Spatial Dynamics Regarding Geographical Concentration of Economic Activities. Italian NUTS-3 Analysis

Stefano De Falco¹

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Abstract

For several years, the themes concerning agglomeration economies have been approached from different perspectives in the scientific debate, as capable of triggering various positive features. The present research starts precisely where many others arrive, that is, given the value of these externalities, analyzing the spatial distribution of the geographical concentration of economic activities and the related influencing factors. To this end, in this contribution an explanatory investigation is carried out into the spatial dynamics deriving from main productive sectors' concentration in some Italian regions. The proposed methodological approach is based respectively on the LISA spatial autocorrelation models and on the analysis of non-neighboring clusters to understand if the geographical area of reference and / or the particular production sector are influencing variables. The empirical investigation confirms the presence of a parametric interaction between factors related in some cases on the geographical context and in others on the productive sector.

Keywords Spatial · Economic Concentration · Autocorrelation

Introduction

The idea that the size of the market has a positive impact on local productivity dates back to Marshall (1890) and was formalized by Fujita and other authors (Fujita et al., 1999). Urban economics literature has identified several mechanisms leading economic density to faster growth and productivity such as cross-fertilization knowledge, increasing returns to scale in a non-tradable intermediate goods sector, etc. Ciccone and Hall (1996) and Combes (2000) provide evidence for the positive role played by density, and these externalities are often related to the concentration of economic activities.

✉ Stefano De Falco
sdefalco@unina.it

¹ Department of Political Sciences, University Federico II of Naples, 80138 Napoli, NA, Italy

The first type of production concentration externalities, fairly rooted in the literature, is that relating to the positive impact of economic density on local productivity (the so-called urbanization externalities). The second source of externalities is represented by the economic advantages deriving from increasing returns to scale, transportation costs and the size of the markets.

As Combes and other authors argue, in many countries, spatial disparities are large and a source of considerable policy concern. In most developed countries, the workers in the richest regions have incomes or wages that are typically double those in the poorest regions. In developing countries, the gaps are often larger (Combes et al., 2004).

In the Fordist economy of the post-war period, mainly focused on hand-manufacturing production, physical and human capital was concentrated in limited locations, located in peripheral areas detached from the cities where residential, social, and recreational functions were mainly carried out. Until the theory of global cities arose, the narrative of innovation had been mainly focused on the subjects or companies that were protagonists, with the analysis of the factors leaving out the role of the urban territories that they were welcoming such companies and contributing to their success and development (Balland et al., 2015).

In the early 1980s, when the value of production gradually began to transition towards intangible factors, the role of cities as drivers of competitiveness became increasingly central.

In the cities that intercept these global processes, the advanced services of finance, culture, and innovation are concentrated.

A concentration paradox arises from the fact that massive developments in communication technologies since the end of the twentieth century have created what Glaeser (2011) called a "flat world". Studies did not sufficiently consider the place as a variable in the urban phenomena paradigm, but this outlook was inverted in the late 1980s and early 1990s (Logan & Molotch, 1987). In time, it became more apparent that cities have the ability to incubate and spread innovation, making them crucial elements that combine both local and global dimensions through experimental laboratories and innovative local architecture. Cities were recognized as capable of animating advanced projects through the use of concrete initiatives for the enhancement of territorial resources and, above all, becoming hosts for company settlements.

Cities, the fulcrum of innovation and regional nodes of global relational systems, now open up to new opportunities deriving from the business world. Thus, they conquer roles, functions, and market shares in a predominant way compared to urban realities anchored to obsolete models (Currid, 2006). Even the World Bank has shifted its axis of analysis on economic productivity to the urban scale. This significantly deviates from more traditional approaches, in which economic growth was expressed exclusively through indices of national relevance. Many studies (Gavinelli & Molinari, 2015; Scott, 2001; Taylor, 2004) observe that cities increase their economic weight and their role as hubs for global processes by assuming an unprecedented centrality in the management and coordination of the contemporary economy.

It then seems interesting in this framework to understand analytically the relationship both between contiguous geographic areas, at the NUTS3¹ scale, and not close to each other, in relation to the density of workers in the main industrial and service sectors, to highlight the presence of mechanisms of productive propagation which depend on the specific sector or on geographical determinisms linked to the particular territory.

In this wake, for example, Rice and other authors have already moved using UK data at the NUTS3-level, in fact found a positive correlation between productivity and agglomeration of economic activity (Rice et al., 2006). Angulo et al. (2014) combine different econometric techniques, including spatial approaches, by investigating the economic resilience of Spanish labour markets at provincial (NUTS-3) level up to the end of 2015. One of the authors main findings is to provide novel evidence on the fact that the different performance of Spanish provinces during and after the Great Recession can be traced to sectoral and locational advantages. The contribution of Mazzola, Lo Cascio, Epifanio and Di Giacomo analyzes evolution of GDP, exports and employment in the Italian provinces (NUTS-3 level) over the last decade. The authors point out the relevance of specific territorial factors like agglomeration economies and territorial capital that contribute to explain the different evolution of provinces in Italy also during the recent recession. The work of Fratesi and Perucca (2018) explains the asymmetric consequences of the Great Recession in the European NUTS-3 regions by underlying the presence of territorial differences in the endowment of structural territorial assets, or “territorial capital”, as key factors. In particular, the authors argue that places endowed with material and immaterial capital assets perform better in times of crisis by showing higher degree of resilience in the presence of shocks, and that places with quantitatively similar but qualitatively different territorial capital deal with the crisis in different ways.

As highlighted by Fazio and Maltese (2015), the choice of the specific NUTS3 spatial level has several advantages. First, NUTS-3 regions correspond to Italian provinces, administrative units that have been traditionally responsible for providing a number of business services. Second, while alternative NUTS classifications identify much larger areas, NUTS-3 are comparable in terms of number and size to the administrative units used in other European studies (e.g., French Départements in Martin et al., 2011). Third, NUTS-3 regions have been widely considered as reference unit in other regional studies on Italian firms.

This paper’s contribution to the existing literature is twofold: on one hand it enriches scientific debate focusing on the effect, in term of spatial correlation, induced by productive concentration—a dimension that has been so far neglected in the research – and on the other hand it proposes a real Italian framework useful for urban planners and managers to better understand the relationship between productive concentration and territories, promoting new elements for their strategies.

The focus is in particular on how the productive concentrations and their effects in term of spatial autocorrelation differ between the South, the Centre and the North

¹ NUTS or “Nomenclature of territorial units for statistics” is the system used by Eurostat to divide the territory of the European Union. Level 3 identifies “small regions for specific diagnoses”.

of Italy, and across different sectors. Doing so requires addressing the identification problem posed by the possible endogeneity of concentration owned to particular regions examined as proxy of all ones, which is tackled by exploiting the unique richness of information contained in the NUTS 3 Eurostat data regarding employments by specific sector.

The paper is structured as follows. The following section reviews the literature regarding the externalities deriving from productive concentration, providing the background for the empirical analysis. Then an analysis on the Italian scenario where the investigation scale is that of NUTS3 referring to some significant regions of the North, Centre and South of the country, is proposed. The proposed methodological approach is based respectively on the LISA spatial autocorrelation models and on the analysis of the cluster concerning data and variables used in the analysis. After describing and reporting the main results, the geographical implications deriving from, are discussed. The conclusion summarizes the implications of the study and directions for future research.

Background

The spatial agglomeration of economic activities is a remarkable feature of the economic geography of many countries, regions and local systems (Boschma, 2005; Boschma, Balland, et al., 2014; Porter, 1990).

Several studies have approached the topic of concentration of economic activities: Cumbers and other authors (Cumbers et al., 2003) investigated the collaborative relationships between companies in different urban locations. Bennet and other authors (Bennett et al., 2001) studied the relationship between urban density and location choice, and Wood studied this topic in the capitals (2002, 2006). As Amin and Thrift (2002) argue, the direct relationship between an urban area and a company's location choice is far from apparent, giving rise to a variety of alternating hypothesis.

The theme of economic growth has generated two macro-strands of research characterized by different considerations of spatial value. One macro-strand is the neoclassical theory (which has never considered territorial factors) correlates development with exogenous factors. The second considers the more recent approaches of the New Growth Theory and New Economic Geography.

Lösch (1940) argued that firms locate in such a way as to maximize profits by considering the general equilibrium of all locations and prices. Krugman (1995) extended the central place explanation by considering market size, agglomeration, and localization economies as actually determinative of a firm's location choice.

In the neoclassical approach, the hypotheses of perfect dissemination of knowledge and constant returns to scale preclude the possibility of explaining persistent growth differentials over time. This is economically backward when referencing the problems experienced in specific local areas.

Neoclassical theories differ from classic theories through the introduction of market competition, revenue, internal economies of scale, the effect of varying combinations of production factors, and a focus on profit maximization

(Hotelling, 1929; Lösch, 1954). Endogenous growth models and the New Economic Geography (NEG), which were developed at the end of the last millennium, have more varied implications. This is because the starting hypotheses account for persistent variations in the ways that different economies develop (Gualerzi, 2001), such as the presence of increasing returns, or through a micro-economic view of the mechanisms used to disseminate knowledge.

The NEG have had the merit of "having given a unifying expression, compared to the mainstream of historical exponents of the space and non-space economy, of the tendency of productive activities to concentrate in physically restricted spaces according to the concept of agglomeration" (Dileo & Losurgo, 2011, p. 455). According to Krugman (1995), this is a field of research that deals with causes ("why") and modalities ("how") concerning economic activity and its interaction with space. Krugman referred to the Marshallian concept of externalities as a regional concentration of economic activities capable of locally generating external economies (Basile et al., 2012).

As the State of European Cities Report highlighted in 2007, cities are increasingly the main engines of economic growth (Amato, 2010). Urban areas are identified as the leading producers of knowledge and innovation and, thus, as the ganglia of the globalized world economy. Furthermore, as underlined by Dematteis and Governa (2003, 2005), they represent the locus of maximum emphasis in a multiform network of actors.

Therefore, the approaches focused on endogenous growth take into account the structural differences of the territories and place the emphasis on the role of accumulating technological knowledge, on the sub-optimal nature of progress and on the possibility of persisting gaps in growth rates. In this way, open spaces for discussion relating to the role of development policies that can produce more significant long-term effects than policies to support the accumulation of physical capital (exogenous growth) are discovered (Lodde, 1999). If, therefore, in neo-classical models, economic policy appears to be of limited value because it cannot affect the long-term growth rate, in those of endogenous growth, this assumes a significant role in the governance of territorial disparities, exacerbated by the existence of contributing forces to increase, over time, the divergences between the various regional economies (hypothesis of "divergence", unlike the "convergence" supposed by the proponents of the neoclassical model).

This divergence is evident according to the North–South axis of the countries and particularly in Italy. However, it is interesting to better investigate this relationship with the territory to understand how a geographic determinism is influential in the phenomena of spatial propagation of production activities and how much it depends on the specificity of the sector regardless of the geographical context.

Other authors laid the foundations in a more recent past (e.g. Fazio & Maltese, 2015) and in a more far one (e.g. Jacobs, 1969) for the search for this parametric dependence on sector and geographic area factors. Fazio and Maltese, in fact, argue that agglomeration externalities, however, do not just originate within the industry (Fazio & Maltese, 2015), while Jacobs (1969), in particular, discusses the role of externalities originating outside the industry within a geographical area.

Table 1 Concentration of economic activities in Italy—Literature review

Topic	Literature review
Agglomeration externalities	Boschma (2005) Becattino (1990); Fazio and Maltese (2015); Cainelli and Leoncini (1999)
Sectorial labor market	Faggian et al. (2017); Giunta et al. (2012); Cingano and Schivardi (2004); Trigilia and Burroni (2009a, 2009b); Paci and Usui (2008)
Spatial analysis of economic activities	Cainelli et al. (2016); Cainelli et al. (2014); Di Giacinto et al. (2014); Cainelli and Lupi (2010); Fazio and Piacentino (2010)

Source: author's elaboration

In Italy, there are mainly three lines of research on this topic developed in the literature, the analysis of externalities from agglomeration, the sectoral labor market and the spatial analysis of economic dynamics. Table 1 shows a review of the main works.

The following analysis focuses on the third line of Table 1 by analyzing the influencing factors in the distribution and spatial propagation processes of the concentration of economic activities in Italy.

Analysis of Spatial Dynamics Regarding Main Productive Sectors' Concentration

Italian Context

According to Trigilia e Burroni (2009) Italy can be defined as a 'regionalized capitalism': a complex and heterogeneous system that gathers together both remarkable dysfunctions and strengths, where local institutions, SMEs and their networks cooperate in a flexible and neo-voluntaristic way to produce territorial competitive advantage.

As highlighted by Filippetti et al. (2019) Italy is characterized by profound geographical differences in the types of industrial specialization, quality of education and human capital, and labour market performance. As these authors affirm (*ibid*), these differences, part of the historical socioeconomic and institutional differentiation of the country as a nation-state, have in recent decades been exacerbated by the internal migration of a highly educated labour force from the Southern to the Central and Northern regions.

The analysis of the production sectors cannot be separated from an adequate consideration of the dimensional aspects. The Italian production structure continues to be clearly characterized, compared to that of the other large European economies, due to the particularly large and widespread presence in the majority of sectors of small and medium-sized production units.

Overall, the Italian production system is made up of 4.2 million companies, which employ 15.7 million workers (Istat, 2017). Compared to the main European countries, on the one hand a considerable weight of micro enterprises emerges (less than 10 employees), on the other a relatively low presence of large units (250 employees and over): micro enterprises realize slightly less than 30 percent of the total added value, a share only slightly lower than that of large companies and they employ almost half of the total employees of the production system (about 48 percent; 24 in industry in the strict sense).

Consequently, the average size of the Italian production system is confirmed to be particularly limited, with 3.7 employees per company for all sectors (9.5 for industry in the strict sense).

This paper considers some regions as proxy of Italian phenomena regarding spatial dynamics related to productive concentration, two regions of South, one of the Centre and two of North.

As frequent in many countries, socio-economics differences between North and South they have deep roots linked to the history of those countries. In this case of Italy, most of the South was a colony of one foreign power or another throughout recorded history, until the creation of Italy in the mid-nineteenth century. Iammarino (2005) provides an eloquent brief review on this past, while Iuzzolino and other authors provides significant economic statistics (Iuzzolino et al., 2013).

How much value does this geographical disparity assume and how much value does the specificity of the particular economic sector assume? These questions are the research determinants that are being investigated.

Methodology

From the analytical point of view, the research determinations described in the previous point were set according to a hypothesis test in the form (1):

$$\left\{ \begin{array}{l} \textit{Hypothesis Test for Productive Concentration} \\ H_1 : \textit{Spatial autocorrelation is dependent of geographical area of reference} \\ H_2 : \textit{Spatial autocorrelation is dependent from particular productive sector} \end{array} \right\} \quad (1)$$

The index used for the analysis of the production concentration (Fracasso et al., 2018; Beaudry & Schiffauerova, 2009) is defined in the (2)

$$PC_i = \frac{\frac{Em_{ij}}{Em_{nj}}}{\frac{Em_{ipot}}{Em_{ntot}}} \quad (2)$$

where,

PC_i is the productive concentration for Italian province i and sector j ; Em_{ij} is the number of employments related to the Italian province i and sector j ; Em_{nj} is the number of employments related to national data and sector j ; finally Em_{itot} is the number of employments related to the Italian province i referred to all sectors and Em_{ntot} is the number of employments related to national data of all sectors.

So easily when $PC_i > 1$ then the concentration of that specific productive sector j in the province i is higher than national average.

The data set on which the (2) calculations are conducted is Eurostat at the NUTS 3 level according to Topel who affirms that local labor markets are usually defined by geographical units (Topel, 1986).

A differentiation relating to sectors as well as geographic has been conducted, cause as Boschma and other authors claim (Boschma, Balland, et al., 2014a; Boschma, Eriksson, et al., 2014) they are very important for outlining the economic patterns of the territories, bringing with endogenous differences capable of generating externalities of different concentration.

The main Italian sectors chosen for the analysis are Industry, Manufacturing, Construction and ICT. The regions identified as proxies for the whole national phenomenon are Lombardia and Piemonte for the North, Toscana for the Centre Italy, and Campania and Puglia for the South.

For the verification of the H1 and H2 hypotheses, the LISA (Local Indicators of Spatial Association) method of spatial autocorrelation of Anselin (1995, 2005; for a purely geographical approach, see also Zacommer & Grasseti, 2014) is considered.

This methodology is based on an index called Moran Index which represents a measure of spatial autocorrelation by comparing gaps between values of the reference variable, in this case the index of productive concentration, between contiguous areas and non-adjacent areas. The algorithm is based on the construction of a weight matrix. It is a non-stochastic square matrix whose elements w_{ij} reflect the intensity of the connection between each pair of areas i, j . In this case represented by the neighborhoods of the city. Measurements of this intensity, which necessarily must be non-negative and finite, can be different. In the simplest form it is based on the concept of binary contiguity according to which the proximity structure is expressed by values 0–1. If two space units have a border in common, greater than zero in length, they will be considered contiguous and will be marked with the value 1.

In the present analysis these laborious steps were carried through the open source GeoDa software developed by Anselin and through the Statgraphics® software for the construction of the dendrograms in order to determine the possible clusters between the provinces of the different regions analyzed.

Spatial autocorrelation can basically have two causes: 1) measurement errors for observations related to contiguous geographic units and 2) real spatial interaction. The former can arise whenever data are used for which there is no perfect correspondence between the territorial unit of analysis and the extent of the phenomenon under examination.

With reference to Moran's I statistics, it is possible to associate a useful graph that provides complementary and supplementary information. This is the Moran Scatterplot which reports the normalized variable on the abscissa axis in a Cartesian graph and the spatial delay (according to the proximity of the weight matrix) of the

normalized variable on the ordinate axis. The Moran statistic is represented by the angular coefficient of the linear relationship between the two variables reported on the axes of the Moran scatterplot. If, therefore, the points are scattered between the four quadrants this will indicate absence of correlation (the angular coefficient is zero). If, however, there is a clear relationship, the Moran Scatterplot can be used to distinguish different types of spatial correlation. The results of the Moran Scatterplot can be reported on a map in order to geographically distinguish the areas with the different types of correlation (High-High, Low-Low, High-Low, Low-High).

In particular, for the dealt case, in this way it is possible to verify if the provinces of the regions analyzed are united by a certain type of correlation linked to productivity and if they are more related to a particular sector.

Moran's Scatterplot also has the important function of highlighting possible limit cases (outliers) so that they can be excluded from the analysis if they represent anomalous cases.

Results

In the first instance, using the (2) the Italian concentration profile of the four production considered sectors (Figs. 1 and 2) has been assessed and the emerged scenario, also confirmed by the analysis of the dendograms (Fig. 3), showed a certain homogeneous distribution for the Manufacturing and Construction sectors, while

a

Fig. 1 Italian productive sectors 'concentration by provinces. Clockwise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017)

b

Fig. 2 Italian productive sectors 'concentration by provinces. Source: Author's elaboration on Eurostat data (2017)

it highlighted strong geographical polarizations of values above the national average for the Industry and ICT sectors. In Appendix 1 the statistical hypotheses test with the contingency scheme that also demonstrates this evidence analytically have been reported, while in Appendix 2 the multivariate correlation which provides evidence of the intensity of correlation between some sectors, is shown.

Fig. 3 Italian productive sectors 'concentration by provinces. Clockwise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017) with Statgraphics

While for the Industry sector it could be noticeable a strong differential along the North South axis with high absolute values in the North, for the second sector, ICT, although still characterized by a very intense concentration in a few nodes in the North, this appears to be relative condition and not absolute one. That is, also in the Center and in the South numerous workers in this sector could be found, but as a proportion the share of those present in the few northern provinces makes all the other provinces below average.

In the southern provinces, the construction sector stood at values above the national average.

From the point of view of the intensity of the concentration of economic activities, some limited provinces stand out for some sectors, Milano and Torino for ICT and Prato, characterized by a long district history in the textile sector, for Industry and Manufacturing.

Based on the scenario at the country level, we move to the provincial scale NUTS 3 considering the five regions of analysis, Lombardia and Piemonte for the North, Toscana for the Centre-Italy and Campania and Puglia for the South.

A first check regards the test of the stationarity of the phenomenon, i.e. the analysis of the time domain of the concentration variation, to avoid that the conducted calculations and the results found in the reference year 2017 were affected by uncertainty with aliasing error. To this end, the trends in the concentration of economic activities in the years 2009–2017 were assessed for the four sectors (Fig. 4). The results show that the phenomenon is stationary except for very few provinces (shown in the figure with a greater thickness than the trend line) and, therefore, these few provinces have been considered outliers that do not affect the conducted analysis.

Fig. 4 Italian productive sectors 'concentration by provinces over time (2009–2017). Clockwise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017)

a

Fig. 5 Intensity distribution of geographical concentration of economic activities Lombardia region. Clockwise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017)

The calculations with the GeoDa software on the spatial effects of the concentration of economic activities report, for each of the four considered sectors, the cartographic distribution of the intensity of the concentration (Figs. 5, 8, 11, 14, 17), Lisa map² (Figs. 6, 9, 12, 15, 18) and Moran diagrams (Figs. 7, 10, 13, 16, 19) respectively for the regions of Lombardia, Piemonte, Toscana, Campania and Puglia respectively.

A first general result that is drawn from the analysis of the results is the right choice of the proxy regions of the Italian distribution, in fact some isomorphisms relating to the concentration of economic activities are detectable for the North and for the South. For the Centre-Italy, only one region was chosen, cause some similarities on regional economic profiles are already known.

In details, as the following.

The Lombardia's production system, particularly flourishing in the mechanical, electronic, metallurgical, textile, chemical and petrochemical, pharmaceutical, food, publishing, footwear and furniture sectors, is still one of the most developed in Italy and Europe, has more than 800,000 businesses. From the firm size statistics,³ it emerges that micro and small enterprises continue to be the backbone of

² Only the maps for which the Montecarlo Method has detected at least one significance per province, are reported.

³ <http://www.asr-lombardia.it>

b

Fig. 6 LISA map of geographical concentration of economic activities Lombardia region. Clockwise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017)

the region's productive fabric, making up more than 99% of Lombard companies. There is considerable sub-regional diversity in the economic activities of businesses in Lombardy. The province of Milano, which alone concentrates more than 40% of companies in the Lombard industry, is home for several multinational and financial companies, health and university institutions and research centres. The provinces of Varese, Como, Lecco, Monza and Brianza, Bergamo all have a strong manufacturing sector, but also a high share of employment services. Lodi and Brescia are characterized by both manufacturing and agriculture, while in the provinces of Sondrio, Cremona, Pavia and Mantua, the agricultural sector prevails.

The companies based in Lombardy mainly belong to 16 industrial specialization districts—local production systems characterized by a high concentration of companies specialized in traditional Made in Italy sectors, but also in those where new technologies and ICT are dominant—and 6 meta-districts—production areas of excellence with strong links with the world of research and innovation.

In Lombardy the spatial autocorrelation effect of the concentration of economic activities shows similar characteristics of the Industry and Manufacturing sectors.

Fig. 7 Moran index of geographical concentration of economic activities Lombardia region. Clockwise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017)

The spatial correlation is present both in positive and negative terms, but the entity is low-moderate as indicated by Moran's analysis.

The history of Piemonte, and Torino in particular, is an important history for Italy, both politically and economically: the proximity to France and the influence of the Savoy family have contributed to giving an energetic boost to the flourishing industry that in the '900 has seen its population increase considerably, mainly due to the arrival of many workers from southern Italy who found employment in the factories. FIAT, "Fabbrica Italiana Automobilisti Torino" has more and more over time fueled the growth of many other complementary industries, such as the chemical and plastic manufacturers of paints and tires, contributing significantly

a

Fig. 8 Intensity distribution of geographical concentration of economic activities Piemonte region. Clockwise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017)

to transforming Torino into a metropolitan city: massive residential neighborhoods are added to the ancient and elegant buildings of the centre, more and more widening the city belt.

b

Fig. 9 LISA map of geographical concentration of economic activities Piemonte region. Industry (SX); and Construction (DX). Author's elaboration on Eurostat data (2017)

C

Fig. 10 Moran index of geographical concentration of economic activities Piemonte region. Industry (SX); and Construction (DX). Source: Author's elaboration on Eurostat data (2017)

Currently the economic importance of Fiat in Piemonte has significantly reduced becoming marginal, production has moved mainly to other Italian regions and abroad and although Turin remains an important administrative system and a strategic decision-making centre, the supply of work decreased, in parallel with

a

Fig. 11 Intensity distribution of geographical concentration of economic activities – Toscana region. Clockwise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017)

b

Fig. 12 LISA map of geographical concentration of economic activities Toscana region. Clockwise Industry, Manufacturing and ICT. Source: Author's elaboration on Eurostat data (2017)

the number of inhabitants, which was however balanced by the new influx of non-EU citizens.

However, chemical and textile factories and electronic production play an important role in the current economy of Piedmont, acting in spatial terms as centres of employment gravity.

In Piemonte, in fact, it could be noticeable the same isomorphism between the Industry and Manufacturing sectors found in Lombardia, but the correlation is always inverse, highlighting a strong industrial concentration in very limited areas.

Toscana region has a notable economic and not only tourist profile, in fact of all the 12 regions included in southern and central Italy only Lazio precedes it as regards income per inhabitant.

The production structure of the Toscana region is homogeneously and organically based on agriculture, industry and tourism and is based on medium—small and medium enterprises and is based on mainly local capital investments.

Numerous factors have contributed to favouring the development of the region, including a vast extension of the hilly area which facilitates the concentration of businesses.

C

Fig. 13 Moran index of geographical concentration of economic activities Toscana region. Clockwise Industry, Manufacturing and ICT. Source: Author's elaboration on Eurostat data (2017)

Northern Tuscany is certainly the richest, most industrialized and populated area, with an income contribution and a wide network of connections and services (road, financial, commercial, etc.) comparable to those of northern Italy.

Southern Toscana region, on the other hand, is characterized by a rather weak industry, which is almost always divided into mono-productive areas, that is, engaged in a single type of production, and with poor links between them.

Toscana region presents a moderate propagation of the concentration of ICT-based activities and the Manufacturing data highlight the particularity of the strength of the historic textile district of Prato.

Campania, the most populous region of Southern Italy, has experienced a varied economic development path, with an industrial past characterized by large companies concentrated mainly in the region capital, Napoli, followed by a total dismantling and development on the one hand of tourism and other regarding tertiary sector, particularly with reference to the ICT.

From the spatial point of view, precisely in relation to the ICT sector, Naples has become a reference centre not only for the region but also from an international point of view. A clear proof is constituted by the dynamics of the suburban

Fig. 14 Intensity distribution of geographical concentration of economic activities Campania region. Clockwise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017)

neighborhood of eastern Naples where large industries followed each another in the last century. The virtuous circle of the redevelopment of this neighborhood, driven by the will of local authorities in partnership with the university strategy of suburbanizing some locations, has triggered, thanks to academic relationships, many settlements with very high added value, such as those of the academies of various multinationals companies (Apple's iOS academy in 2016; Digita from Deloitte and Cisco Academy in 2018) which often earned the place the front pages of national and international newspapers.⁴

But, also at a regional level, this entrepreneurial dynamism, with spatial manifestations inherent the agglomerations of enterprises, has been promoted and favoured by the strategy of the institutions. With RIS3 Campania (Research and Innovation Strategies for Smart Specialization) the Region has, in fact defined the strategy for a

⁴ Some examples: Stephanie Kirchgaessner on the Guardian: Silicon Valley comes to Naples: Apple prepares to open Italian academy. Link: <https://www.theguardian.com/world/2016/oct/05/apple-academy-naples-italy-san-giovanni-tim-cook>.

Manuela Saragosa and Rosamund Jones of BBC: Business Can the city of pizza reinvent itself as a tech capital? Link: <https://www.bbc.com/news/business-45486674>

Simona Brandolini on Corriere del Mezzogiorno: "Cisco punta su Napoli: Ormai è la Disneyland dell'innovazione».

b

Fig. 15 Lisa map of geographical concentration of economic activities Campania region. Clockwise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017)

sustainable and inclusive development of the Campania context, based on the integration of the innovation system with the productive-economic and socio-institutional one. This strategy was based on the choice of concrete policy priorities related to the enhancement and development of production-technological domains concentrated both functionally and both physically in space, candidates to represent the areas of specialization with respect to which to concentrate the resources available in relation to the European programming 2014–2020.

In the last fifteen years Puglia, an area traditionally with a strong agricultural vocation, has brought to completion a complex and articulated process of transformation of its economic and production system with considerable value also from a spatial point of view. Due to the opportunities offered by the last two programming cycles of the resources of the European Community, it has chosen to strengthen its entrepreneurial fabric through the creation of concentrated areas of businesses to be connected both physically and both culturally to the research and innovation system.

C

Fig. 16 Moran index of geographical concentration of economic activities Campania region. Clockwise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017)

To meet this aim, the strategy in Puglia was implemented through the use of the "Integrated logistics area" (ILA), a system that affects a wide territorial area and that includes the triangle of specialized ports Bari (region's capital)-Brindisi-Taranto, with the logistics infrastructures at their service.

Campania and Puglia show similar data on the concentration of ICT activities in the regional capitals, Naples and Bari, presenting industrial concentrations in the inner provinces.

The spatial correlation is, therefore, present in inverse form and also characterized by very relevant intensity as shown by Moran's analysis.

In summary, the test (1) on which the research core was based, is satisfied for both hypotheses. In details, while H_1 is valid for the Industry, Manufacturing and Construction sectors, the H_2 hypothesis is specific referred to the ICT sector, mainly characterized by urban nature, and concentrated in the regional capitals regardless of the geographical area of reference.

Fig. 17 Intensity distribution of geographical concentration of economic activities Puglia region. Clock-wise Industry, Manufacturing, Construction and ICT. Source: Author's elaboration on Eurostat data (2017)

Discussion

The analytical photography of some regions of Italian scenario in terms of concentration of economic activities confirms the persistence and consolidation of some paradigms that have emerged since the 1990s.

Particularly, clearly emerges the very high value of territorial dimension, indeed considerable as a variable of influence in the spatial processes related to the productive economy. The geographical context represents, in fact, a determinant factor both for the competitiveness of the individual company, but above all for the agglomerated form of companies, constituting what some scholars (Barrionuevo et al., 2019) have defined the effect of the territory.

In the North, after the new challenges of the 1980s, during which there was significant pressure on the system of small and medium-sized enterprises to approach a global dimension of the economy and to undertake the development of international networks abandoning the local area, it was celebrated in the subsequent years of the 90 s the value of the local territory for its great ability to achieve positive growth indicators based on industrial agglomerations (Becattini, 1990a, 1990b; Becattini et al., 2009).

Several authors study and note this result. For example, Fenoaltea (2007) identifies the forces driving the economic growth of the regions in the 'industrial triangle' (the northwestern regions of Lombardia, Piemonte and Liguria) as natural

Fig. 18 Lisa map of geographical concentration of economic activities Puglia region. Clockwise Industry, Manufacturing and Construction. Source: Author's elaboration on Eurostat data (2017)

resources—water and hydroelectric energy or 'white coal'—during the first industrial revolution (c.1830–1880) and human capital, which came to predominate during the second industrial revolution (1880–1915) (Fenoaltea, 2007). Cainelli et al. (2016) find that the effect of localization externalities is stronger than the effect of diversification externalities on Italian manufacturing firms.

The scenario therefore shows a South which, although very active and dynamic on the digital theme as highlighted by the data on ICT start-up trends, compared to the Northern locomotive can and must further advance. As for the individual tech components that guide the digital transformation of Italian companies, the most growing concern virtual and augmented reality (up 160.5%), wearable devices (+116.2%), intelligence artificial (+39.1%), the public cloud (that is, simplifying a lot, cloud services on demand and at low or very low cost, increasingly used also by companies as well as by private individuals, +26.1%), the IoT (+24%) and solutions for data analytics (+7.6%). It is important to mixture the issues of the sector with the results of the spatial approach since the ICT sector was rooted in the metropolitan and urban areas for all the regions analyzed, so the dynamics of the sector must concern urban planners and actors of the institutions for the related urban policies.

The correlation between the sectors (in Appendix 3 to 7) also plays an important role as it can induce spatial correlations in the medium term with consequences on new

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Fig. 19 Moran index of geographical concentration of economic activities Puglia region. Clockwise Industry, Manufacturing and Construction. Source: Author's elaboration on Eurostat data (2017)

urban configurations with increasingly variable geometries and effects on transport and territorial services to be provided.

For example, a criticality linked to Campania concerns the Construction sector which continues to offer a significant contribution at the country level, representing 8% of the Italian GDP. Furthermore, by virtue of its long and complex supply chain, it connects construction to over 90% of the economic sectors. However, in Campania this spatial osmosis is still negative (Appendix 6). Whereas a reason can be attributed to the different need for urban spaces for the various activities, it is necessary to consider the need and opportunity to reach strategies for the enucleation of general headquarters from the industrial and operational headquarters, aimed at finding settlement factors linked to the geographical proximity between different companies as well as than in the same sector.

Conclusions

Concentration of labour market generate some form of agglomeration externalities, be it knowledge spillovers or thick labour markets itself, which make territories more productive and more prone to economic growth.

Policymakers in developed and developing countries promote the clustering of firms (Helmers, 2017). In the EU, the European Commission has even elevated the promotion of clusters to one of its nine strategic priorities for successfully promoting innovation within the Lisbon Agenda (EU Commission, 2013).

In the frame of evident positive externalities linked to agglomerative economies, in this contribution an analysis has been proposed referring to the Italian case investigating some regions dynamics. The analysis has examined both propagation models related to geographical continuity in order to verify the possible presence of a spatial correlation, and both isomorphisms, between geographically not proximate areas, arising by the value of a specific sector.

The results showed that the Italian scenario is characterized by distributions of concentration of different economic activities in relation to the various production sectors, with particular polarizations in the North with the exception of the construction sector.

Furthermore, the analysis in a spatial approach has shown an existence of specific autocorrelation phenomena according to the different geographical areas and instead a common transversal characteristic that concerns the particular ICT sector.

The evidence found on the one hand enriches the scientific debate by photographing analytically the trend production paradigms on the Italian territory faced in a spatial perspective, and on the other hand they suggest useful indications for urban planning and for possible osmosis actions between urban geography and business geography to be taken in count by local actors and urban planners.

Appendix 1 Tests of Independence

Test	Statistic	Df	P-Value
Chi-Squared	19,633	123	1,0000

This table shows the results of a hypothesis test run to determine whether or not to reject the idea that the row and column classifications are independent. Since the P-value is greater than or equal to 0,05, we cannot reject the hypothesis that rows and columns are independent at the 95,0% confidence level.

Appendix 2 Correlation matrix—Italy. Source: Author's elaboration on Eurostat data (2017)

	Industry	Manufacturing	Construction	ICT)
Industry	1			
Manufacturing	0,998,629,032	1		
Construction	-0,100,018,093	-0,109,080,719	1	
ICT	-0,021,482,625	-0,013,440,773	-0,491,203,534	1

Appendix 3 Correlation matrix—Lombardia. Source: Author's elaboration on Eurostat data (2017)

	Industry	Manufacturing	Construction	ICT)
Industry	1			
Manufacturing	0,994,827,571	1		
Construction	-0,172,123,686	-0,181,514,061	1	
ICT	-0,21,568,398	-0,211,380,211	-0,756,907,657	1

Appendix 4 Correlation matrix—Piemonte. Source: Author's elaboration on Eurostat data (2017)

	Industry	Manufacturing	Construction	ICT)
Industry	1			
Manufacturing	0,999,308,918	1		
Construction	0,301,048,542	0,284,035,997	1	
ICT	-0,614,904,893	-0,604,129,044	-0,512,803,316	1

Appendix 5 Correlation matrix—Toscana. Source: Author's elaboration on Eurostat data (2017)

	Industry	Manufacturing	Construction	ICT)
Industry	1			
Manufacturing	1			
Construction	0,99,749,709	1		
ICT	-0,225,385,963	-0,242,217,848	1	

Appendix 6 Correlation matrix—Campania. Source: Author's elaboration on Eurostat data (2017)

	Industry	Manufacturing	Construction	ICT)
Industry	1			
Manufacturing	0,997,656,587	1		
Construction	0,112,111,688	0,156,394,873	1	
ICT	-0,095,626,465	-0,125,995,469	-0,830,424,165	1

Appendix 7 Correlation matrix—Puglia. Source: Author's elaboration on Eurostat data (2017)

	Industry	Manufacturing	Construction	ICT)
Industry	1			
Manufacturing	0,997,679,843	1		

	Industry	Manufacturing	Construction	ICT)
Construction	-0,772,100,247	-0,752,659,083	1	
ICT	0,227,344,097	0,231,832,627	-0,147,758,143	1

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