Localisation Patterns of Knowledge-Creating Services in Paris Metropolitan Region

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Abstract

Based upon an hermeneutic approach, which explicitly takes into account the role space plays within the knowledge economy, the article is aimed at providing the geography of knowledge-based activities in the Paris metropolitan area and at depicting the shape of their external economies and agglomeration forces. The added value supplied by this paper consists in: a) the spatial extent covered (the Paris Metropolitan Region), in order to consider the role that the pivot city and the surrounding towns/cities jointly play within the urban regional structure; and b) the improved explicative capability of a hermeneutic approach descending from its cross-fertilisation with the "knowledge source-based approach", which distinguishes between analytic, synthetic and symbolic services according to their prevailing source of knowledge. The proposed methodology makes it possible to depict the spatial relationships both within KCS and between KCS and manufacturing activities in a more appropriate manner.

1 Introduction

The aim of this chapter is to identify the geography of knowledge-based activities in the Paris Metropolitan Region (PMR) according to the hermeneutic approach which characterises this collective book. The localization of economic activities is a crucial issue in regional studies, in that it supplies a valid proxy to represent the working mechanisms of the market forces, the outcomes of previously implemented territorial policies, as well as helpful information for shaping future policies: while

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providing evidence of regional potential, in fact, it helps to identify possible lock-in conditions requiring targeted actions.

It is by now widely accepted, both in the academic and collective agents fields, that economic performances of countries, regions and cities are increasingly dependent on their capability to acquire knowledge and foster innovation and creativity. Acquiring knowledge allows firms and organizations to face global competition through innovation in products and processes while triggering a cumulative process: the more their knowledge base is developed at time "*t*", the greater their capability to absorb and handle new knowledge from various sources, local or external, so that their knowledge base at time "*t*+1" is greatly enhanced as is their capability to re-absorb more knowledge.

Most metropolitan regions and areas, which are simultaneously embedded at the local/regional level and connected to the global network, are generally considered the nodes where the majority of information fluxes converge to and information is processed (Lane, Pumain, van der Leeuw, & West, 2009). Thanks to absorptive and creative aptitudes, new information is transformed into learning, eventually leading to innovation. Regional science scholars have long investigated the reasons why cities attract economic activities in general and knowledge-based ones in particular. As Musters and Gritsai (2013) well summarise from a rich literature, urban areas usually succeed in providing standard location conditions (agglomeration economies, cluster opportunities, and urban externalities), soft conditions (peculiar environmental features which enhance urban attractiveness) and well established relational networks between individuals, firms and organization. In addition, when sharing the same territorial base, economic activities can take advantage from the so-called Jacob's externalities, in that economic heterogeneity facilitates the raising of network externalities (Capello, 2000) between different clusters based on different locations but situated within the same urban or metropolitan area. According to Boschma and Iammarino (2007), this is particularly true for related variety (advantages coming from the co-location of related industrial sectors in terms of shared or complementary competences), which is more likely supposed to induce effective interactive learning and innovation, while unrelated variety (advantages descending from the co-location of sectors that do not share complementary competences) mostly affect the risk spreading. What is however crucial, and makes the difference between the city and a simple urban agglomeration, is that cities can also count on path-dependent advantages springing from the political, economic and societal role they play within their respective national systems (Amin & Thrift, 1992; Camagni, 2012; Chinitz, 1961; Hall, 2004; Simmie, 2005).

It is also worth noting that economic geographers are increasingly focusing on the location patterns of knowledge-based activities, stressing the embeddedness of the action of local firms, as well as on the relational and place-dependent nature of their knowledge sources. As suggested by Phelps and Ozawa (2003), for instance, the content and role of external economies and agglomeration forces depend on place and time which they are referred to. Unlike Industrial Districts, for example, which obey to a relatively easy spatial rationale, are spatially bounded and belong to a certain industrial sector, an urban or metropolitan area is a much more complex

reality (Camagni, 1999). Its components, indeed, are generally characterised by different reference industries as well as different location rationales, which could be inspired by concentration (Storper & Scott, 2009), polycentricism (Meijers, 2005), dispersion (Parr, 2002), or even scatteration (Coffey & Shearmur, 2002).

The analysis of the regional knowledge-base has been further enriched by considering the nature of the knowledge sources. According to the "*knowledge base*" concept introduced by Asheim and Gertler (2005), firms and organization differently source knowledge in that innovation modes depending on the type of the involved economic activities. If scientific activities mainly rely on *analytic knowledge*, economic activities grounding on customer-supplier interactions more likely require *synthetic knowledge* while cultural production is more related to *symbolic knowledge*. In spite of the fact that economic activities are generally characterized by different mix of tacit and codified knowledge, inserting the above mentioned categories (analytic, synthetic and symbolic) should enrich the debate and overcome the dualistic question whether knowledge is codified or tacit (Johnson, Lorenz, & Lundvall, 2002, in Asheim, Boschma, & Tödtling, 2013), which is in fact an oversimplification as opposed to the increasing complexity of learning, creativity and innovation.

The explicit hypothesis underpinning these recent developments, in particular those regarding the crucial role played by both the *type* of knowledge base and the *local/regional socio-economic-institutional level*, bridge the regional innovation systems approach with the hermeneutic one.

Being based on learning in perceiving/establishing differences between cognitive attitudes, a hermeneutic approach, in fact, fully recognises the importance of context-specific, place-specific relational contexts (the *meso-dimension*). It further proves to give thickness to the notions of place, and milieu in particular, by showing how individuals, firms and organizations, which are anchored in specific relational systems, interact with territorial features in enhancing their creative attitudes and capabilities. Though in a different way, a hermeneutic approach also questions about the nature of the knowledge base too. By introducing the notion of Knowledge-creating Services (KCS), in fact, we distinguish between different economic activities depending on the fact they source directly or indirectly from *Learning 2* or *Learning 3* practices, which represent an original element within knowledge economy perspective.

Notwithstanding the evident interplays between the notions of regional innovation platforms (Cooke, De Laurentis, MacNeill, & Collinge, 2010) and generative milieu, both relying on a pragmatic notion of learning, some differences, however, persist between the two approaches, as Cusinato remarks in the general introduction. Nevertheless it seems interesting to incorporate the knowledge base concept into the theoretical frame this chapter refers to, in order to assess the potential improvements in its explanatory capability with respect to the milieu approach, the objective being to substantiate the benefits of the hermeneutic approach.

On these basis, the article aims to analyse and discuss the localisation patterns of knowledge-based activities in the Paris Metropolitan Region, testing whether activities based on different sources of knowledge behave homogenously from a territorial perspective or, otherwise, they require different environments. The final

aim is to argue whether their *location rationale* affects places' capabilities in fostering creativeness and innovativeness. In doing so, the first task to be accomplished regards the spatial identification of the PMR. Secondly, by means of descriptive statistics a list of stylised facts will be framed, regarding both KCS services and their relationships with manufacturing industry. Third, we will show how the interpretative capability of the hermeneutic approach can be improved by internalising the knowledge base concept within the KCS classification, further testing the results by means of centrality, concentration, and clustering indexes. The results will be finally discussed also taking into account the role played by previously implemented territorial public policies.

2 Paris Metropolitan Region: The Unit of Analysis

Given the key role played by the relational context, the identification of the territorial unit to which referring the analysis represents a crucial issue. Notwithstanding its wide relevance in regional sciences, this issue has not received the attention it deserved, being the spatial unit of analysis usually unsophistically chosen among the (given) administrative ones or on the base of data availability (Burger, van Oort, & van der Knaap, 2010).

How do we conceive the city and the metropolitan region? Which is the spatial extent we have to refer to? Are we interested in its administrative boundaries, its functional area or its regional dimension?

When seeking to answer these crucial questions, a clear overlapping with the evolutionary geography emerges again. Evolutionary geographers, when dealing with the relational dimension of external economies, must address the issue of the changing role played by cities in different places and different times.

A traditional manufacturing city, usually depicted as an urban centre surrounded by rural areas or suburbs, is characterised by different external economies promoting agglomeration, which, in turn, depends on uneven features (such as leading industry, productivity growth basis, division of labour, sources of accumulation, scale economies, and ownership of enterprises), as well as on its development stage (be it proto-industrial, industrial or late-industrial) (Phelps & Ozawa, 2003).

Even more than an industrial city, a post-fordist city, which mainly—but not solely—relies on the service sector, has a more diversified and spatially diffused economy, peculiarly shaping the form of agglomeration forces. Recurring to Alonso, who first introduced the concept of "borrowed size", we notice that, generally, within metropolitan areas, also small cities "apparently achieve sufficient scale for the functioning of a modern economy by borrowing size from one another. This phenomenon transforms the issue of the size and growth of a city by redefining it to include, in some degree, its neighbours" (Alonso, 1973, p. 200). External economies, in this view, are not bounded within a single location/city, being rather shared among functionally interrelated networks of cities (Phelps & Ozawa, 2003).

Accepting this idea means reconsidering the role a pivot city and the surrounding ones jointly play within the urban regional structure. In this sense, as noted by

Meijers and Burger, "it would make sense to study agglomeration externalities at the scale of the regional urban system rather than the single city, as interactions with nearby cities may also influence the presence of agglomeration externalities" (Meijers & Burger, 2010).

Although from a different perspective, also the hermeneutic approach also stresses and focuses on the relational features of milieus. Established the fact that innovation appears as knowledge recombination, the hermeneutic approach, according to a dialogical-pragmatic perspective, considers knowledge as the act of "constructing information within a certain relational space (Learning 2 and following levels)" (see the Introduction), the so-called Knowledge-Creating Milieu (KCM). As outlined in the introduction, KCMs can be depicted as socio-cultural systems which actively concur in shaping their cognitive, creative and innovative evolutionary paths, on the basis of certain structural conditions, such as heterogeneity of mental habits, relational density, a shared physical-symbolic apparatus, and openness to the external world, jointly acting *on the mental-emotional attitudes of the people involved*.

This entails that generative milieus can be conceived as multi-layered places, acting at various scale (firms, organisations, cities, regions), where innovation takes place through an interactive process based on the exchange and transformation of both tacit and codified knowledge (Chesbrough, 2003). As for the Paris case study, recourse to the daily urban space will be invoked. This latter includes the core of an urban or metropolitan area (the city of Paris, in our case), as well as its surrounding areas (suburbs and hinterlands) and cities, which are functionally interrelated with the urban core. In doing so, we aim to identify the larger spatial extent of Paris potential relational field onto which systematic face-to-face contacts between individuals, firms and organisations occur and are enhanced at the same time.

Of course, the importance of long-distance relationships is not neglected here. We assume, in fact, the globally networked character of Paris, as its ranking in different global cities classifications demonstrates. Until to the end of the twentieth century, Paris had the same ranking as New York, Tokyo and London, according to the Globalization and World Cities Research Network (GaWC, 2012), while in 2012, having meanwhile lost one position, it has been included into the Alpha+ category.[1] Furthermore, according to MasterCard Worldwide Canters of Commerce Index (Mastercard Worldwide, 2008), Paris ranks respectively seventh, when referred to the aggregated index, and fourth, when the capability to create knowledge is concerned.

By focusing on the local/regional level of the relational field, we stress the fact that, in addition to the crucial role played by outwards connections, a KCM can count on its internal one. Dealing with a metropolitan KCM, in fact, means referring to the spatial and relational extent which guarantees the coexistence of the

[1] First order Global Cities are classified according four categories: Alpha++ (New York and London), Alpha+ (including Paris), Alpha and Alpha−.

maximum level of heterogeneity (namely the maximum level of different interpretative codes) and shared physical-symbolic apparatus within the same daily urban system.

Under these hypothesis, the definition of Metropolitan Area (Insee, 2011) will be first adopted and then articulated on the basis of its underlying Employment Areas (Zone d'Emploi-ZE) (Insee, 2012). According to Insee, large urban areas are defined on the basis of demographic, labour market and functional (commuting flows) indicators. Precisely, they are constituted by a major urban centre (an urban unit offering more than 10,000 jobs) and its surrounding rings (all municipalities whose residents—at least 40 % of them—work within the urban unit or in another municipality of the rings). On the basis of given thresholds (at least 500,000 habitants and 20,000 urban managerial and professional occupations, such as design and research, intellectual services, business-to-business services, management, culture and leisure) a large urban area is defined as a metropolitan area.

Starting from the Insee definition of Paris metropolitan area (Fig. 1), all the underlying ZEs have been considered. The aim is to depict the internal territorial organization of the PMR on the basis of its labour market areas, which are, at once, the places where the bulk of the resident population lives and works in, and part of a wider ZEs network pivoting on the core one of Paris. The proposed methodology meets at the same time the need to use data concerning the work places of employees and to provide a spatial definition of KCM to which referring the analysis. PMR, in this view, represents the maximum territorial extent (identified in functional terms) within which daily face-to-face contacts (and, consequently contacts between different cognitive codes) are allowed.

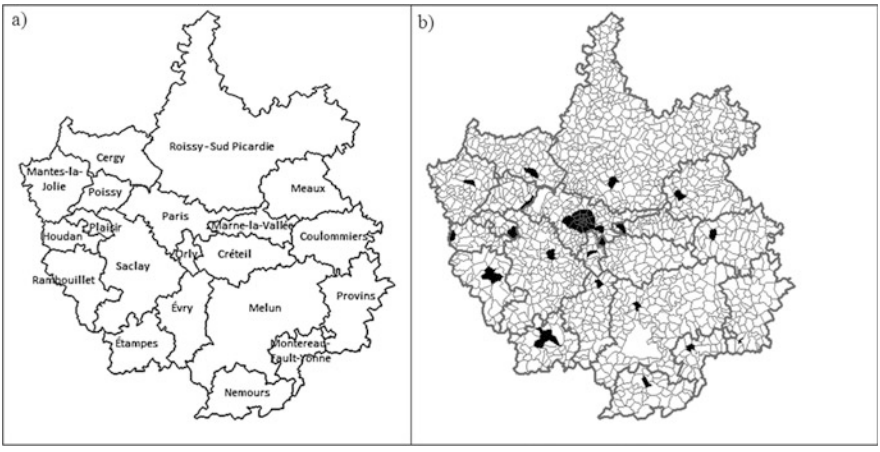

Fig. 1 Municipalities, ZEs, and ZEs' Urban cores of PMR. (**a**) Paris metropolitan region and its ZEs and (**b**) Paris metropolitan region, ZEs, municipalities and Urban cores (*black areas*). (An Urban core is represented by the centroid (or pivot) municipality of each ZE, that is the most important municipality in terms of employment opportunities. In most cases the name of each ZE is taken from its Urban core)

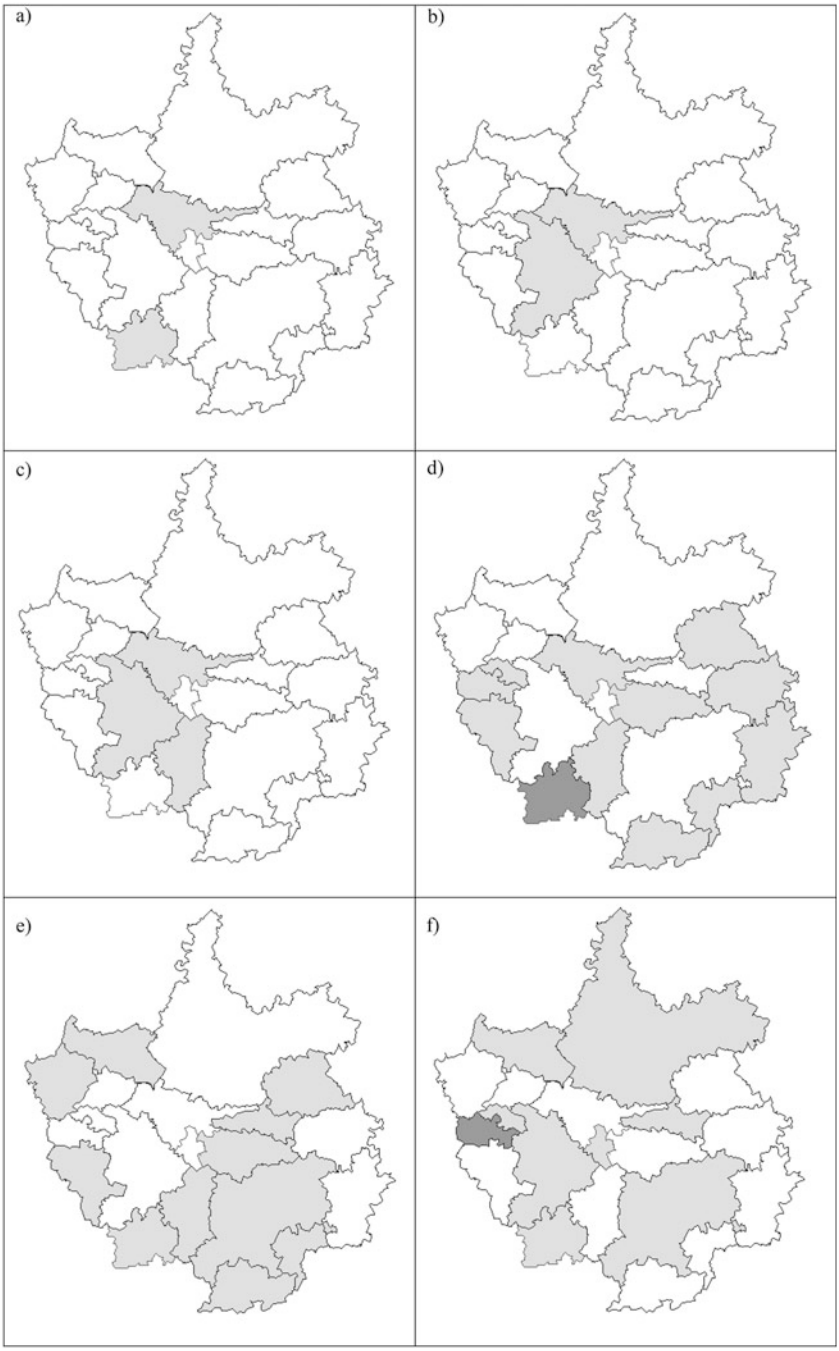

Fig. 2 LQs according KCS categories and ZE. (**a**) KCS LQ, (**b**) Private core LQ, (**c**) Private core-related LQ, (**d**) Public core LQ, (**e**) Public core-related LQ and (**f**) Collateral. (The scale of greys denotes the strength of LQs (*white* is lower than 1, *light grey* ranges between 1 and 2, *medium grey* between 2 and 5, *dark grey* is greater than 5). This key is to be used for all forthcoming figures)

Under the above mentioned hypothesis, we identify the Paris Metropolitan Region (Fig. 2) which represents the territorial proxy of the Paris KCM.

3 A Geography of KCS in the Paris Metropolitan Region: Main Stylised Facts

The empirical analysis will be based on CLAP 2008 database (*Connaissance locale de l'appareil productif*, Local knowledge of the productive system; Insee2008), which concerns the whole of French firms and employees on municipal level, with a five-digit detail. Data will be analysed using basic descriptive statistics, including the Location Quotient (QL).[2]

3.1 PMR and the National Context

According to the proposed definition, PMR is composed by 20 ZEs and covers an area of 14.191 km^2, hosting nearly 12 million of inhabitants and 5.5 million of employees, of whom 1.73 million belong to the KCS sector (Table 2).

These values, compared with national ones, highlight the very crucial role played by PMR, although some differences, according to the different variables involved in the analysis, emerge. While covering only 2.6 % of the national territory, PMR turns out as the main centre both in terms of residential and productive activities. In this regard, it is worth noting that its total employment share (24.3 % out of the total) slightly exceeds population share (19.4 % out of the total) indicating the centripetal economic force of PMR which extends over the whole nation (Gilli, 2011).

The economic role of PMR considerably differs when different economic sectors are concerned. As shown by Table 2, the gap between local and national shares and LQs attributable to KCS and manufacturing activities (respectively 29.8 % and 14 %, and 1.5 and 0.7) depicts the major role played by knowledge-based services. Furthermore, when considering KCS subdivisions, we realise that the specific asset of PMR relies on Private KCS. The share of Private Core KCS, in fact, almost covers the half of total French KCS employees (46.7 %), while the related LQ reaches the value of 2.7, which is the highest among those reported. Private Core-related KCS, for their part, slightly exceed 37 % of French total and their LQ amount to 2.2. On the contrary, PMR role according to Public KCS is less pronounced: both Public Core and Public Core-related KCS LQ values are closer to one, while their shares (respectively 21.5 % and 22 %) are lower than total employment share (Table 1).

As for manufacturing industry, a clear heterogeneity emerges between Hi-tech manufacturing industries and less technology intensive categories (Medium and

[2] For a detailed description of the Location Quotient, see Appendix.

Table 1 Population and employees—a comparison between PMR and France

	PMR	France	% PMR/France	LQ PMR
Sup (km^2)	14,191	543,965	2.6	
Population	12,038,267	62,134,866	19.4	
Total employment	5,547,307	22,799,082	24.3	1.3
Manufacturing employment	446,147	3,192,786	14.0	0.8
Hi-tech	97,348	333,991	29.1	1.7
Medium-tech	235,655	1,821,083	12.9	0.8
Low-tech	113,144	1,037,712	10.9	0.6
KCS employment	1,732,306	5,815,945	29.8	1.7
Private core	783,206	1,676,628	46.7	2.7
Private core-related	111,213	299,646	37.1	2.2
Public core	338,084	1,570,407	21.5	1.3
Public core-related	452,265	2,057,155	22.0	1.3
Collateral	47,538	212,109	22.4	1.3

Low-tech): the higher the science and technological level characterising the productive process and output, the higher the share and the value of LQ expressed by PMR. In this respect, Hi-tech manufacturing share and LQ amount respectively to 29.1 % and 1.5, while, Medium and Low-tech activities appear to be less important.

3.2 PMR Economic Structure

Moving from the comparison between PMR and the national level and focusing on PMR economic structure, its knowledge-led nature is confirmed. We notice that KCS employees amount to almost one third of total metropolitan employment (31.2 %).

Further, we can notice that Private Core KCS capture the lion's share, representing about a half of total KCS, being followed, in order of importance, by Public Core-related, Public Core KCS, Private Core-related KCS and activities Collateral to KCS (Table 3).

The contribution of manufacturing activities appears to be of less relevance, amounting to just 8 % of total employment. In this case Medium-tech activities capture the lion's share, slightly exceeding half of total manufacturing employment, while Hi-tech and Low-tech activities share almost equally the remaining part (Table 3).

Under the above considerations a first stylised fact can be depicted. It concerns the specific position PMR covers within the hermeneutic approach, given the crucial role played by KCS in general and by Private Core ones in particular, these latter being the most distinguishing knowledge-based services among those proposed.

Even though in a lesser degree and restricted to a technology-led perspective, hi-tech manufacturing activities represent a further peculiar asset of PMR economy,

Table 2 ZE areas, population and employment of PMR ZEs—absolute values

Cod_ZE	ZE	Sup (km^2)	Pop	Emp	Emp_man	Hi-tech	Medium-tech	Low-tech	Emp_KCS	Private core	Private core-related	Public core	Public core-related	Collateral
56	Roissy - Sud Picardie	3258	1,655,527	523,436	50,588	3868	34,185	12,535	92,799	15,705	5805	29,159	37,110	5020
1101	**Paris**	**552**	**5,851,493**	**3,353,561**	**190,061**	**44,675**	**82,245**	**63,141**	1,195,256	**628,370**	**77,102**	**212,167**	**253,366**	**24,251**
1102	Montereau-Fault-Yonne	310	315,444	138,076	11,508	1277	5339	4892	34,243	11,286	2463	7265	11,961	1268
1103	Coulommiers	660	61,160	13,374	2075	105	1031	939	2936	370	191	1282	1023	70
1104	Meaux	689	141,513	38,061	3957	100	2519	1338	9692	1156	580	3688	4046	222
1105	Melun	1838	379,272	117,997	13,877	4093	7698	2086	31,130	4710	1356	6520	17,236	1308
1106	Montereau	307	40,556	11,552	2436	0	2234	202	2600	187	39	1226	1058	90
1107	Nemours	556	48,696	13,098	2679	143	1994	542	2469	258	62	944	1127	78
1108	Provins	726	42,388	10,376	1505	1	1257	247	2398	346	110	1073	804	65
1109	Houdan	239	37,350	9986	998	340	353	305	2503	366	162	1065	630	280
1110	Mantes-la-Jolie	571	164,141	39,369	6385	1185	3361	1839	8197	1752	248	2360	3559	278
1111	Poissy	271	245,199	68,723	20,774	2183	17,239	1352	11,267	2332	955	1957	5471	552
1112	Rambouillet	547	70,693	19,015	3057	831	1450	776	4621	1145	308	1304	1711	153
1113	Plaisir	119	53,693	19,490	2741	1011	1536	194	4586	996	167	2024	1172	227
1114	Étampes	495	56,825	16,114	1237	33	856	348	5819	1737	82	2402	1422	176
1115	Évry	587	326,231	130,885	13,810	5499	5414	2897	40,971	9967	4738	8520	16,661	1085
1116	Saclay	1117	1,140,238	490,110	67,246	22,906	36,473	7867	152,118	76,142	10,119	21,234	38,140	6483
1117	Créteil	581	543,576	177,225	12,811	1075	8823	2913	50,383	4849	1699	17,576	25,276	983
1118	Orly	122	478,636	215,654	15,705	3401	6770	5534	44,264	14,894	3268	8057	14,594	3451
1119	Cergy	647	385,636	141,205	22,697	4622	14,878	3197	34,054	6638	1759	8261	15,898	1498
	PMR	14,191	12,038,267	5,547,307	446,147	97,348	235,655	113,144	1,732,306	783,206	111,213	338,084	452,265	47,538
	Tot France	543,965	62,134,866	22,799,082	2,208,157	333,991	836,454	1,037,712	5,815,945	1,676,628	299,646	1,570,407	2,057,155	212,109

Table 3 ZE areas, population and employment out of total PMR

Cod_ZE	ZE	Sup (km^2)	Pop	Emp	Emp_man	Hi-tech	Medium-tech	Low-tech	Emp_KCS	Private core	Private core-related	Public core	Public core-related	Collateral
56	Roissy - Sud Picardie	23.0	13.8	9.4	11.3	4.0	14.5	11.1	5.4	2.0	5.2	8.6	8.2	10.6
1101	**Paris**	**3.9**	**48.6**	**60.5**	**42.6**	**45.9**	**34.9**	**55.8**	**69.0**	**80.2**	**69.3**	**62.8**	**56.0**	**51.0**
1102	Marne-la-Vallée	2.2	2.6	2.5	2.6	1.3	2.3	4.3	2.0	1.4	2.2	2.1	2.6	2.7
1103	Coulommiers	4.7	0.5	0.2	0.5	0.1	0.4	0.8	0.2	0.0	0.2	0.4	0.2	0.1
1104	Meaux	4.9	1.2	0.7	0.9	0.1	1.1	1.2	0.6	0.1	0.5	1.1	0.9	0.5
1105	Melun	12.9	3.2	2.1	3.1	4.2	3.3	1.8	1.8	0.6	1.2	1.9	3.8	2.8
1106	Montereau-Fault-Yonne	2.2	0.3	0.2	0.5	0.0	0.9	0.2	0.2	0.0	0.0	0.4	0.2	0.2
1107	Nemours	3.9	0.4	0.2	0.6	0.1	0.8	0.5	0.1	0.0	0.1	0.3	0.2	0.2
1108	Provins	5.1	0.4	0.2	0.3	0.0	0.5	0.2	0.1	0.0	0.1	0.3	0.2	0.1
1109	Houdan	1.7	0.3	0.2	0.2	0.3	0.1	0.3	0.1	0.0	0.1	0.3	0.1	0.6
1110	Mantes-la-Jolie	4.0	1.4	0.7	1.4	1.2	1.4	1.6	0.5	0.2	0.2	0.7	0.8	0.6
1111	Poissy	1.9	2.0	1.2	4.7	2.2	7.3	1.2	0.7	0.3	0.9	0.6	1.2	1.2
1112	Rambouillet	3.9	0.6	0.3	0.7	0.9	0.6	0.7	0.3	0.1	0.3	0.4	0.4	0.3
1113	Plaisir	0.8	0.4	0.4	0.6	1.0	0.7	0.2	0.3	0.1	0.2	0.6	0.3	0.5
1114	Étampes	3.5	0.5	0.3	0.3	0.0	0.4	0.3	0.3	0.2	0.1	0.7	0.3	0.4
1115	Évry	4.1	2.7	2.4	3.1	5.6	2.3	2.6	2.4	1.3	4.3	2.5	3.7	2.3
1116	Saclay	7.9	9.5	8.8	15.1	23.5	15.5	7.0	8.8	9.7	9.1	6.3	8.4	13.6
1117	Créteil	4.1	4.5	3.2	2.9	1.1	3.7	2.6	2.9	0.6	1.5	5.2	5.6	2.1
1118	Orly	0.9	4.0	3.9	3.5	3.5	2.9	4.9	2.6	1.9	2.9	2.4	3.2	7.3
1119	Cergy	4.6	3.2	2.5	5.1	4.7	6.3	2.8	2.0	0.8	1.6	2.4	3.5	3.2
		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	% on total PMR				8.0	1.8	4.2	2.0	31.2	14.1	2.0	6.1	8.2	0.9
	Paris ZE/PMR	3.9	48.6	60.5	42.6	45.9	34.9	55.8	69.0	80.2	69.3	62.8	56.0	51.0

suggesting the existence of synergies and complementary externalities between these two industries, which will be subsequently investigated.

This first result fits with the fact that Paris is part of a wider Global Cities network, facing (and, at once, benefiting from) a global market whose core-activities presuppose Learning 2 and Learning 3 practices and consequently, the need for an inherent specialisation when willing to be part of it. With respect to manufacturing activities, the fact that Medium and Low-tech activities are numerically greater than Hi-tech ones, does not contradict the above conclusions. PMR, in fact, must provide a wide range of goods—from Hi-Tech to crafted ones—for its local market. Due to its size (nearly 12 million of inhabitants) part of this production necessarily locates within its metropolitan region notwithstanding related LQs do not suggest a specific specialisation in these industries. As for Hi-tech activities, we must take into account that a lower share of related employees is counterbalanced by higher level of productivity per worker. It is, in fact, assumed that labour productivity considerably increases moving from Low-tech to Hi-tech industries.

3.3 A Geography of KCS Within PMR

In order to provide a geography of KCS and to ascertain whether or not the five considered KCS categories are affected by similar or different location rationales, an analysis of their relative distribution and their LQs(according to the territorial level of ZE) has been performed (Tables 2, 3 and 4). The results will be interlaced with those descending from the analysis of manufacturing industries, aiming at stressing the existence of spatial complementarities or overlaps.

The very first stylised fact arising from the analysis concerns the crucial role Paris ZE plays within PMR, particularly in terms of knowledge-based services. Though it spatially covers only 3.9 % of total metropolitan region, the urban core of PMR concentrates 48.6 % of total population, 60.5 % of total employees and 69.5 % of total KCS employees (Table 3). On the contrary, manufacturing employees account for a lower share, equal to 42.6 %, depicting a two-tier pattern, further confirmed by LQs values: KCS tend to locate preferably within the urban core (LQ equal to 1.14) while manufacturing industries mostly spread outwards (LQ equal to 0.70) (Table 4).

By disaggregating KCS and manufacturing activities a more articulated situation emerges. As for KCS, we found that the concentration of its subdivisions within Paris ZE is considerably uneven. In particular, Private Core KCS are mostly located in the very centre of PMR (Paris ZE), their share amounting to 80.2 %. This evidence is in line with a vast literature regarding accessibility theories and willingness to pay for a central location (Alonso, 1964; Fujita, 1985), and with Global Cities concept (Sassen, 1991). Lower shares (even though higher than those affecting total employment) are related to Private Core-related KCS (69.3 %), Public Core KCS (62.8 %), Public Core-related KCS (56 %) and activities Collateral to KCS (51 %).

Table 4 ZEs' LQ according to the different industries

Cod_ZE	ZE	Emp	Emp_man	Hi-tech	Medium-tech	Low-Tech	Emp_KCS	Private core	Private core-related	Public core	Public core-related	Collateral
56	Roissy - Sud Picardie	0.69	1.20	0.42	1.54	1.17	0.57	0.21	0.55	0.91	0.87	1.12
1101	**Paris**	**1.24**	**0.70**	**0.76**	**0.58**	**0.92**	**1.14**	**1.33**	**1.15**	**1.04**	**0.93**	**0.84**
1102	Marne-la-Vallée	0.95	1.04	0.53	0.91	1.74	0.79	0.58	0.89	0.86	1.06	10.7
1103	Coulommiers	0.48	1.93	0.45	1.81	3.44	0.70	0.20	0.71	1.57	0.94	0.61
1104	Meaux	0.58	1.29	0.15	1.56	1.72	0.82	0.22	0.76	1.59	1.30	0.68
1105	Melun	0.68	1.46	1.98	1.54	0.87	0.84	0.28	0.57	0.91	1.79	1.29
1106	Montereau-Fault-Yonne	0.62	2.62	0.00	4.55	0.86	0.72	0.11	0.17	1.74	1.12	0.91
1107	Nemours	0.58	2.54	0.62	3.58	2.03	0.60	0.14	0.24	1.18	1.06	0.69
1108	Provins	0.53	1.80	0.01	2.85	1.17	0.74	0.24	0.53	1.70	0.95	0.73
1109	Houdan	0.58	1.24	1.94	0.83	1.50	0.80	0.26	0.81	1.75	0.77	3.27
1110	Mantes-la-Jolie	0.52	2.02	1.72	2.01	2.29	0.67	0.32	0.31	0.98	1.11	0.82
1111	Poissy	0.61	3.76	1.81	5.90	0.96	0.53	0.24	0.69	0.47	0.98	0.94
1112	Rambouillet	0.58	2.00	2.49	1.80	2.00	0.78	0.43	0.81	1.13	1.10	0.94
1113	Plaisir	0.79	1.75	2.96	1.86	0.49	0.75	0.36	0.43	1.70	0.74	1.36
1114	Étampes	0.62	0.95	0.12	1.25	1.06	1.16	0.76	0.25	2.45	1.08	1.27
1115	Évry	0.87	1.31	2.39	0.97	1.09	1.00	0.54	1.81	1.07	1.56	0.97
1116	Saclay	0.93	1.71	2.66	1.75	0.79	0.99	1.10	1.03	0.71	0.95	1.54
1117	Créteil	0.71	0.91	0.35	1.17	0.81	0.91	0.19	0.48	1.63	1.75	0.65
1118	Orly	0.98	0.91	0.90	0.74	1.26	0.66	0.49	0.76	0.61	0.83	1.87
1119	Cergy	0.80	2.00	1.87	2.48	1.11	0.77	0.33	0.62	0.96	1.38	1.24

In terms of LQ we can notice that Paris ZE performs quite well with respect to Private KCS, whose value amount to 1.33 (Private Core KCS) and 1.15 (Private Core-related KCS). On the contrary, the relative presence of Public KCS is not particularly distinguishing, as the LQ values of Public Core KCS (1.04) and Public Core-related KCS (0.93) show. Collateral KCS play an even less important role, which accounts for the lowest LQ (0.84) among KCS.

Under these evidences and taking into account the major role played by Paris ZE in absolute terms, a second stylised fact can be stated. Private KCS, whose location choices are mostly shaped by market decision, are considerably concentrated within the centre of PMR. Public KCS, which rely on services (universities, hospitals and by general public administration activities) whose location is mainly public policy-oriented, appears to be more evenly distributed across the metropolitan region.

These different patterns depict a clear correlation between "private" Learning 2 and 3 practises and the need for centrality and agglomeration, which is more pronounced than for Public KCS. This remark holds with respect to Core-related KCS as well, in the sense that Private Core-Related KCS more likely tend to concentrate within Paris ZE than Public Core-Related KCS. The former, which relies on market dynamics, appears benefiting to a greater extent from a central location, which further implies proximity interactions with Core KCS. On the contrary, the latter are more evenly distributed across territory due to the fact that services they supply require closeness to citizens/end users. Collateral activities to KCS, finally, are those less depending on a central location.

Taking into account these different location rationales, a third stylised fact can be pointed out, concerning the evidence that the higher is the level of Learning practices involved in a given KCS service, the higher the willingness to choose a central location. Within both Private and Public KCS, in fact, the share of Core activities—namely those directly involved in Learning 2 and 3 processes—is remarkably higher than the share of core-related ones. This fact suggests that, in general, the upper part of the hermeneutical chain, both private and public, is strictly correlated with volume, relational density and physical-symbolic substratum, which are key factors characterising the central area of PMR.

By enlarging the analysis to the other PMR ZEs, further useful factors emerge in order to depict the geography of KCS.

As for KCS, in addition to Paris only Saclay (8.8 % out of total KCS employees) and Roissy (5.4 %), which host respectively several research centres and the Charles de Gaulle airport, show a KCS employment base considerably higher than that of the other ZEs. However, LQ analysis points out that only Paris (LQ equal to 1.1) and Étampes (LQ equal to 1.2) have a relative higher concentration of KCS (Fig. 2a): Given the size of the latter (0.5 % of total population and 0.3 % of total KCS) we can affirm that, when considering KCS as a whole, Paris ZE is the only metropolitan knowledge pole that can be taken into consideration.

On the contrary, when considering KCS subdivisions, a more articulated situation can be outlined. In particular, with regard to Private KCS, we notice that when moving from activities which are *directly* part of Learning 2 and 3 practises (Private Core KCS) towards activities which are *indirectly* part of Learning 2 and 3 practises

(Private Core-related services) the spatial extent of concerned territory increases: if Private Core KCS are considered, two ZEs show LQ values higher than 1 (Paris and Saclay, whose LQ amount respectively to 1.33 and 1.13), while, when Private Core-related KCS are taken into account, they amount to three (Paris, Saclay, and Évry, whose LQ are equal respectively to 1.15, 1.03 and 1.81) (Fig. 2b, c).

In this regard two important considerations can be stressed.

First, the fact that a higher relative presence of Private Core KCS extends outside Paris ZE (including Saclay, which borders Paris in the South-west) suggests related firms could have chosen a more peripheral location benefiting from lower land rents and congestion costs, while remaining close to the metropolitan centre and keeping on to take advantage from its agglomeration economies.

Actually, the fact that Saclay is specialised in Private Core KCS depends on the interplay between market forces and the outcomes of a precise public policy intervention,[3] the so-called "Campus of Saclay Plain". Saclay,[4] actually, had been planned as a scientific pole just after the Second World War, when several public research centres (such as CNRS-National Centre for Scientific Research, CEA-National Atomic Energy Commission, ONERA-National Office for Aerospace Studies and Research) were delocalised into this area. After their relocation in Saclay, they were followed, in successive waves, by several public universities (HEC business school, Polytechnique, Supélec-École supérieure d'électricité, etc.) and, finally, during the last decade, by private research centres (Thomson-CSF, Danone, Thales, Kraft). Therefore, at least for the Paris case study, a wider location of Private Core KCS has been triggered by public policy interventions. By locating their facilities within the area, in fact, Private Core firms, while benefiting from lower congestion costs and land-rent, can take advantage of synergies and complementary networks springing from proximity with other knowledge-based activities.

Secondly, the fact that Évry (which ranks sixth among the 20 ZEs considered in terms of population size and host 4.3 % of total Private Core-related employees) has the highest LQ in Private Core-related KCS (Table 4), suggests that private activities indirectly participating to Learning 2 and 3 practices can be located in a more peripheral position than Private Core ones. Figure 2a, b, indeed, show that when shifting from Core to Core-related KCS, concerned territory expands.

On the contrary, when considering Public KCS, the context radically changes. As for Public Core KCS we observe a sort of buffer zone (the first ring of ZEs surrounding Paris one) in which LQs are lower than one, followed by a second ring in which they are higher than 1 (Fig. 2d, e). Here again, this location rationale appears to be inspired by public policies: if ZEs bordering Paris can benefit from its central market in terms of public services, farthest ZEs need to be supplied by

[3] The case of Saclay suggests that a considerable share of Private Core employees actually work for public institutions, such as the National Atomic Energy Commission which employs approximately 6000 workers.

[4] Saclay is 25 km far from Paris.

locally settled facilities. As a result specialisation in Public Core KCS is more sprawled across all PMR than that concerning Private Core KCS.

A similar location pattern also affects Public Core-related KCS, with the difference that, belonging to the lower part of the hermeneutical chain, their location is even more sprawled across PMR.

Finally, collateral activities to KCS, whose nature is the less distinguishing from a hermeneutic perspective, show LQ values higher than one in the edges of PMR, further confirming the hypothesis that a direct correlation between propensity to choice a central location and the upper part of the hermeneutical chain (and vice versa) exists.

3.4 Manufacturing and KCS Services

The analysis of manufacturing activities leads us to a third stylised fact. According to the data, the related share of these activities in Paris ZE is considerably lower than KCS one (42.6 % against 69 %, Table 3). This evidence is in line with the fact that, in general, manufacturing activities suffer from congestion externalities, are land-consuming(a factor of production relatively scarce within urban centres) and source of various impacts on the surrounding environment, being consequently located in the edges of cities or in their hinterland.

When focusing on their subdivisions,[5] however, some interesting remarks can be pointed out. In particular, location choices of manufacturing activities appear to be reversed with respect to KCS, in the sense that the lowest the technological level of concerned activities the highest the likelihood to choose a central location. Low-tech manufacturing share and LQ, in fact, show the highest values in Paris ZE, amounting respectively to 55.8 % and 0.92 (Tables 3 and 4). These activities appear to be relatively more attracted to a central location than Medium and Hi-tech manufacturing activities, in that they can benefit from city brand, the urban atmosphere, and its symbolic dimension. Medium-tech activities, on the contrary, are mostly located outside Paris ZE (their share and LQ with respect to Paris ZE amount respectively to 34.9 % and 0.58), while Hi-tech industries have an intermediate position (their share and LQ amount respectively to 45.9 % and 0.76). These latter, as stressed by many scholars (Asheim et al., 2013; Shearmur, 2012), are

[5] Manufacturing industry has been articulated according the OECD definitions: High-technology industries include aircraft and spacecraft, pharmaceuticals, office, accounting and computing machinery, radio, TV and communications equipment, medical, precision and optical instruments; Medium-technology industries include electrical machinery and apparatus, n.e.c., motor vehicles, trailers and semi-trailers, chemicals excluding pharmaceuticals, railroad equipment and transport equipment, n.e.c., machinery and equipment, n.e.c., building and repairing of ships and boats, rubber and plastics products, coke, refined petroleum products and nuclear fuel, other non-metallic mineral products, basic metals and fabricated metal products; Low-technology industries include wood, pulp, paper, paper products, printing and publishing, food products, beverages and tobacco, textiles, textile products, leather and footwear, manufacturing, n.e.c.; recycling (OECD, 2011).

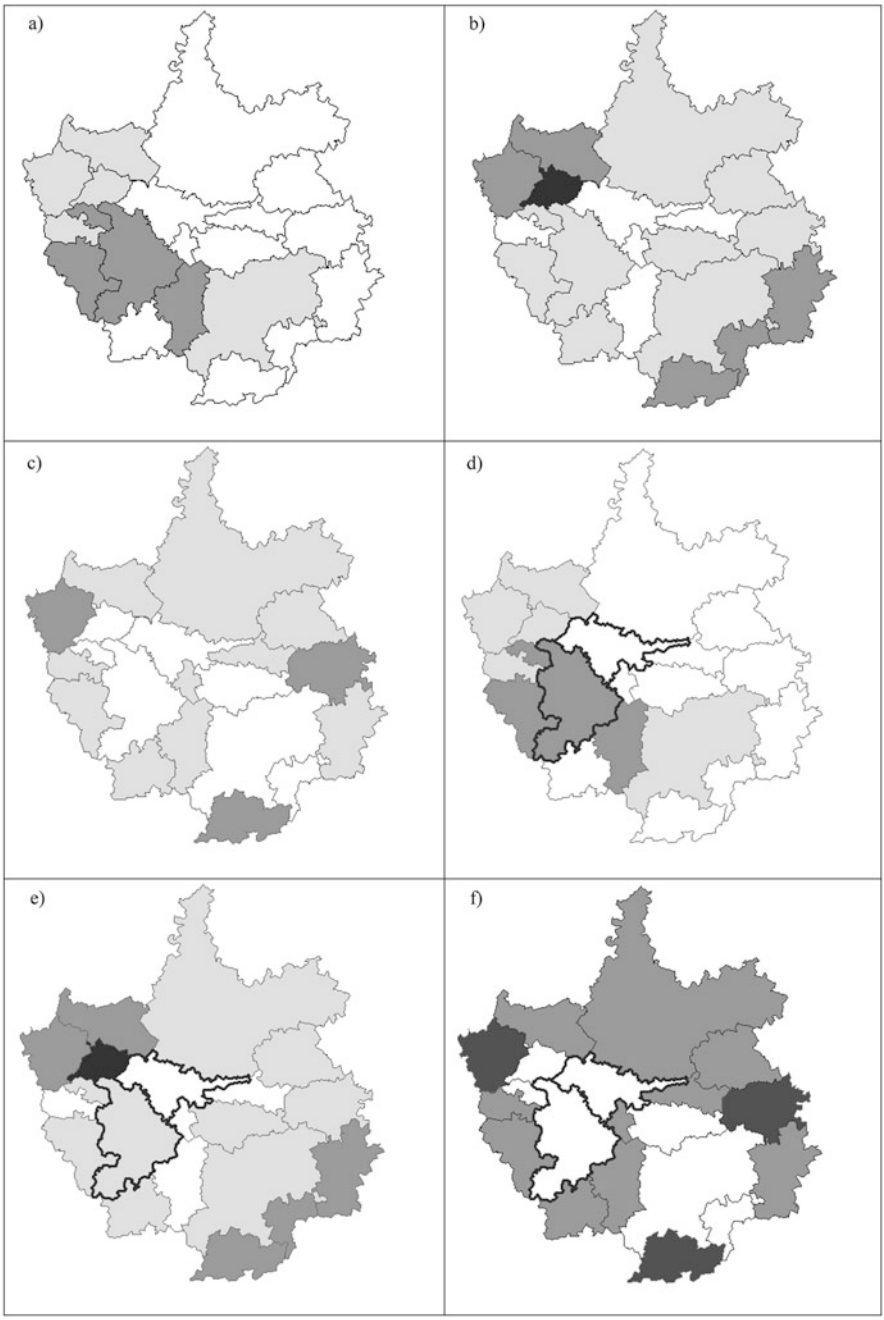

Fig. 3 LQs according to manufacturing categories and ZE. (**a**) Hi-tech, (**b**) Medium-tech, (**c**) Low-tech, (**d**) Private core KCS (*black bordered*)—Hi-tech (scale of *greys*), (**e**) Private core KCS (*black bordered*)—Medium-tech (scale of *greys*) and (**f**) Private Core KCS (*black bordered*)—Low-tech (scale of *greys*)

usually less dependent on a central location, benefiting, above all, from the presence of the so-called knowledge infrastructure expressed at the entire metropolitan region level.

The final step of the analysis regards a comparison between location patterns of Private Core KCS and the different types of manufacturing activities in order to depict spatial overlapping and complementarities. As shown by Fig. 3d–f, two different patterns can be depicted. When considering Private Core KCS and Hi-tech industries, Saclay turns out as the place where the co-location process between knowledge-based services and Hi-tech-based manufacturing reaches its maximum extent. This evidence lets us hypothesize a greater importance of location economies and economies of related variety than urbanization ones. On the contrary Medium and Low-tech industries are characterised by complementary patterns compared with Private Core KCS (with the exception of Saclay) letting us suppose a less relevant role played by agglomeration economies between these type of industries (the higher the values of Medium and Low-tech LQs, the higher the distance from Private Core KCS poles).

Relationships between Hi-tech manufacturing and Private Core KCS will be deeper analysed in the next paragraph, after having cross-fertilised the hermeneutic approach with the knowledge source-based approach proposed by Asheim and by making recourse to the LISA indicator on a municipal level.

4 Hermeneutic Approach and Knowledge Source-Based Approach: Is There Room for Improvements?

The aim of this paragraph is to ascertain whether or not there is room for improvement of the interpretative capability of the above illustrated hermeneutic approach. In particular consequences in terms of localisation patterns will be assessed when cross-fertilising the hermeneutic approach with the "knowledge source-based approach" proposed by Asheim.

To this end, Private Core KCS will be further disaggregated in analytic, synthetic and symbolic services according to their prevailing source of knowledge which characterises a given service (Table 5).

Under this perspective, three types of Private Core KCS will be considered:

(1) analytic Private Core KCS, which are mainly composed by science-based services grounding on codified knowledge;
(2) symbolic Private Core KCS, whose activity mostly rely on re-shaping cognitive codes and where tacit knowledge also matters;
(3) synthetic Private Core KCS, which are context-based services, importantly grounding on tacit knowledge.

Although each proposed category of Private Core KCS is "composed of more than one knowledge base, (. . .) one knowledge base will represent the critical

Table 5 Private core KCS according to the their prevailing source of knowledge (analytic, synthetic and symbolic)

NAF rev. 2	Description	Source of knowledge	NAF rev. 2	Description	Source of knowledge
5811Z	Book publishing	Symbolic	6920Z	Accounting, bookkeeping and auditing activities; tax consultancy	Synthetic
5813Z	Publishing of newspapers	Symbolic	7010Z	Activities of head offices	Synthetic
5814Z	Publishing of journals and periodicals	Symbolic	7021Z	Public relations and communication activities	Symbolic
5821Z	Publishing of computer games	Symbolic	7022Z	Business and other management consultancy activities	Synthetic
5829A	System and network software publishing	Symbolic	7111Z	Architectural activities	Symbolic
5829B	Development tools and programming languages software publishing	Symbolic	7112B	Engineering. Technical studies	Synthetic
5829C	Application software publishing	Symbolic	7211Z	Research and experimental development on biotechnology	Analytical
5911A	Production of motion pictures for television and television programmes	Symbolic	7219Z	Other research and experimental development on natural sciences and engineering	Analytical
5911B	Production of institutional and promotional motion pictures	Symbolic	7220Z	Research and experimental development on social sciences and humanities	Analytical
5911C	Production of motion pictures for cinema	Symbolic	7311Z	Advertising agencies	Symbolic
5912Z	Motion picture, video and television programme post-production activities	Synthetic	7320Z	Market research and public opinion polling	Synthetic
5920Z	Sound recording and music publishing activities	Synthetic	7410Z	Specialised design activities	Symbolic
6010Z	Radio broadcasting	Symbolic	7420Z	Photographic activities	Symbolic
6020A	Broadcast of general-interest television programmes	Symbolic	7490A	Activities of quantity surveyors	Synthetic
6020B	Broadcast of thematic television programmes	Symbolic	7490B	Sundry professional scientific and technical activities	Synthetic
6201Z	Computer programming activities	Synthetic	9001Z	Performing arts	Symbolic
6202A	Hardware and software consultancy	Synthetic	9003A	Artistic creation related to fine arts	Symbolic
6202B	Third party maintenance of computer systems and applications	Synthetic	9003B	Other artistic creation	Symbolic
6312Z	Web portals	Symbolic	9411Z	Activities of business and employers membership organisations	Synthetic
6391Z	News agency activities	Symbolic	9412Z	Activities of professional membership organizations	Synthetic
6910Z	Legal activities	Synthetic	9420Z	Activities of trade unions	Synthetic

knowledge input that the knowledge creation and innovation processes cannot do without" (Asheim et al., 2013).

By performing share and LQ analysis on the basis of analytic, symbolic and synthetic source of knowledge, a more articulated context than that depicted by Private Core KCS emerges. Analytic, symbolic and synthetic-based services, indeed, perform quite differently according to different location patterns.

In particular we observe that the share of symbolic services attributable to Paris ZE amounts to 87.4 % out of total PMR (while Private core KCS as a whole amount to 80.2 %), to 80.5 % with regard to synthetic activities and "only" to 53.3 % when analytic services are concerned (Table 6). These evidences are confirmed by the analysis of LQs, which are higher than 1 in the cases of symbolic and synthetic services (respectively 1.47 and 1.32) but lower than 1 in the case of analytical services (0.88) (Table 6), while Private core KCS as a whole amount to 1.33.

Even though in a basic and preliminary way, the classification of KCS according to their source of knowledge appears to enrich the analysis and to better detail KCS localization patterns.

By comparing the above reported results with those referred to the whole Private Core KCS category, different specialisation pattern can be framed. Figure 4, in fact,

Table 6 Analytic, synthetic and symbolic private core KCS shares and LQ per ZE

	%			LQ		
	Analytic	Symbolic	Synthetic	Analytic	Symbolic	Synthetic
Roissy - Sud Picardie	1.4	1.5	2.3	0.15	0.16	0.24
Paris	**53.3**	**87.4**	**80.5**	**0.88**	**1.47**	**1.32**
Marne-la-Vallée	1.4	1.3	1.5	0.55	0.49	0.62
Coulommiers	0.0	0.0	0.1	0.00	0.21	0.21
Meaux	0.0	0.1	0.2	0.00	0.16	0.26
Melun	0.2	0.4	0.7	0.07	0.22	0.33
Montereau-Fault-Yonne	0.0	0.0	0.0	0.00	0.05	0.15
Nemours	0.0	0.0	0.0	0.00	0.09	0.18
Provins	0.0	0.0	0.1	0.00	0.18	0.29
Houdan	0.0	0.0	0.1	0.24	0.28	0.25
Mantes-la-Jolie	0.4	0.1	0.2	0.57	0.22	0.32
Poissy	0.1	0.2	0.4	0.08	0.20	0.28
Rambouillet	0.2	0.2	0.1	0.49	0.70	0.31
Plais ir	0.6	0.1	0.1	1.68	0.22	0.27
Étampes	0.0	0.1	0.3	0.00	0.21	1.07
Évry	2.7	0.4	1.5	1.13	0.19	0.61
Saclay	30.6	5.9	8.8	3.47	0.49	1.07
Créteil	0.4	0.7	0.6	0.13	0.21	0.19
Orly	8.7	1.0	1.5	2.23	0.26	0.38
Cergy	0.1	0.5	1.1	0.06	0.18	0.42
	100.0	100.0	100.0			

Fig. 4 LQs according analytic, synthetic and symbolic private core KCS and ZEs. (**a**) Private core KCS, (**b**) Analytic KCS, (**c**) Symbolic KCS and (**d**) Synthetic KCS

depicts a sort of two-tier pattern: from one side Paris ZE emerges as the unique centre providing symbolic services; from the other Saclay stands out as the most important analytic-based services centre (LQ equal to 3.47), surrounded by other three ZE with the same specialisation (Plaisir, Creteil and Orly) (Fig. 4a). Synthetic activities, whose nature is prominently context-oriented, appear to be the *trait d'union* between the two previous categories.

In order to refine the territorial detail of the analysis and to identify possible clusters of services according to their different knowledge source, we made recourse to the LISA indicator, which has been performed at a municipal level on the basis of related LQ. Results are reported in Fig. 5, confirming the above described evidences. As for analytic Core KCS we observe a well spatial bounded

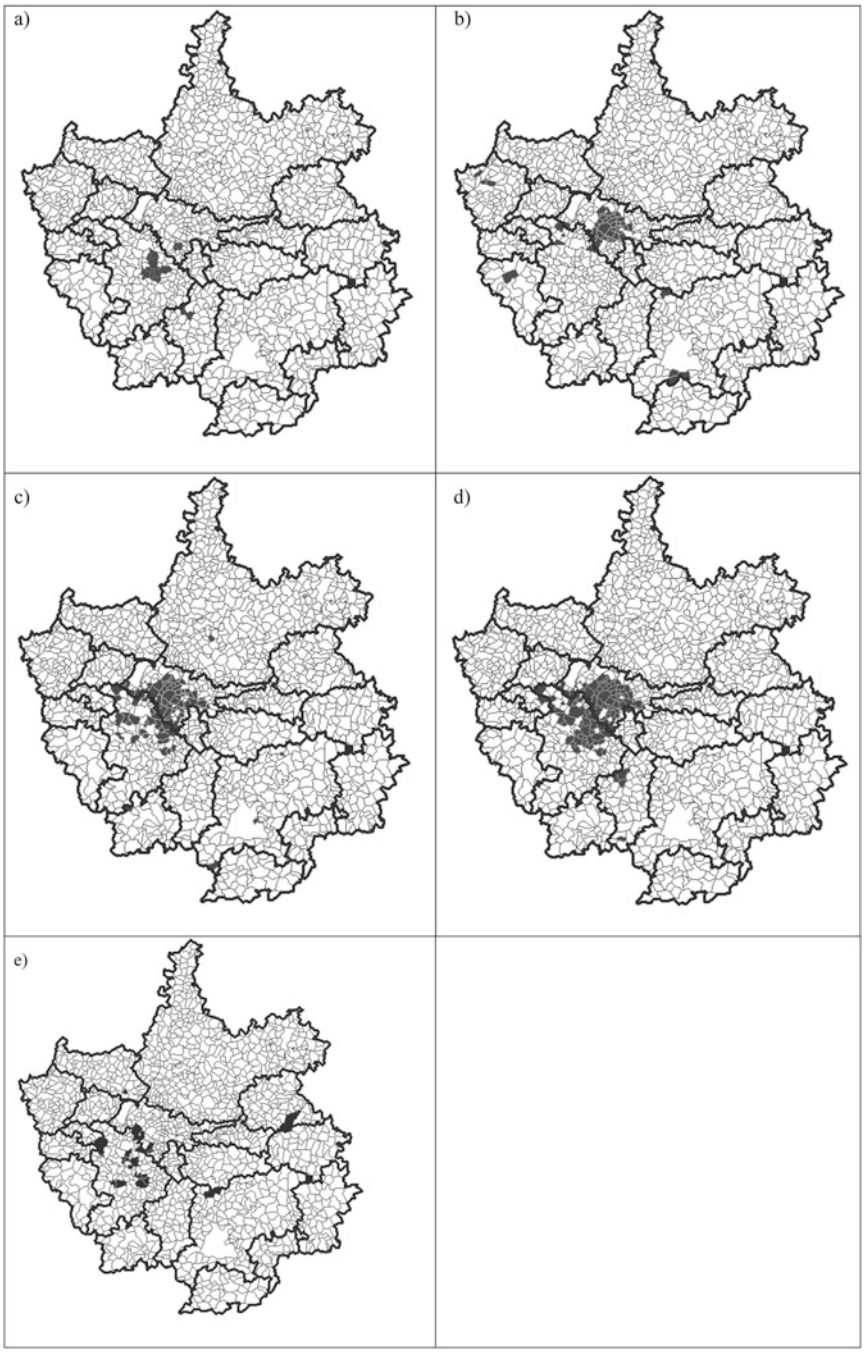

Fig. 5 Cluster of municipalities (*dark grey*) resulting from LISA performing. (**a**) Analytic KCS, (**b**) Symbolic KCS, (**c**) Synthetic KCS, (**d**) Private core KCS and (**e**) Hi-tech

Table 7 Relative Entropy index (RE), Delta index and Modified Wheaton index (MW) in PMR

	RE	Delta	MW
Population	0.49	0.50	0.68
Tot employees	0.41	0.61	0.77
KCS	0.34	0.68	0.82
Private core	0.23	0.79	0.90
Private core-related	0.33	0.69	0.83
public core	0.41	0.61	0.77
Public core-related	0.43	0.57	0.73
Collateral	0.44	0.60	0.73
Analytic private core		0.84	0.80
Symbolic private core	0.17	0.78	0.93
Synthetic private core	0.23	0.60	0.89
	0 = Max concentration	1 = Max concentration	1 = Max centrality

cluster composed by 14 municipalities pivoting on Saclay. We further observe proximity/overlapping relationships between the analytic cluster and the hi-tech ones located within Saclay ZE (Fig. 5a, c), which appear to be the only spatial relationship between Private Core KCS and Hi-tech manufacturing.

Symbolic Private Core KCS, on the contrary, pivot on the urban core of PMR. The related cluster, in fact, concerns almost the whole of Paris *Arrondissements* (with the exception of the 4th, 12th and 19th), plus the first and second rings of western and northern surrounding municipalities, which are, however, included within Paris ZE. This result stresses the crucial role played by the "urban environment" with respect to this kind of activities.

The cluster of Synthetic Private Core KCS, finally, nearly overlaps with the ensemble of symbolic and analytic clusters. Notwithstanding its continuum character across Paris and Saclay ZEs, a two-tier rationale could be inferred, in the sense that its northern part is supposed to be the expression of Paris urban core, while the southern one to rely and results from the development of the Saclay area.

The last step of the empirical analysis consists in testing the location patterns previously depicted by means of centrality and concentration indexes. In particular the Relative Entropy index, the Delta index and the Modified Wheaton index[6] will be performed, aiming at overcoming eventual bias related to size, number of sub-areas which compose each ZE and to take into account ZEs' distance from the Core Business District—which is represented by Paris ZE (Table 7).

The Relative Entropy and Delta indexes provide us with information on how certain phenomena are distributed across space, giving count of their degree of concentration.

In doing so, the Relative Entropy index allows results not to be biased by the number of sub-areas involved in the analysis, while Delta index takes into account

[6] For a detailed description of the mentioned indexes, see Appendix.

their territorial extent. Results coming from the calculation of both indexes provide converging evidences, while confirming previously highlighted patterns.

According to the Relative Entropy index concentration phenomena considerably differ among KCS sub-categories. Private KCS tend to be more concentrated than Public KCS, while Collateral KCS are those (relatively) more sprawled across PMR. Symbolic and Analytic Private Core KCS, moreover, are those affected by the higher degree of concentration.

The same pattern is depicted by the Delta index, with the only exception that Symbolic Private Core KCS, which are slightly less concentrated than Analytic Private Core ones when ZEs' territorial extension is considered.

The Modified Wheaton index, finally, by supplying information on the localisation pattern of economic activities on the basis of their distance from the CBD, confirms the above results. The fact that among analytical, symbolical and synthetic service the former are supposed to be the less affected by proximity with the CBD, perfectly fits with the existence of the related cluster in Saclay ZE.

In conclusion we may affirm that articulating Private Core KCS category according to their main source of knowledge appears to provide a more stylised geography of knowledge-based services, to positively affect the interpretative capability of the hermeneutic approach and, as a consequence, its effectiveness when willing to shape public policies.

Similar considerations hold when the geography of KIBS activities (see Introduction) is considered. As shown by Fig. 6, ZEs with KIBS and Private Core KCS LQ higher than one perfectly overlap, concerning Paris and Saclay ZEs. As for related clusters some differences emerge, depending on the different economic activities concerned by the two approaches. It is worth noting, in fact, that KIBS

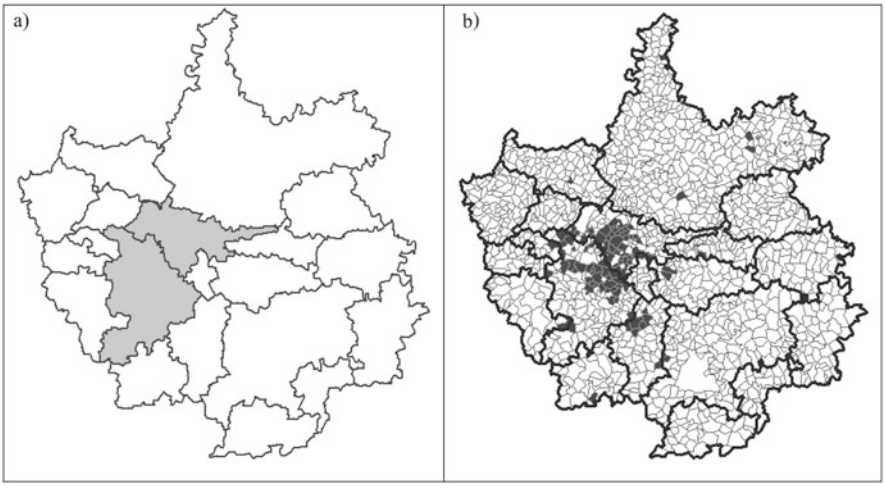

Fig. 6 KIBS LQs and clusters. (**a**) KIBS LQs and (**b**) KIBS clusters

cluster appears to be less centred onto Paris municipality (and Paris ZE at large) than Private Core KCS (in that, for instance, it involves "only" 10 *Arrondissements* out of 20 against the 17 of the KCS). This evidence can be explained by the fact that KIBS classification puts together services that the hermeneutic approach considers as belonging to different Learning practices.

5 A Critical Discussion of the Main Findings and Concluding Remarks

The attempt to identify the geography of knowledge-based activities in the PMR allows us to express some critical reflections on the usefulness and pertinence of a hermeneutic approach when investigating the generative knowledge potential from a territorial perspective.

By disaggregating between Private and Public KCS, and, further, in Core and Core-related KCS, different location patterns can be depicted. The crucial role played by the very urban core of PMR in hosting KCS being understood, we observe that:

(1) Those KCS whose core-activity directly consists in or presupposes Learning 2 or Learning 3 practices (Core KCS) more likely concentrate in the very centre of PMR (Paris ZE), more so than services which occupy the lower part of the hermeneutic chain (Core-related KCS and Collateral activities to KCS).
(2) A remarkable difference in spatial behaviour emerges between Private and Public KCS. All performed indicators (LQ, concentration and centrality) show that the former are more concentrated than the latter, suggesting a higher degree of dependency on a central position related to Private KCS.
(3) The subdivision of Private Core KCS in analytic, symbolic and synthetic activities depicts a more stylised context with respect to the standard provided taxonomy, suggesting that different sources of knowledge preferably require or ground on different metropolitan environments. Within PMR, analytic activities are supposed to be mostly public policies-led, symbolic ones urban atmosphere-led, while synthetic KCS could be defined as milieu-led
(4) The most important form of spatial interaction between KCS and manufacturing regards the overlapping and proximity relationships between Analytic KCS and Hi-tech industry. The co-location of their respective clusters within Saclay ZE let us suppose they can benefit from agglomeration economies and economies of related variety allowed by spatial proximity. The fact that Low-tech industry shows the highest share among manufacturing ones within Paris ZE is worth to be noticed even if is less important in absolute terms. This evidence could imply a sort of relationships between traditional productions and the symbolic values expressed by Paris urban environment.

These stylised facts suggest some critical remarks.

First, notwithstanding a sizeable literature stressing the role of service industries in fostering the process of spatial diffusion of economic activities in contemporary agglomerations, we did not find unambiguous evidences of this point when referring to KCS activities. Evolutionary geographers and economists have stressed the changing localisation patterns of economic activities, particularly for service industries, within modern metropolitan regions. They argue that localisation patterns of economic activities increasingly depend on the whole regional economic structure instead of single well-bounded places (Parr, 2002), and that "the potential for a cluster to develop in a given location thus depends not only on the local business base, but also on its location relative to other clusters" (Bennett, Coles, & McDonald, 1999, p. 399), implying a lower degree of localisation constraints. By our side, we actually notice different location behaviours depending on whether or not KCS directly participate to Learning 2 and 3 practices (Core vs Core-related KCS). This result, at least for PMR, suggests that the location rationale of service industries depends on the Learning level they work at. In particular, when indirectly involved in Learning 2 and 3, KCS show a lower degree of localisation constraints: the less distinguishing the source of knowledge, the more diffused their location. On the contrary, Private Core KCS are characterised by a higher degree of concentration and centrality: the more distinguishing the source of knowledge, the more concentrated the concerned KCS.

Furthermore, a lower degree of centrality and concentration seems to depend on the Private or Public nature of KCS. The formers, which are more likely affected by market forces, tend to be more concentrated than the latter ones. Public KCS location rationale, in fact, mostly depends on public policy choices, which aim at counterbalancing centripetal forces triggered by market forces, and realising a more articulated urban design. This result appears to depend on Ile de France Regional planning regulations which have been pursuing polycentrism as the corner stone of urban planning during the last 50 years (Thiard & Berger, 2006). It further stresses the crucial role that collective agents could, or even should, play in shaping local development trajectories.

Finally, choosing to adopt the Asheim taxonomy within the hermeneutic approach makes it possible to achieve an interesting explicative added value. According to the literature, empiric evidence suggests that:

(1) Symbolic Private Core KCS, grounding on media, fashion, advertising, and design activities, and recurring to Learning 2 and 3 practices devoted to handle social norms and habits, mainly depend on "everyday culture of specific social groupings" (Asheim et al., 2013). As confirmed by the analysis, these latter are clearly affected by urban environment and atmosphere, being the activities with the highest degree of territorial anchorage among those considered;
(2) Analytic activities, on the contrary, less depend on a specific urban environment. The Saclay-based cluster confirms the hypothesis according to which analytic KCS, being science and codified knowledge-based, mostly rely on relational fields involving universities and research centres rather than on the symbolic apparatus. On the other hand it is worth noting that: (a) the spatial and

relational proximity with the city of Paris represents obviously a crucial element in the development of the area; and (b) this peculiar localisation choice results from a series of targeted public policies which have being implemented (in different waves since the end of the Second World War) aimed at decentralising and decongesting the urban core of Paris, towards a more balanced metropolitan polycentric structure (Thiard & Berger, 2006). Furthermore, public and private establishments settled there on the basis of a clear chronology: public research centres first, followed by public universities, and, finally, by private research centres. A collective choice, in other words, created a suitable and favourable environment for the later settlement of the private sector.

(3) Synthetic activities, mainly relying on customer-supplier relationships and, in the case of Paris, on global networked activities of the several multinational hosted by the capital, obviously benefit from the urban environment (Sassen, 2010), as empirical results suggest. In addition, by virtue of their interlinking nature, they also settled in the Saclay area, as private research centres did, after the coming of public knowledge infrastructures. As a result, the Saclay area can be considered nowadays the second metropolitan cluster in synthetic activities.

The analysis according the knowledge source of KCS finally allows us to depict spatial relationships between KCS and manufacturing activities more appropriately than using the standard hermeneutic taxonomy: a further confirmation of its explicative added value.

Appendix

(1) The Location Quotient (LQ) is defined as follows:

$$LQ = \frac{\frac{e_{i,j}}{e_j}}{\frac{E_i}{E}} \tag{1}$$

where $e_{i,j}$ is the number of employees in the industry i of the sub-area j (ZE or municipality in our case), e_j is the total number of employees of sub-area j, E_i is the total number of employees in the industry i in the total area (PMR or ZE in our case), and E is the total number of employees in the total area.

(2) Relative Entropy (RE) index is calculated according to the following formula:

$$RE = \frac{\left(\sum_{i=1}^{n} PDEN_i \times \log \frac{1}{PDEN_i}\right)}{\log(N)} \tag{2}$$

where:

$$PDEN_i = \frac{DEN_i}{\sum_{i=1}^{n} DEN_i}$$

DEN_i represents the density of a given variable in the sub-area i, and n is the number of considered sub-areas.

The main advantage of using the *RE* index is that the number of sub-areas involved in the analysis does not affect the results. The index ranges between 0 and 1: the closer it is to 1, the less population or jobs are concentrated, and vice versa. The disadvantage, on the contrary, is that *RE* cannot be used when zero-densities appear.

(3) Delta Index is calculated as follows:

$$\delta = \frac{1}{2}\sum_{i=1}^{n} \left|\frac{x_i}{X} - \frac{a_i}{A}\right| \tag{3}$$

Where $\frac{x_i}{X}$ is the share of a given variable in sub-area i with respect to total area and $\frac{a_i}{A}$ is the share of the extension of the sub-area i on the extension of the total area.

The index allows us taking into account the spatial extension of a sub-area i when aiming at assessing concentration with respect to a given phenomenon. It ranges between 0 and 1: higher values of Delta Index indicate a greater concentration of a given variable in a relatively small number of sub-areas, while, when closer to 0, a more uniform distribution affects the area.

(4) Modified Wheaton (*MW*) measures the speed at which the cumulative proportion of employment increases along the radius joining the CBD with the farthest sub-areas, and is calculated as follows:

$$MW = \frac{\left(\sum_{i=1}^{n} E_{i-1} DCBD_i - \sum_{i=1}^{n} E_i DCBD_{i-1}\right)}{DCBD*} \tag{4}$$

Where E_i is the cumulative proportion of the population or employment in the sub-area i; $DCBD_i$ is the distance between the sub-area i and the CBD; $DCBD*$ is the distance between the CBD and the farthest sub-area i. MW ranges between 0 and 1, with 1 representing a perfect centralisation.

(5) Spatial autocorrelation index of Anselin (1995), also known as LISA (Local Indicator of Spatial Association) is calculated as follows:

$$LISA = \frac{(X_i - \overline{X})\sum_{j}^{n} W_{ij}(X_j - \overline{X})}{\sum_{i}^{n} (X_i - \overline{X})^2 \Big/ N} \tag{5}$$

where N is the total number of sub-areas, X_i and X_j population or employment in the sub-area i and j and W_{ij} the weights matrix related to the Euclidian distance between i and j. LISA enables us to identify sub-areas where variables values

are strongly positively (or negatively) associated with one another, depicting a cluster.

References

Alonso, W. (1964). *Location and land use*. Cambridge, MA: Harvard University Press.

Alonso, W. (1973). Urban zero population growth. *Daedalus, 109*, 191–206.

Amin, A., & Thrift, N. (1992). Neo-Marshallian nodes in global networks. *International Journal of Urban and Regional Research, 16*(4), 571–587.

Anselin, L. (1995). Local indicators of spatial association-LISA. *Geographical Analysis, 27*(2), 93–115.

Asheim, B. T., Boschma, R., & Tödtling, F. (2013). Knowledge sourcing, innovation and constructing advantage in regions of Europe. *European Urban and Regional Studies, 20*(2), 161–169.

Asheim, B. T., & Gertler, M. S. (2005). The geography of innovation: Regional innovation systems. In J. Fagerberg, D. C. Mowery, & R. R. Nelson (Eds.), *The Oxford handbook of innovation* (pp. 291–317). Oxford: Oxford University Press.

Bennett, P., Coles, D., & McDonald, A. (1999). Risk communication as a decision process. In P. Bennett, & K. Calman (Eds.). *Risk communication and public health* (pp. 207–221). Oxford: Oxford University Press.

Boschma, R., & Iammarino, S. (2007). *Related variety and regional growth in Italy*. SPRU Electronic Working Paper Series, 162.

Burger, M. J., van Oort, F. G., & van der Knaap, B. (2010). *A treatise on the geographical scale of agglomeration externalities and the modifiable areal unit problem* (ERIM Report Series Research in Management, ERS-2008-076-ORG). Rotterdam: Erasmus Research Institute of Management.

Camagni, R. (1999). The city as a milieu: Applying GREMI's approach to urban evolution. *Revue d'Economie Régionale et Urbaine, 3*, 591–606.

Camagni, R. (2012). Creativity, culture and urban milieux. In L. Fusco Girard, T. Baycan, & P. Nijkamp (Eds.), *Sustainable city and creativity: Promoting creative urban initiatives* (pp. 183–198). Aldershot: Ashgate.

Capello, R. (2000). The city network paradigm: Measuring urban network externalities. *Urban Studies, 37*(11), 1925–1945.

Chesbrough, H. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Boston: Harvard Business School Press.

Chinitz, B. (1961). Contrasts in agglomeration. *American Economic Review, 51*(2), 279–289.

Coffey, W., & Shearmur, R. (2002). Agglomeration and dispersion of high-order service employment in the Montreal metropolitan region, 1981–96. *Urban Studies, 39*(3), 359–378.

Cooke, P., De Laurentis, C., MacNeill, S., & Collinge, C. (Eds.). (2010). *Platforms of innovation: Dynamics of new industrial knowledge flows*. Cheltenham: Edward Elgar.

Fujita, M. (1985). Existence and uniqueness of equilibrium and optimal land use: Boundary rent curve approach. *Regional Science and Urban Economics, 15*(2), 295–324.

GaWC. (2012). http://www.lboro.ac.uk/gawc/world2012t.html

Gilli, F. (2011). The "Paris Basin", a metropolitan region. *Cybergeo: European Journal of Geography, 578*. doi:10.4000/cybergeo.24913.

Hall, P. (2004). Creativity, culture, knowledge and the city. *Built Environment, 30*(3), 256–258.

Insee. (2011). http://www.insee.fr/fr/ffc/ipweb/ip1333/ip1333.pdf

Insee. (2012). http://www.insee.fr/fr/ppp/bases-de-donnees/donnees-detaillees/atlas-zone-emploi-2010/pdf/atlas-ze-2010.pdf

Johnson, B., Lorenz, E., & Lundvall, B.-Å. (2002). Why all this fuss about codified and tacit knowledge? *Industrial and Corporate Change, 11*(2), 245–262.

Lane, D. A., Pumain, D., van der Leeuw, S. E., & West, G. (Eds.). (2009). *Complexity perspectives in innovation and social change*. New York: Springer.

Mastercard Worldwide. (2008). https://www.mastercard.com/us/company/en/insights/pdfs/2008/MCWW_WCoC-Report_2008.pdf

Meijers, E. J. (2005). Polycentric urban regions and the quest for synergy: Is a network of cities more than the sum of the parts? *Urban Studies, 42*(4), 765–781.

Meijers, E. J., & Burger, M. (2010). Spatial structure and productivity in US metropolitan areas. *Environment and Planning A, 42*(6), 1383–1402.

Musters, S., & Gritsai, O. (2013). The creative knowledge city in Europe: Structural conditions and urban policy strategies for competitive cities. *European Urban and Regional Studies, 20* (3), 343–359.

OECD. (2011). http://www.oecd.org/science/inno/48350231.pdf

Parr, J. B. (2002). Missing elements in the analysis of agglomeration economies. *International Regional Science Review, 25*(2), 151–168.

Phelps, N. A., & Ozawa, T. (2003). Contrasts in agglomeration: Proto-industrial, industrial and post-industrial forms compared. *Progress in Human Geography, 27*(5), 583–604.

Sassen, S. (1991). *The global city: New York, London, Tokyo*. Princeton, NJ: Princeton University Press.

Sassen, S. (2010). The city: Its return as a lens for social theory. *City, Culture and Society*, *1*(1), 3–10.

Shearmur, R. (2012). The geography of intrametropolitan KIBS innovation: Distinguishing agglomeration economies from innovation dynamics. *Urban Studies, 49*(11), 2331–2356.

Simmie, J. (2005). Critical surveys edited by Stephen Roper innovation and space: A critical review of the literature. *Regional Studies, 39*(6), 789–804.

Storper, M., & Scott, A. J. (2009). Rethinking human capital, creativity and urban growth. *Journal of Economic Geography, 9*(2), 147–167.

Thiard, P., & Berger, M. (2006). Le polycentrisme de l'aire métropolitaine de Paris: rhétorique de la planification territoriale ou organisation métapolitaine de l'espace? *Territoires en mouvement, 2*, 3–14.