

The reconfiguration of traditional manufacturing areas affected by servitization processes: a perspective from Italy

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Abstract

The contemporary reconfiguration of global relations and market tendencies has brought challenges to the economic structure of local manufacturing systems based on specialized small and medium sized firms. Reactions and changes are taking on various forms. An increasingly important role is played by the synergies between service activities and manufacturing industries, delineating territorial servitization processes. This paper aims at exploring signs of the servitization processes that affect the structural configuration of manufacturing areas, such as the industrial districts (IDs). Employing Italy as a reference case study, a primary objective of the analysis is the identification of localisation patterns of service activities and their association with manufacturing activities. Moreover, taking advantage from a multivariate analysis, the paper explores differentials in manufacturing firms' productivity levels according to such patterns of localization. The results show a strong relation between the capabilities of such areas to follow virtuous development paths and the localization of specific manufacturing related services.

Keywords: servitization processes; KIS; labour market areas; new manufacturing

Subject classification codes: O14, R11, R12

1. Introduction

The recent radical changes related to the main features of the global competition are a big challenge for small and medium sized enterprises (SMEs) specialised in traditional manufacturing sectors. Specifically, the historical industrial areas, where the specialization in manufacturing activities has a long tradition, suffered both the increasing unpredictability of consumer demand (Lester and Piore, 2009) and the introduction of new digital-based technologies in manufacturing activities and logistics. They significantly disrupt the existing industry supply chains and business models (see

Kagermann et al., 2013; Hodson, 2008; Bettiol and Micelli, 2014). To meet such challenges, in many areas of the industrialised countries, some more pro-active firms have started to combine new knowledge resources both to introduce in the productive processes the emerging technologies and to take advantage of opportunities coming from the changing demand features.

Many scholars are involved in understanding strong and weak points of the structural features of local SMEs systems in order to promote renewal models that can be resilient to such radical challenges (see Hassink, 2005; Pike et al., 2010; Martin, 2011; Boschma, 2015). A crucial issue to investigate becomes the exploration of specific phenomena related to the growing weight of the service activities in territories specialized in manufacturing industries (see Vendrell-Herrero & Wilson, 2016; Lafuente et al., 2016). This structural reconfiguration, even if it not completely new, is still difficult to be clearly understood because of the variety of its forms (Kowalkowski et al., 2015), and its increasing complexification.

In a first phase, in the 1990s, the role of services in manufacturing areas was strongly related to up-streams or down-stream functions with respect to locally shrinking manufacturing phases (Gadiesh and Gilbert, 1998). Today, manufacturing goods are becoming more and more service-based goods (Porter and Heppelmann, 2014), and these renewed manufacturing goods require a structural reconfiguration of the traditional industrial areas, promoting territorial servitization processes (Lafuente et al., 2016), and supporting an increase of the value added of industrial goods (Vendrell-Herrero et al., 2017). This interplay shapes the patterns of localization of knowledge intensive services (KISs) defined by various trigger features (see Muller & Zenker, 2001; Strambach, 2008; Muller and Doloreux, 2007).

The present paper aims at exploring such servitization processes, adopting Italy as reference case study. Section 2 explores the role of the so-called servitization processes in place-based industrial organisations, and suggests a critical assessment of some recent contributions on this topic. After a brief description of data and methodologies, described in Section 3., Section 4 presents a descriptive analysis of the localisation patterns of new service activities and their association with manufacturing activities. Section 5 goes deeper on such patterns, and proposes an empirical explorative analysis that allows to identify five types of Italian manufacturing LMAs in the year 2011 by illustrating a variety of interplays between manufacturing and services activities. Section 6 summarises the main results.

2. Literature review

The interplay between manufacturing and services activities is raising a growing attention in international debates. The increasing volatility and personalization of consumer demand in many markets, the opportunities and threats coming from new industrial countries with the international fragmentation of production (Lester & Piore, 2009; Humphrey & Schmitz, 2002), and the disruptive rate of introduction of new technologies in fields as ICT, AI, transport, materials, etc. (Duyin & Geissler, 2016), have enlarged the importance of synergies between specialized manufacturing industries and service activities. This has brought about not only an increasing role of (and value reaped by) tertiary phases such as logistics, marketing, design and R&D (smile curve), but also an increasing service content of many manufactured goods (Cusumano et al. 2015).

In a recent work, Porter & Heppelmann (2014) explored the principal features of the new manufacturing products. Following the authors, the new generation of manufacturing goods are defined not only by physical components. Other two elements

have often a crucial importance nowadays: the “smart” and the “connectivity” components¹. Therefore, the implementation of new knowledge resources may increase the value added of goods in vast sets of markets by meeting the demand of personalized features, high quality, and continuous exchange of information between customers and producers (Cui & Wu, 2016).

Because of such phenomena, the localisation of new service activities in old industrial areas is nowadays reinforcing more and more. However, localization patterns and virtuous synergies in manufacturing areas are not yet clearly delineated. First, the outsourcing in value-added services raises appropriation problems (Cusmano et al., 2010), because of the intangible nature of these activities, which can be managed in various ways. Place-specific solutions in some manufacturing areas allow e servitization processes to a faster development: ‘KIBS are confronted with the specific problems of their clients and thus they require most often direct contacts with them in order to conceive solutions by recombining existing knowledge and complementing it with new inputs if necessary. A high share of these interactions, especially in the starting phase of a consulting activity, is characterized by a strong tacit content, requiring personal contacts. Proximity (geographical, social, cultural, etc.) is hence helpful to manage these phases’ (Muller and Zenker, 2001, 1506).

Moreover, there are the effects related to the various configurations that may be assumed by the service activities, as suggested by Cusumano et al. (2015): “smoothing services”, which do not alter the product functionality (e.g. financial and insurance

¹ Specifically, ‘smart components’ amplify the capabilities and value of the physical components (i.e. sensors, data storage, controls, and software); while ‘connectivity’ components amplify the capabilities and value of the smart components and enables some of them to exist outside the physical product itself components (i.e. ports, antennae, and protocols).

options, implementation issues, or basic training); “adapting services”, which significantly expand the product functionality and where knowledge required to provide the service is difficult to separate from detailed knowledge of the product itself (e.g. major customizations, training or consulting for new uses of the same product, or bundles of tailored products and services); “substituting services”, which replace the purchase of a product (e.g. data processing services sold in lieu of mainframes, Software as a Service SaaS), or where consumer may purchase the use of goods instead of buying the product directly. These various types of services enter in different way the economic structure of manufacturing areas, promoting the competitiveness of the local industry variously. In this sense, the increasing localisation of service activities in manufacturing areas may ‘contribute to local competitiveness and employment creation through the virtuous cycle generated when a resilient local manufacturing base attracts or stimulates the creation of complementary KIBS businesses, which in turn facilitates the creation of new manufacturers.’ (Lafuente et al., 7, 2016).

In the territorial servitization processes (Muller and Zenker, 2001), knowledge intensive services (KISs) are developing into a knowledge-processing and knowledge-producing industry (Strambach, 2008). In this sense, KIS rooted on knowledge, innovation and spatial proximity dimensions (Muller and Doloreux, 2007), are characterised by place-based processes of agglomeration that affect in different ways the local manufacturing specialisations.

These phenomena impact on the production processes in various forms, and SMEs specialized in traditional manufacturing sectors, and their territories, find here new opportunities (Sforzi, 1994), but meet difficult challenges. The capability of small sized firms to respond by adjusting internal resources is usually limited. Traditional small firms specialized in local manufacturing activities usually do not develop internally a

large set of complementary knowledge resources (see Becattini et al., 2009). Here, the systemic dimension assumes a crucial role and the force bringing to localization of specific services activities into a specific area is clearer.

In what follows, we propose an empirical analysis that tries to identify various shapes that the servitization process takes on different types of local systems in contemporary Italy.

3. Objective, data and methodology

Within the general themes just recalled, the objective of our analysis is the detection of localisation patterns of new service activities and their association with manufacturing activities. In order to achieve such goal, we apply a two steps analysis. In the first step, we detect servitization patterns by means of a common statistical measure that assesses both the geographical concentration of industries and the industrial specialization of local systems. In the second one, economic variables and socio-demographic variables are combined to verify the presence of synergies between specialised manufacturing industries and service activities at local level. This second step is explorative and carried out through a multivariate analysis.

The unit of analysis adopted to identify the variety of such territorial patterns is the Local Market Areas (LMAs), which are sets of contiguous municipalities that show a high degree of self-containment of the commuting inflows and outflows between the municipalities of the same set². In order to explore the topics recalled in the previous

² LMAs are identified by Istat (2014) on the basis on 2011 Population Census data with a new methodology of identification, which is a variation with respect that developed in 2001 for the identification of local labour systems (Istat 2005). Although it is still based on Travel-To-Work-Areas (TTWA). Istat (2015a) provides a full explanation on differences between the two

section, we used the Business Census employment data related to the year 2011. Moreover, in this work, Eurostat aggregations of services based on NACE Rev. 2 is adopted. This classification defines economic sectors as *knowledge-intensive services* (KIS), such as air transport, publishing activities, computer programming, information service activities, financial and insurance activities, scientific research and development, and so on, or as *less knowledge-intensive services* (LKIS) (i.e. wholesale and retail trade; land transport and transport via pipelines; postal and courier activities; real estate activities; rental and leasing activities; office support and other business support activities, and so on) at the NACE 2-digit level (Eurostat, 2016).

4. Metrics, data and descriptive results

In order to detect servitization patterns, we use a common statistical measure that assesses both geographical concentration of industries and industrial specialization of LMAs, i.e. the location quotient (LQ). It is given by the following formula:

$$LQ_{i,j} = (Emp_{i,j} / Emp_{.j}) / (Emp_{i.} / Emp_{..}) \quad (1)$$

where i is the type of service activity and j is the LMA. Therefore, $Emp_{i,j}$ are persons employed in industry i in LMA j , $Emp_{.j}$ is the total number of persons employed in LMA j , $Emp_{i.}$ is the total number of persons employed in service activity i and $Emp_{..}$ is the national total number of employed persons. A LQ higher than 1.0 will occur if an industry makes a higher share of jobs in a specific area than industry does nationally. It is identified usually as a critical value.

methodologies. Business Census data related to the years 2001 and 2011 at the establishment level have been applied to new LMAs to identify the new IDs (Istat, 2015b and c).

LQ is applied to Business Census data for the year 2011. Employment data at the establishment level of enterprises, public institutions and not for profit institutions (i.e. all active economic units) is used to derive localization patterns of service activities. As recalled above, the Eurostat aggregation of services based on NACE Rev. 2 is adopted. This classification defines economic sectors as *knowledge-intensive services* (KIS) or as *less knowledge-intensive services* (LKIS) on the basis divisions of NACE 2-digit level (Eurostat, 2016). Our statistical universe is more precisely classified into the following categories of KIS: Knowledge intensive market services, High-tech knowledge intensive services, Knowledge intensive financial services, Other knowledge intensive services. Concerning LKIS, the classification distinguishes between: Less knowledge intensive market services; Other less knowledge intensive services. Finally, the category of Non-service industries includes the remaining activities not classified as KIS or LKIS (i.e. industrial activities, construction, agriculture, etc.).

The majority of persons employed is concentrated in Less knowledge intensive market services (33.5%) and non-service economic activities as manufacturing (29.3%). Similar values apply for establishments (i.e. plants and offices).

[INSERT TABLE 1 ABOUT HERE]

LQ values are calculated on KIS and LKIS categories over Italian LMAs. Considering the highest LQ among the categories with values higher than 1, we identify the specialization service sector by LMA. Accordingly, over one third of Italian LMAs are featured in knowledge intensive service activities (as Table 2 shows, the share of the Total LMAs specialised in KIS is around 36%). Around 35% of LMAs have the highest

specialisation in non-service activities, and most of them corresponds of course to Manufacturing LMAs. Moreover, the Italian LMAs are mainly specialized in “Other knowledge intensive services” (i.e. publishing activities; veterinary activities, public administration and defence, and education), in “Less knowledge-intensive services” (i.e. wholesale and retail trade, repair of motor vehicles and motorcycles, land transport and transport via pipelines, office support, and other business support activities), and in “Other less knowledge intensive services” (i.e. postal and courier activities, activities of membership organisation, and undifferentiated goods- and services-producing activities of private households for own). While “Knowledge intensive market services” (i.e. water transport, air transport, legal and accounting activities, professional, scientific and technical activities, and employment activities) feature the lowest number of LMAs. Considering how such specializations are related to LMAs identified as Manufacturing and Not Manufacturing (Table 2), the fact that in few cases of Manufacturing LMAs the highest specialisation concerns financial and intensive market services, may suggest that the so-called “smoothing services” have not a dominant role in manufacturing areas, and sophisticated service-based goods may increase in importance. Actually, the higher share of Manufacturing LMAs specialized in ‘Other less knowledge intensive services’ and the low number of LMAs specialised in “High tech knowledge intensive services” confirm the image of a slow transition, with a limited role played by ‘substituting services’, such as data processing.

[INSERT TABLE 2 ABOUT HERE]

Looking at the regional distribution of such patterns of localization in Italy, some territorial differences seem to confirm the place-based nature of the processes of KIS agglomeration. “Knowledge intensive market services” and “High tech knowledge intensive services” do not concentrate in any region (they equally distribute across regions, with no specific prevalence in Northern nor in Southern or Central regions). By contrast, LMAs featured by “Knowledge intensive financial services” are mainly localized in Lombardy and Tuscany, “Other knowledge intensive services” are mainly localized in Southern Italy (specifically Sardinia and Sicily, probably because of the relative weight of public employment), “Less knowledge intensive market services” LMAs are mainly localized in Trentino Alto Adige and Campania, while Tuscany, Puglia and Calabria show LMAs featured by “Other less knowledge intensive services”.

Furthermore, among 141 Italian IDs identified by ISTAT (2015b and c), which are by definition specialized in manufacturing activities, only 22 are specialized in KIS or LKIS as shown in Table 3. The remaining set falls in the category of “Non-service activities”, showing a low presence of cases of high specialization in service activities. Specifically, Tuscany and Veneto have the highest number of IDs specialized either in KIS or LKIS. This could identify an advanced territorial servitization process led by the historical manufacturing tradition of these two Italian regions. Particularly, IDs specialized in textile and clothing, mechanical and food and beverage industries are also featured by KIS (e.g. Padua is specialised in “High tech knowledge intensive services”) or LKIS, with specific evidence of association of mechanical IDs of Veneto and KIS.

[INSERT TABLE 3 ABOUT HERE]

In a multi-specialization perspective, it is necessary to check out if a LMA is characterized by more than one specialization either in KIS or LKIS. In this case, we look for further association evidences considering the three highest values of LQ by LMA³. This multi-specialization perspective allows to identify a certain number of specializations in “Knowledge intensive financial services” and in “Knowledge intensive market services” distributed in a quite large number of IDs (105 against the only 22 IDs with the highest specialized in KIS and LKIS). Here, some interesting associations emerge between the IDs manufacturing sector of main specialization and KIS and LKIS. Again, textile and clothing, mechanicals, household goods, food, leather and shoes are industrial specializations of IDs that mostly associate with KIS.

[INSERT TABLE 4 ABOUT HERE]

5. A multivariate analysis on manufacturing LMAs

A set of multiple data sources concerning several economic aspects is available at the LMA level (Istat 2015d) as the productivity rate (measured in terms of value added per employee), labour cost per employee, foreign trade balance (a variable which assesses the possible prevalence of import or export), and the employment rate of the LMA. In

³ In Table 2 the specialization is identified only considering the LQ for KIS and LKIS. Here, we observe the three higher values of each LMA.

addition, socio-demographic variables are available, such as the share of foreigners over residents, the active population turn-over index that is the percentage ratio between 60-64 and 15-19 years, and the width size of the LMA in terms of municipalities and resident population. Finally, we also introduced proxies for industrial organization typologies derived by the intermediate results obtained by the application of the IDs algorithm⁴ to 2011 Business Census data. Manufacturing LMAs are therefore divided into: Large Enterprises (LEs) based LMAs with high prevalence of specialized employment in SMEs⁵ (“LEs-based LMAs district”); “other LEs-based LMAs”; industrial districts “IDs”; “other SMEs-based LMAs”.

We take all such indicators, together with the LQs, and apply to them an explorative analysis carried out through a multivariate technique at the LMA level, in order to detect localization patterns of KIS and socio-economic variables. Particularly, the analysis focuses on the sub-population of manufacturing LMAs to verify the presence of synergies between specialised manufacturing industries and service activities. From the methodological point of view, the explorative analysis makes use of both a combined technique based on a Multiple Correspondence Analysis (MCA), which enables us to detect significant statistical associations among selected variables, and a Cluster analysis to highlight clusters of LMAs featured by the same characteristics.

Our variables are calculated at the LMA level, and particularly involve LQ values of KIS, in addition to the set of economic and socio-demographic variables

⁴ Intermediate results have been published in Istat 2015b and can be downloaded at the following link: <http://www.istat.it/it/archivio/150320>

⁵ In 2011, out of 61 manufacturing LMAs featured by the presence of large enterprises (LEs), 28 have been found with a specific feature: more than 50% of employment of the specialization industry is absorbed in SMEs.

specified above. Overall, all variables are expressed in terms of quintiles, therefore our dataset is based on nominal categorical data. A MCA is therefore used to simultaneously analyse the patterns of relationships of multiple categorical variables and detect the underlying structured patterns of data⁶. These patterns are represented graphically in the Figure 1, which show proximities between points in a two-dimensional map⁷. Particularly, row points and column points represent modalities of variables, and their closeness among each other represents association patterns obtained from the data (see Abdi and Valentin, 2007, for full methodological details).

Oppositions between rows and columns are maximized in order to uncover the underlying dimensions best able to describe the data. In terms of interpretation of the axes, the first two axes are the most important dimensions in terms of the amount of variance accounted for. As it is shown in the graph (Figure 1), the *x*-axis represents, from the right hand to the left, the decrease in the employment rate, correlated to the decreasing share of foreigners over total population, the decreasing export propensity and the decreasing size of LMAs. It also shows the contraposition between LMAs specialized in Knowledge intensive market services, High tech knowledge intensive services and Knowledge intensive financial services (on the left-hand side) and Other knowledge intensive services (on the right hand side). The *y*-axis upwards from bottom shows the increase in economic performance, and it is represented by the increasing labour costs and increasing productivity rates (value added by persons employed).

⁶ The Correspondence Analysis technique is used to analyse the contingency tables formed by the set of analysed categorical variables and provides factors which represent the association among variables categories.

⁷ The map has two dimensions as we select the first two factors obtained in the MCA as they represent 80% of variability of the phenomenon.

It is possible to detect several associations between points-characters. Import propensity of a LMA is associated to its small dimension; low levels of productivity to LMA specialization in other KIS; very low levels of employment to low share of foreigners; the industrial structure based on IDs to a high share of foreigners on total resident population, medium export propensity, medium level of productivity and labour costs, high active population turn-over, the multiple specialization in Knowledge intensive financial services other KIS. Furthermore, the presence of large enterprises (LEs-based LMAs with specialized SMEs) is associated to good economic performance, good employment level, the specialization in Knowledge intensive financial services, High tech service and Market services, and a large dimension of the LMA.

[INSERT FIGURE 1 ABOUT HERE]

Factors obtained by the MCA are utilized in the second part of the analysis. In fact, the information on factors obtained by the MCA is applied to a Cluster analysis of the set of manufacturing LMAs to identify homogenous groups of LMAs on the basis of factors detected in the data. Ward linkage clustering method and Euclidean distances metrics have been used in order to reduce the variance within groups and increase the in-between variance. In terms of metrics, Euclidean distance among observations (LMAs)

has been chosen since it is suitable for quantitative variables⁸. Results show specific localization and specialization patterns which can be summarized in terms of five types of Italian manufacturing LMAs in the year 2011:

- **Performing LMAs** – The overall most performing group (63 LMAs) includes both IDs (33), one other LMAs based on SMEs, and LE-based LMAs (29). This set has the highest aggregate average labour productivity rate, labour cost, share of foreigners, employment rate and export orientation. Foreigners share is high while the active population turn-over index is in line with national average. On average, LMAs of this group are large in terms of population and municipalities. In terms of knowledge intensive service specialization, the prevailing ones are Knowledge intensive financial services (6 LMAs) and Knowledge intensive market services (4 LMAs), which overall mainly concentrate in this cluster. A group of 4 LMAs are specialized in both Know The set also includes one LMA specialized in Knowledge intensive high tech services. IDs of this group have an employment rate higher than the LEs-based LMAs, higher foreigner ratio but lower active population turn-over index. Prevailing specialization is mechanicals (15 IDs), followed by textile and clothing (4 IDs), and households and chemicals (3 IDs each). Many LMAs of this group are localized in the Lombardy region.
- **Stand-alone LMAs** - The smallest group (4 LMAs) is composed by large enterprises-based LMAs (Sassuolo, Agordo, Augusta) and a SMEs based LMA (Garessio) with the highest productivity rate and labour cost. They are import oriented, and perform a low employment rate.

⁸ In order to choose the most appropriate number of clusters, pseudo-F Calinski and Harabasz (1974) and Duda and Hart index have also been calculated and considered in addition to the dendrogram.

- **Open IDs** - A group of 78 LMAs, mainly district types (59 IDs) with prevailing specialization in mechanicals (17 IDs), households (13 IDs), textile and clothing (12 IDs), and leather (7 IDs), shows an economic performance in line with national average, an high employment rate, and the highest foreigners ratio over total population. They are export oriented. In terms of services, few of these LMAs are specialized in Knowledge intensive financial services (6), Knowledge intensive market services (3) and Knowledge Intensive High tech services (1). LMAs of this group are mainly localized in Veneto (16), Lombardia (14), Toscana and Marche (10 IDs each). It is interesting to note that half of LMAs belonging to this group have specialization in low knowledge intensive market services, while many of them is specialized in other low knowledge intensive services.
- **Worst LMAs** – A group of 51 LMAs, with mixed industrial structure but more than half composed by IDs (33), is characterized by low levels of productivity and labour cost, employment rate below national average, low share of foreigners over total population, but the highest active population turn-over index. Export propensity in line with national average. LMAs of this group are specialized in Other knowledge intensive services (15), where public employment has a large presence. The main sector specialization of IDs is textile and clothing (9 IDs) followed by households (7), leather and mechanicals (6 each).
- **Southern Worst LMAs** - The final group is composed of 24 LMAs mainly specialized in Other knowledge intensive services (13). They perform the worst performance in all the variables analysed among all groups, and geographically are concentrated in the Southern areas of Italy. In terms of industrial

organization, 16 of such LMAs are IDs, while two are other LMAs SMEs based, and 6 are LEs-based LMAs. The main sectors of specialization are textile and clothing (7), and food processing (5).

The geographical distribution is illustrated in Figure 2 below. Evidence got from the explorative analysis above suggests a non-surprising association between high-performing manufacturing LMAs, both IDs and large-enterprises based LMAs, and specific categories of KIS: Knowledge intensive market services and Knowledge intensive financial services. Also interesting is the presence of a large number of open IDs, with average economic performances, scoring specializations in low knowledge intensive market services and in other low knowledge intensive services, which include many traditional service functions for manufacturing activities. The first cases perhaps fit more precisely with the idea of a progress in territorial servitization processes related to strong manufacturing specializations. However, also the second types of cases, though consistent with more traditional functions, point to an increasing density of relations between services and manufacture in certain types of manufacturing local systems.

[INSERT FIGURE 2 ABOUT HERE]

6. Conclusions

The concentration of productivity progress within specific manufacturing phases and the de-localization of standardised manufacture to low cost regions, within global value chains, have challenged the traditional specialization of many old manufacturing areas in advanced countries (Baldwin, 2013). These phenomena are leading to both the decline of many manufacturing areas and their transition along servitization processes, where such systems may depend on the functions of large metropolitan areas (Derudder et al., 2011). However, some old manufacturing areas may be able to react, at least for a while, combining the manufacturing tradition to new service specializations. In this case, the value of local productions increases, opening to new paths of local development and resorting sometimes to new interpretations of authenticity and cultural heritage (Bellandi and Santini, 2017). Processes of local production differentiation, which are typical of industrial districts (Becattini et al, 2009), increasingly concern the specialization of service functions once performed within manufacturing companies (Sforzi, 1994), and expand to other types of manufacturing areas. More crucial and difficult to absorb and even to detect is however the development of servitized products. Such products ask for a territorial embedding of specific and specialized knowledge intensive services (KIS), combining within contexts favourable also to more traditional processes of production differentiation. An interesting field for developing and controlling hypotheses, but also for measuring empirical difficulties and solutions related to the analysis of territorial servitization processes, is Italy. This country is still the second largest manufacturing economy in Europe, with a widespread variety of industrial forms.

The analysis illustrated in this paper, specifically the multivariate methodology applied to Italian manufacturing LMAs in 2011, paves the way to the test of hypotheses

of spatial dependence of LMAs, which are featured by the presence of KIS (and LKIS) and conditioned to their industrial structure. This will be object also of future research.

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Appendix

Knowledge based services		NACE Rev. 2 codes – 2-digit level
Knowledge intensive services (KIS)	Knowledge intensive market services (excluding high-tech and financial services)	50 to 51 Water transport; Air transport; 69 to 71 Legal and accounting activities; Activities of head offices, management consultancy activities; 73 to 74 Architectural and engineering activities, technical testing and analysis; 78 Advertising and market research; Other professional, scientific and technical activities; 80 Employment activities; Security and investigation activities;
	High-tech Knowledge intensive services	59 to 63 Motion picture, video and television programme production, sound recording and music publish activities; Programming and broadcasting activities; Telecommunications; computer programming, consultancy and related activities; Information service activities; 72 Scientific research and development;
	Knowledge intensive financial services	64 to 66 Financial and insurance activities (section K).
	Other knowledge intensive services	58 Publishing activities; 75 Veterinary activities; 84 to 93 Public administration and defence, compulsory social security (section O); Education (section P), Human health and social work activities (section Q); Arts, entertainment and recreation (section R).
Less knowledge intensive services (LKIS)	Less knowledge intensive market services	45 to 47 Wholesale and retail trade; Repair of motor vehicles and motorcycles (section G); 49 Land transport and transport via pipelines; 52 Warehousing and support activities for transportation; 55 to 56 Accommodation and food service activities (section I); 68 Real estate activities (section L); 77 Rental and leasing activities; 79 Travel agency, tour operator reservation service and related activities; 81 Services to buildings and landscape activities; 82 Office administrative, office support and other business support activities; 95 Repair of computers and personal and household goods;
	Other less Knowledge intensive services	53 Postal and courier activities; 94 Activities of membership organisation; 96 Other personal service activities; 97 to 99 Activities of households as employers of domestic personnel; Undifferentiated goods- and services-producing activities of private households for own use (section T); Activities of extraterritorial organisations and bodies (section U).