits can be transmitted to loans in other locations, provided banks possess physical branches in those markets.

7. Polarization relative to customers' locations

As explained above, agglomeration can be also investigated along another dimension, i.e. that of the propensity of bank branches to locate in nearby local markets. As detailed in Section 4, the preliminary evidence provided by plotting the map of the local diffusion of bank branches appears to favor the existence of strong polarization. To gauge quantitatively the extent of this phenomenon we resort to both our index τ and to the well-known Moran's I index.

In order to make both types of indexes operational, a preliminary choice of the spatial weights gauging the degree of proximity between two regions is required. In this case, we opted to define spatial weights based on an inverse function of the distance between the LLMA's central locations, where distances are expressed in kilometers and computed from the great circle formula. Compared to a weighting scheme based on the simple presence/absence of contiguity

between locations, these formulation has the advantage of offering a less extreme representation of how spatial interactions decay with distance. Alternative weights specifications, namely those based on effective bilateral distances (e.g. travelling time), though could sometimes provide better proxies for the actual decay of spatial spillover effects, are exposed to the risk of being endogenous with respect to the intensity of the agglomeration forces and for that reason were not considered in the present work.

As above, we first analyze the bank branches map with reference to the map of plant counts for the entire service sector. Estimates of the τ index indicate a general prominence of polarization over agglomeration forces in determining the spatial distribution of bank branches. As shown in table 2.a and Figure 4b, in 1991 the estimated value for τ is above 20, against median values well below one both in manufacturing and in the service sectors (see Di Giacinto and Pagnini, 2011). The vast majority of the spatial variation in the local diffusion of bank branches is thus seen to come from the polarization (global) component in the model. The value for the *I* index, which provides an alternative approach to measuring polarization, is also quite high when compared to the level prevalently estimated for tertiary activities (respectively 0.08664 against 0.01019 for the median of the service sector).

As regards the time pattern, both indicators point to a decline in the strength of spatial polarization of bank branches starting in the nineties, although the fall is much more intense in the case of the *I* index. The evidence of a progressive reduction of the degree of polarization is broadly confirmed when the τ index is measured with respect to LLMAs population levels or total firm counts (see tables 2.b and 2.c). When measuring polarization with reference to population we are able to update the indicators up to year 2015 and, as already shown for the γ_W agglomeration index, we find evidence only of minor changes with respect to estimates obtained for the year 2011.

In the case of the retail sector, the estimated value for τ is also above one but neatly below the level reported for the banking sector. At the same time, the dynamics of the indicator does not display any clear cut trend in the data.

The evidence of strong polarization means that local markets displaying a relative (low) high specialization in terms of the presence of bank branches, i.e. a relatively (low) high level of $(s_i\text{-}x_i)$, tend to be located closer to other (de) specialized local markets. In other words, banks might benefit from locating their branches closer to other specialized local markets.

As explained above, this additional piece of evidence can be interpreted as the fact that in the banking sector the benefits of geographic risk diversification seem to be limited as compared to the agency costs and the problems with the span of control generated by a geographically diversified branch network. We conjecture also that the lower level of

polarization in the retail sector might also signal the fact that the costs of controls over peripheral units are less severe in this sector as compared to the banking industry.[17]

Moreover, consistent with this evidence Felici and Pagnini (2008) show that banks tend to open branches mainly in target local markets that are close to their pre entry locations. This spatial trend in bank geographic expansion can be in turn due to several considerations discussed in the above mentioned paper and mainly acting through a supply-side channel. It can be argued that entry costs increase with geographical distance from the target market. A bank entering into a new and remote market has to produce more efforts: (a) to get itself known by the clientele in the new market; (b) to acquire knowledge of the new location and of the customers acting inside its borders; (c) to let the new branch interact with corporate headquarters and with the rest of its geographical network (costs for increasing the span of control). All those mechanisms are at work and might explain the relatively high level of polarization detected for the banking sector in our data.

Moreover, Felici and Pagnini (2008) showed that accumulation of ICT capital at bank level partially eroded those distance related entry costs thereby facilitating entry into remote local markets. This additional piece of evidence could hence partly explain the moderate fall of polarization that is observed between 1991 and 2011.

8. Robustness checks

We expose our findings to a series of robustness checks and extensions. As mentioned before, in the previous sections we resorted to the 2011 map for the LLMA in order to compute agglomeration indexes for all the other years. Alternatively, we used in the same way the map of the Italian LLMAs as defined in 1991, the results both in terms of the level and the dynamics of the indexes do not change.

The two most recent years in our analysis, the years 2001 and 2011, include quite heterogeneous sub periods, i.e. the 2001-07 interval within which bank branches had been growing substantially and the 2007-2011 time span featured by the Great recession with a fall in the number of the branches. To see if something special occurred in the latter, we computed agglomeration indexes for the banking sector by using as a reference point the year 2007. Results display a substantial stability over the 2007-2011 period, thus confirming the previous findings.

While we deem the LLMAs to provide the most appropriate spatial reference for our analysis under a priori theoretical considerations, in order to check for the robustness of our empirical results with respect to the choice of the reference spatial partition, we replicated the analysis at the level of the 110 Italian administrative provinces. The results, displayed in Figure 6, show how at this broader spatial scale the picture is entirely confirmed with respect to

17In turn, this could be due to the fact that the activity within local stores is relatively standardized and hence can be easily controlled at distance as compared to that carried out in local bank branches where for instance local loan officer have to assess credit worthiness for small sized firms.

agglomeration tendencies. Polarization remain substantial and is larger than the level observed in the retail trade sector for most part of the period considered.

9. Final remarks

All in all the evidence collected in this paper shows that in Italy the banking sector displays only a moderate tendency to concentrate in space within highly specialized local labor market areas. The spatial distribution of bank branches is found out to be not much more spatially concentrated than that observed for the service sector as a whole and to follow quite narrowly the localization patterns of the sources of local demand, especially when the latter are proxied by firm location choices. Moreover, the degree of spatial agglomeration in the sector remained relatively stable in the period 1991-2015.

At the same time, the banking sector exhibits a strong propensity to polarization in space, i.e. bank branches usually tend to show similar level of spatial concentration in nearby local markets. The latter piece of evidence can be explained by the fact that banks tend to open branches mainly in target local markets that are close to their pre entry locations (Felici and Pagnini, 2008). Moreover, the (moderate) tendency of polarization to fall in recent years might be attributed to the role that information and communication technologies had in increasing banks' span of control over their geographic networks.

All in all, these results show that the spatial distribution of bank branches in Italy did not undergo a radical transformation during the last twenty years. This evidence is apparently hard to reconcile with the liberalization process of the nineties, the shift from the previous boom in bank branching to the retrenchment observed during the Great recession and, last but not least, the intense development of ICT throughout the period. This is probably due to the resilience that till recent times the bank geographical networks exhibited with respect to all these changes. From this point of view, it might be that further advances in ICT, big data analytics and other technologies, fostered further by the recent pandemics crisis, might eventually have a stronger impact on the banking industry in the next future. Along this perspective, it would also be of interest to replicate our analysis for the different bank categories and analyze how they have been reacting in terms of their localization strategies to the changes in the economic and financial conditions brought about by the ongoing crisis. This investigation could also include cooperative banks that are currently undergoing a deep transformation in their business models and are still subject to some residual constraints on their location choices. We leave these topics for a future research agenda.

Tables and figures

Figure 1. Two examples of bank branch localization patterns (1) Example 1: banks diversify risk

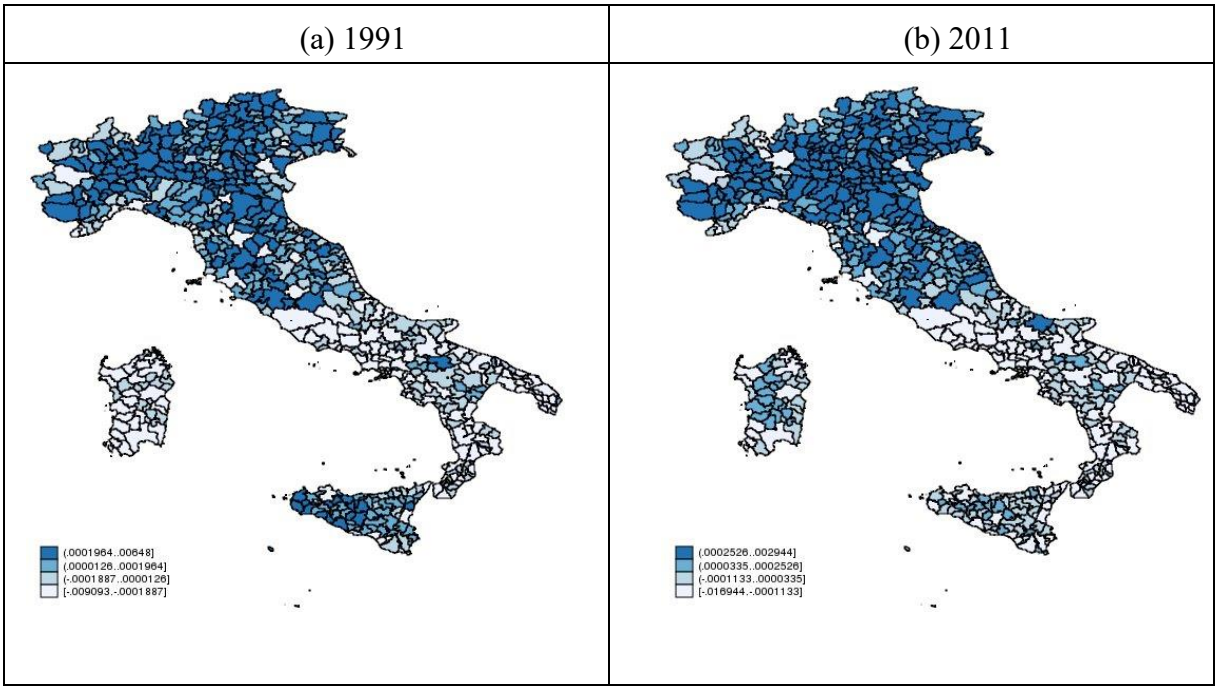
A2	B3		A3		A1;B5
B1			A2		A3
A1		B2			B3
A5;B2			A5		A3

Example 2: Banks expand by contiguity

			B2	B3	B5
		B1	B2	B5	B2
A1	A2	A3	A1		
A3	A2				
A5	A5	A3			

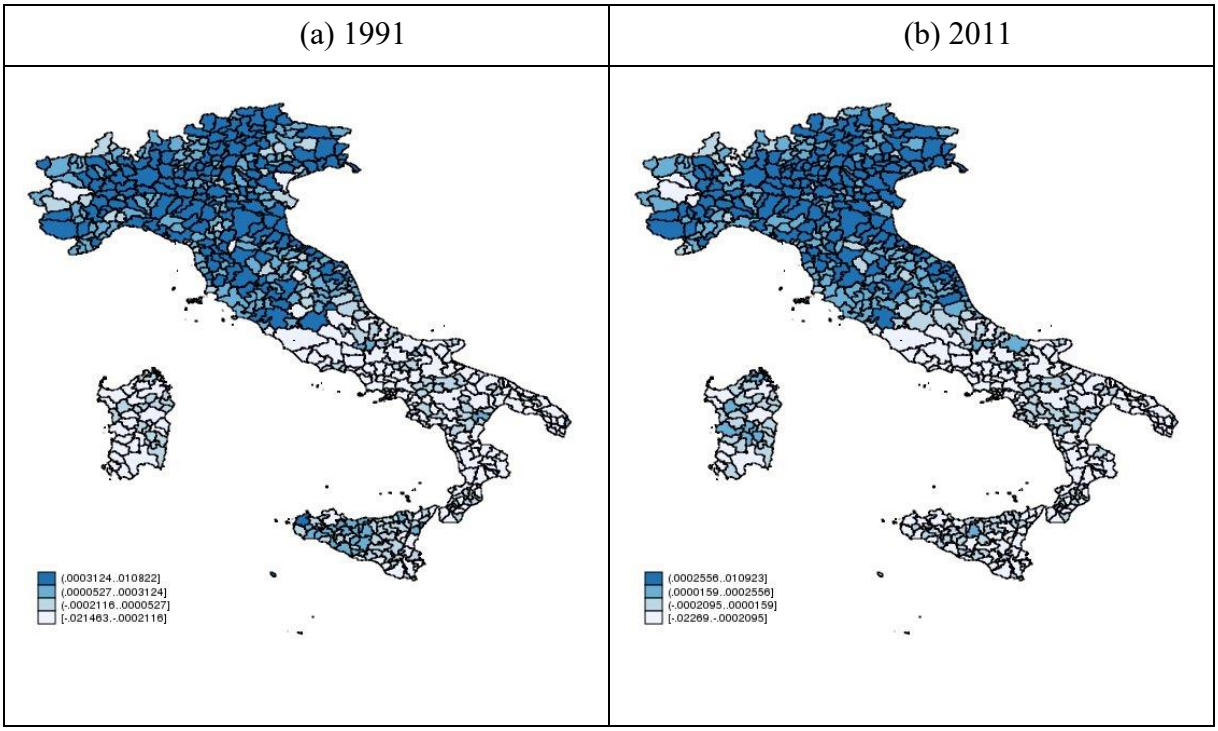
Two examples of branch location patterns. Assume that there are two banks (denote d by A and B). This figure provides a graphical example with reference to bank branch distribution in two polar cases where banks pursue an expansion strategy based on contiguity (Example 1) or with the aim of achieving geographical risk diversification (Example 2). In a regular 5×5 lattice whose cells represent the set of N regions, the grey area denote the location of banks' Corporate headquarters (the one in the lower left corner pertains to Bank A and the other to B), the numbers following each capital letter denotes the amount of branches owned by each bank in a specific location. Evidently, no case of polarization would emerge from Example 1 while a strong polarization is detected in Example 2.

Figure 2. Spatial distribution of bank branches relative to total service sector productive units (1)



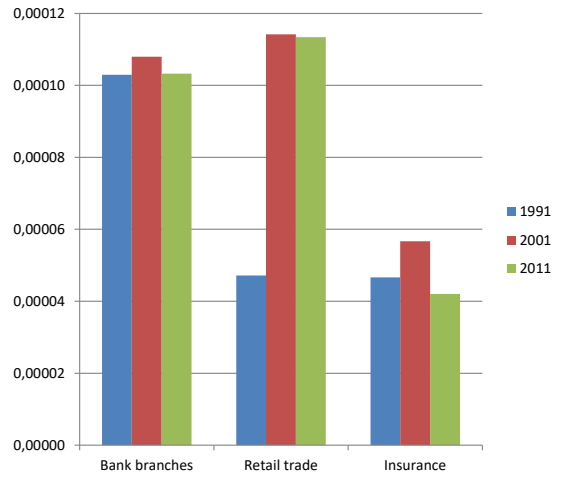
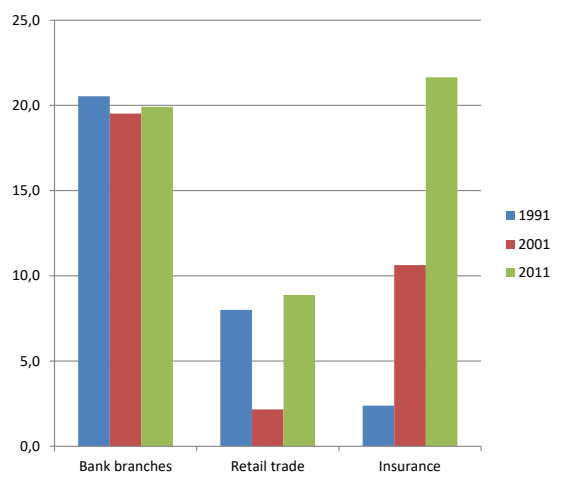
(1) The figures map the variable ($s_i - x_i$), where s_i is the i-th LLMA's share of total bank branches and x_i is the share of total service sector plants.

Figure 3. Spatial distribution of bank branches relative to total LLMA's population (1)



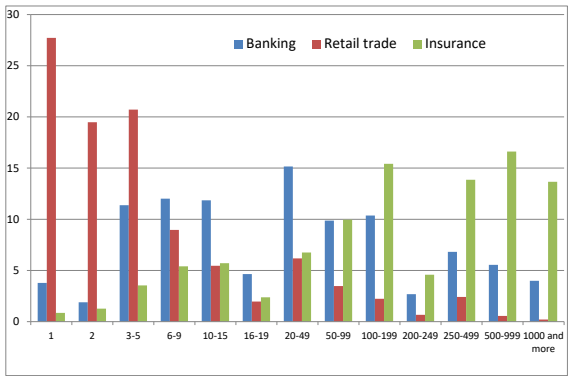
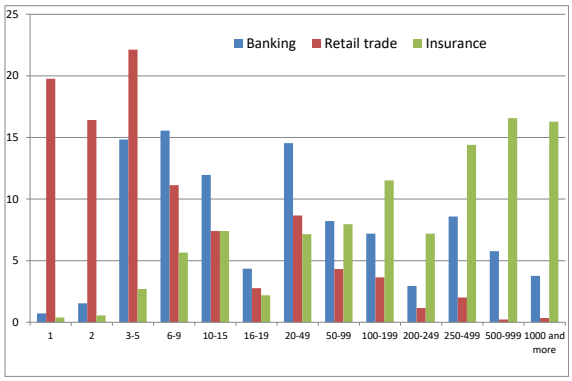
(1) The figures map the variable ($s_i - x_i$), where s_i is the i-th LLMA's share of total bank branches and x_i is the population share.

Figure 4. Spatial concentration indexes

(a) agglomeration	(b) polarization
	

(1) The figures display the Di Giacinto and Pagnini indexes computed with reference to bank branches counts at the LLMA's level, assuming as reference spatial distribution the total number of service sector plants.

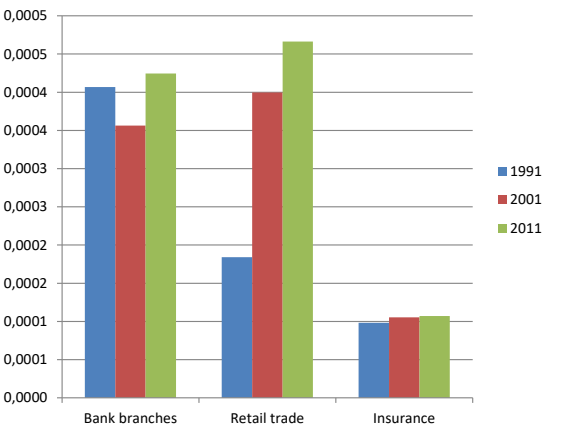
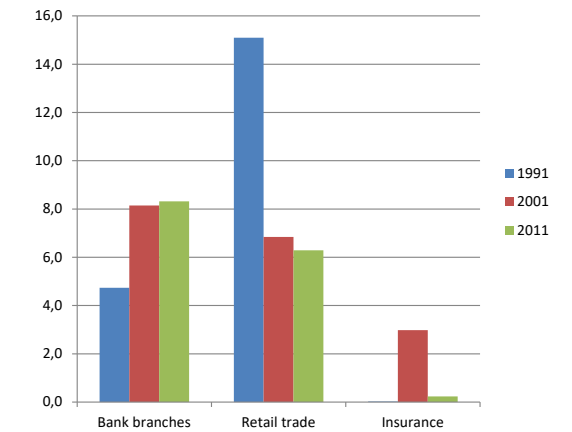
Figure 5. Employment distribution by establishment size (1)

(a) 2001	(b) 2011
	

Source: our computation on Istat's census data

(1) On the horizontal axis are displayed establishment size classes according to the number of employees. The height of the histogram represents the share of total employment pertaining to each size class.

Figure 6. Spatial concentration indexes at provincial level

(a) agglomeration	(b) polarization
	

(1) The figures display the Di Giacinto and Pagnini indexes computed with reference to bank branches counts at the level of the 110 Italian administrative provinces, assuming as reference spatial distribution the total number of service sector plants.

Table 1a. Agglomeration indexes: bank branches counts with respect to the spatial distribution of service sector plants

	Di Giacinto-Pagnini index (γ_w)		
	Bank branches	Retail trade	Insurance
1991	0.00010	0.00005	0.00005
2001	0.00011	0.00011	0.00006
2011	0.00010	0.00011	0.00004
	Ellison Glaeser index (γ_{EG})		
	Bank branches	Retail trade	Insurance
1991	0.00034	0.00046	0.00006
2001	0.00087	0.00200	0.00030
2011	0.00088	0.00201	0.00015

Table 1b. Agglomeration indexes: bank branches counts with respect to the spatial distribution of population

	Di Giacinto-Pagnini index (γ_w)		
	Bank branches	Retail trade	Insurance
1991	0.00017	0.00004	0.00053
2001	0.00016	0.00004	0.00025
2011	0.00016	0.00005	0.00021
2015	0.00015	–	–

Table 1c. Agglomeration indexes: bank branches counts with respect to the spatial distribution of business firms

	Di Giacinto-Pagnini index (γ_w)		
	Bank branches	Retail trade	Insurance
1991	0.00010	0.00009	0.00006
2001	0.00008	0.00013	0.00004
2011	0.00009	0.00011	0.00004

Table 2a. Polarization indexes: bank branches counts with respect to the spatial distribution of service sector plants

	Di Giacinto-Pagnini index (τ)		
	Bank branches	Retail trade	Insurance
1991	20.54	8.00	2.38
2001	19.52	2.16	10.63
2011	19.92	8.88	21.65
	Moran index (I)		
	Bank branches	Retail trade	Insurance
1991	0.08664	0.05745	0.02726
2001	0.03739	0.02566	0.02322
2011	0.04230	0.02485	0.01032

Table 2b. Polarization indexes: bank branches counts with respect to the spatial distribution of population

	Di Giacinto-Pagnini index (τ)		
	Bank branches	Retail trade	Insurance
1991	12.02758	0.70747	0.12663
2001	9.41864	9.77713	3.58844
2011	8.20933	9.90020	4.13989
2015	8.44669	–	–
	Moran index (I)		
	Bank branches	Retail trade	Insurance
1991	0.07645	0.02520	0.00611
2001	0.08948	0.03902	0.02725
2011	0.08837	0.05194	0.04131
2015	0.08658	–	–

Table 2c. Polarization indexes: bank branches counts with respect to the spatial distribution of business sector firms

	Di Giacinto-Pagnini index (τ)		
	Bank branches	Retail trade	Insurance
1991	30.61663	38.40819	0.46351
2001	8.53147	5.65715	1.86617
2011	12.17884	3.23189	0.42062
	Moran index (I)		
	Bank branches	Retail trade	Insurance
1991	0.05618	0.06920	0.01955
2001	0.05640	0.04970	0.02797
2011	0.06217	0.04039	0.02252

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