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Thesis

**The spatial dimension of creativity:  
Evidence from the metropolitan region of Rome**

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This thesis is organised in three parts (papers):

1. From the subsidised muses to creative industries: convergences and compromises
2. Cities and creative industries: the case of Rome
3. Analysing the detailed location patterns of creative industries in the metropolitan area of Rome

## **Abstract**

The difficulty to ‘place’ economic activities stemming from culture and creativity in a fairly comprehensive and intelligible context has prevented researchers and policy makers from coming to shared conclusions on definition criteria. The terminology-related confusion reached the peak at the end of the nineties when ‘creative industries’ superseded ‘cultural industries’, which had been until then a widely-agreed term for cultural policies at the national and the international level.

In the light of the intense academic debate developed around the cultural/creative industries, the first paper analyses tensions and debates around the diverging definitions, as well as some peculiar characteristics of these industries and their multiple relationships with the urban context. The effects of application of different classification schemes in the mapping of the sector’s boundaries are discussed, to illustrate the difficulties culture faces while competing with other sectors for funding within national and international economic policy frameworks.

Creative industries in the Metropolitan region of Rome are geographically concentrated. The purpose of the second paper is to empirically test the hypothesis that this geographic concentration arises from the benefits of the innovative urban milieu, which is characteristic of specific metropolitan areas. A spatial regression model is estimated using data on the creative industries in the Metropolitan region of Rome by census blocks. We estimate the number of creative firms by census block unit with a spatially lagged dependent variable. The empirical results show that the estimated coefficient of the spatially lagged dependent variable is significantly positive, indicating that the number of creative firms in a census block is influenced by the number of creative firms in neighbouring census blocks. This enables us to explore the conditions that account for the concentration of creative industries.

The purpose of the third paper is to analyse the detailed location patterns of creative industries in the Metropolitan region of Rome. The spatial distribution of economic activities is studied by utilising spatially referenced point data as input to a statistical model based on Ripley’s K-function. Pairwise differences between K-functions of observed point patterns are computed and compared



with simulated confidence bands. A null hypothesis of random labelling is tested upon three conditions: by analysing the spatial distribution of different creative sectors with respect to the rest of creative activities; by comparing pairs of creative subcategories for the purpose of identifying those revealing mutual attraction; by comparing, for each creative subcategory, localization patterns of creative firms with respect to the localization of respective service functions.

The empirical analysis showed that the core creative sectors have the tendency to cluster in space at small distances (up to 20 – 40 kilometres) while the respective service sectors are dispersed internally and disposed around the core. In particular this holds true for the pattern displayed by Architecture, Antiquities, Publishing, Music and performing arts, Video, Film and photography, Radio and television. Pairwise point pattern analysis revealed the existence of urban clusters characterised by the co-existence of different creative activities.

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# 1 From the subsidised muses to creative industries: Convergences and compromises

## Abstract

The emergence of creative industries as a distinct economic sector is easy to be located in the recent past. Whilst creativity always played a role in economy, debates on its significance, terminology and definitions started soon after World War II, intensified during the second half of the last century, and remain intense to the present day.

The difficulty to 'place' economic activities stemming from culture and creativity in a fairly comprehensive and intelligible context has prevented researchers and policy makers from coming to shared conclusions on definition criteria. The terminology-related confusion reached the peak at the end of the nineties when 'creative industries' superseded 'cultural industries', which had been until then a widely-agreed term for cultural policies at the national and the international level.

In the light of the intense academic debate developed around the cultural/creative industries, this paper analyses tensions and debates around the diverging definitions, as well as some peculiar characteristics of these industries and their multiple relationships with the urban context. The effects of application of different classification schemes in the mapping of the sector's boundaries are discussed, to illustrate the difficulties culture faces while competing with other sectors for funding within national and international economic policy frameworks.

**Key words:** creative industries, cultural industries, technological innovation, cultural economy, cultural policies.

## 1.1 Introduction

The rise of awareness about the economic significance of creativity in a globalized world has gone hand in hand with the affirmation of the term 'creative industries', often used interchangeably to the term 'cultural industries'. This paper will unpack the concept of 'creative industries' in the context of the extensive literature, aiming to answer the following research questions:

Which is the role of the cultural sector within the creative industries?

What are the strengths of creative industries?

Notwithstanding the broad literature on the subject covering the evolution of the two 'creatively intertwined' terms (O'Connor, 1999; Towse, 2000; Cunningham, 2001; Flew, 2002; Hesmondhalgh, 2002; Caust, 2003; Garngam, 2005; Hesmondhalgh & Pratt, 2005), the structural and organizational characteristics of the creative industries and the complex relationship between creativity on the one hand and society and economy on the other (Momaas, 2004; Garnham, 2005; Pratt, 2005; 2011b; Hesmondhalgh, 2007; Galloway and Dunlop, 2007; Evans, 2009; Scott, 2010;

Flew, 2010), there is a blatant lack of convergence about key issues such as the existence of an univocal definition and a widely agreed theoretical basis enabling for an unambiguous delimitation of the sector boundaries. These incongruences, in turn, greatly affect public policies, through ill-suited sectorial objectives within economic agendas that have other priorities.

As a matter of fact, the topic is dominated, both at academic and at political level, by a terminological muddle that has fuelled, over the last decade, a prolific but confusing and inefficient debate in terms of economic policy and regional planning outcomes. Writing about the shift from ‘cultural’ to ‘creative’, Pratt (2011b) points at the inherent weakness of the term ‘creative industry’, arguing that ‘...all industries are creative’ and that it is not possible to distinguish between, for example, scientific and cultural innovation. Other scholars affirm that ‘...all industries are cultural’ because the goods and services they produce have cultural relevance (Mato, 2009).

Cunningham (2001) considers that the term ‘cultural industries’ is already superseded through the advent of digital technology. He argues that new types of creative applications assume that the public are no longer reliant neither on the big corporation mass-produced entertainment (film, broadcasting, music) nor on real-time public consumption (arts), which are the ‘traditional’ components of cultural industries. On the other hand, Hesmondhalgh (2007) considers that the term ‘creative industries’ merely bypasses the cultural dimension, thus ignoring fundamental characteristics of the cultural production such as the symbolic and the social meaning.

Adorno and Horkheimer, who coined the term ‘culture industry’ in the ‘40s, would be perhaps relieved by the drift on the terminology: *‘To speak of culture was always contrary to culture. Culture as a common denominator already contains in embryo that schematization and process of cataloguing and classification which bring culture within the sphere of administration’* (Adorno and Horkheimer 1979/1947).

Indeed, today there is less talk about culture in policy documents, whilst creativity, creative industries, creative occupations, creative clusters, are more pervasive terms. It has been widely argued that this shift in the terminology was not neutral (Cunningham, 2002; Hesmondhalgh and Pratt, 2005); it served to disjoin the ‘creative industries’ from those cultural productions that in order to be viable necessitate the ‘visible hand’ (public or private), defined by Dick Netzer (1978) as the ‘Subsidised Muses’.

Most of the components of creative industries classification schemes adopted by national and international organizations for policy development purposes fall within the remit of the ‘traditional’ cultural domain. Creative industries encompass economic activities in the sectors of arts, media and publishing, including some typically creative activities such as design, architecture, advertising, or computer games. Classification schemes, often related to the structure of the statistical data, reckon with the fact that cultural categories are highly inhomogeneous and in part invisible to data collection (Girard, 1989). When looking at different classifications, the most striking feature is the inclusion or exclusion of entire groups of activities, according to the position they hold in a matrix defined by the categories axis (arts – cultural industries – creative industries) and the value chain axis (creation – production – distribution). Generally the ‘mobile’ parts concern categories falling within the creative activities/production domain, like design, style or software, or related to the heritage, such as the cultural tourism. As a result, features on creative employment, value added or share in the GDP, placed in the first pages of many policy reports, hardly match.

In the recent ESSnet Culture 2009 final report (2012) the EU has opted for the disjointed term ‘cultural and creative industries’, obviating ambiguities in labelling some of the sub-sectors. But tensions and awkwardness about terminology are far from being over. Whilst operating frameworks such as ‘ESSnet Culture’ or ‘UNESCO framework for cultural statistics’ are entitled after ‘culture’, almost all the mapping documents have accomplished the conversion to ‘creative’<sup>1</sup>. The EU program ‘Creative Europe’ (ex ‘Culture Program’) finances (with fewer resources in comparison to

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<sup>1</sup> <http://unctad.org/en/pages/PublicationArchive.aspx?publicationid=946>;  
<http://www.unesco.org/new/en/culture/themes/creativity/creative-economy-report-2013-special-edition/>;  
<http://www.nesta.org.uk/publications/dynamic-mapping-uks-creative-industries> (accessed: 24/12/1024).

other sectorial-specific funding programmes) 'traditional' cultural activities<sup>2</sup>. Creative industries are instead identified with the 'knowledge economy' driven by the 'digital' technologies. As such, they can draw upon other segments of the Structural Funds, where greater resources are allocated.

The commitment to positioning the creative industries at the forefront of economic competitiveness does not release researchers and policy makers from the duty to understand what will be the impact of the recent turn in economic and cultural policies. The lack of reflexivity, argues Garnham (2005), '*...it disguises the very real contradictions and empirical weaknesses of the theoretical analyses it mobilises, and by so doing helps to mobilise a very disparate and often potentially antagonistic coalition of interests around a given policy thrust. It assumes that we already know, and thus can take for granted, what the creative industries are, why they are important and thus merit supporting policy initiatives*'.

The rest of the paper is organised as follows. Section 2 provides a literature review on the evolution of the term 'creative industry'. Section 3 critically analyses the characteristics of the creative industries. Section 4 brings insights on cultural policies, operating frameworks and creative industries mapping documents. Section 5 illustrates, with data from the Metropolitan region of Rome, the effects on the sector boundaries and on the sector weight, of the application of different classification schemes. Section 6 discusses the spatial dimension of creativity, the concept of creative cluster, the relationships with the metropolization and the linkages with regional and urban planning and policies. Section 7 summarizes the main findings and conclusions.

## 1.2 History and definitions

The concept of creative industries is closely related to that of cultural industries. Almost all of the academic contributions dealing with these issues quote a writing of 1944 by marxist philosophers Theodor Adorno and Max Horkheimer, where the term 'culture industry' appears for the first time to emphasize what it was perceived as a contradiction between culture and industry. Heavy quotation perhaps is due to the fact that they criticized the drift of culture on the sidelines of an epochal technological revolution; today, in the midst of the digital revolution, some of their concerns still appear updated.

Culture industry was about new industries of mass reproduction and distribution – film, sound recording, mass circulation dailies, popular prints, radio broadcasting – as opposed to the 'arts' – visual and performing arts, museums and galleries. According to Adorno and Horkheimer the Fordist factory system moved into the realm of culture: the producers of culture became alienated wagers, the artist workshops turned into factories headed by the big corporations. Thus, culture industry was rooted in the new system of monopoly capitalism, exercising total control over the masses through mass media powered by modern industrial techniques.

The so-called 'high arts' defined by Dick Netzer (1978) as 'subsidised muses' remain at the origin of tensions that today concern the capability to measure the economic weight of culture. Cultural needs satisfied by subsidised muses are different from those produced and distributed through the market. There is convergence on the fact that market cannot ensure the efficient allocation of resources for the creation of cultural products and services related to the sphere of high arts (Valentino, 2012). Notwithstanding, these make up the indisputable core of sectorial classifications.

Market failure is the logic behind state support for the arts. During the 1940s Keynes himself, as head of the Committee for Encouragement of Music and the Arts (CEMA), contributed to the process of 'nationalization', legitimized during the post-war years with the establishment of the Arts

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<sup>2</sup> [http://ec.europa.eu/programmes/creative-europe/index\\_en.htm](http://ec.europa.eu/programmes/creative-europe/index_en.htm) (accessed: 24/12/1024).



Council of Great Britain (Galloway and Dunlop, 2007). The assumption of market failure also justifies many of the international declarations and conventions, such as those of the United Nations Educational, Scientific and Cultural Organisation (UNESCO).

During the 1970s and 1980s a new awareness emerged that cultural industries needed to be part of national cultural policies. France, reacting to US pressure on access to new markets for cultural trade exercised through the General Agreement on Tariffs and Trade (GATT), was the first nation to elaborate in the early 1980s a cultural public policy aimed at assisting the commercial sector (Towse, 2000; Flew, 2002). It was argued that, whilst a minority of cultural activities related to arts absorbed all the attention, the vast majority of consumed cultural products produced by the commercial sector could not be simply left to fend for themselves (Girard, 1972; 1982). The Greater London Council (GLC) and other UK city councils took up these themes during the 1980s.

In Britain Nicholas Garnham and others conducted a remarkable work in adapting the notion of cultural industry to industrial policy making. The central argument of Garnham (1987; 1990) and Williams (1981), exponents of the school of political economy, was that under capitalism culture was produced as a commodity, and thus subject to the logic and the contradictions of this production system. Garnham based his analysis of the cultural industries on the rejection of the idealist traditions of existing state support for culture and, contextually, the awareness of the fact that most people's cultural needs were already being met by the market and not by state 'subsidised muses' (Garnham, 1990). The crucial point was that art and the market are not antagonistic to each other: the market is an efficient way of allocating resources and reflecting choice. Therefore, cultural goods and services are to be distributed following the audience demand. Concerns emerged on the fact that there was not enough insight of how, by whom and under what conditions culture was produced, as detailed analysis was absent. On the other hand, this materialist vision of culture, seen to be completely reducible to the needs of 'capital' or the 'ruling class', reminds of post war Adorno and Horkheimer warnings, recalling the intrinsic contraposition between 'high arts' and commercial culture.

The experiments in France and Britain during the 1980s were a response to the national cultural policies centred on the arts and heritage and on subsidies to artists and producing institutions. The conceptual shift from 'culture industry' to 'cultural industries' represented an industrial approach to cultural policy (Bianchini and Parkinson, 1993). The commercial production of culture was addressed using economic and statistical tools (value-chains, employment mapping) and focusing on how the sector as a whole worked, including non-creative activities. In so doing, a better understanding was reached, of the connections between technologies of production and distribution, changing business models, the emergent connections between symbolic and informational goods, and between culture and communications systems (Hesmondhalgh, 2002; 2007). This understanding was at the basis of the cultural industries policy initiatives of the UNESCO programme on communications inequalities (1970) and Cultural industries (1982), and those of the Council of Europe in 1978 and 1980 respectively, aimed to analyse the structure of cultural industry and create frameworks for assessing its socio-economic effects (Garnham, 1990).

The 1990s marked a new development stage for cultural policy and the cultural industries in particular, as the new category 'creative industry', conceived in the political sphere, busted into the scene. The 'formal' origins of the terminology are in the Britain Government's establishment of a Creative Industries Task Force in 1997, which elevated cultural industries at national policy, shifting the term to 'creative industries' and linking it to the 'knowledge economy'.

After the election victory of the British Labour Party in 1997, the Department of National Heritage became the Department of Culture, Media and Sport (DCMS). In 1998 a Creative Industries Mapping document was produced, which gave a definition of creative industries that enhanced commercially motivated activities if compared to the exclusively 'artistic' ones. These industries were considered at the bases of economic development, urban regeneration and regional industrial diversification (Creative Industries Task force, 1998). Complemented by optimistic employment and wealth creation statistics, the DCMSs 'handy definition' introduced a list of 13 sub-sectors with clear links to statistical sources. The use of the term 'creative industry' it was

presented as a purely pragmatic move in order to facilitate access to funding; since the word ‘culture’ was too reminiscent of the ‘arts’ and thus not about economics at all, it should have been avoided (Cunningham, 2002; Hesmondhalgh and Pratt, 2005).

The DCMSs Mapping Document defines as creative industries those ‘which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property’ (Creative Industries Task force, 1998). In UK this framework it was widely used by local authorities, development agencies, arts organisations and consultancies, to place cultural industry strategies at the heart of local and regional cultural and economic strategies. Whereas it was conceived as a toolkit for measuring the economic impact of the ‘creative industries’, it had a huge impact worldwide, as witnessed by proliferation of an elevated number of similar reports in other countries (KEA, 2006; UNCTAD, 2013; UNESCO-UNDP, 2013).

Garnham (2005) argues that the shift in terminology was not a mere change of labels but there were both theoretical and policy implications. He criticized the inclusion of ‘software’ employment within the creative categories, to make the statistics look more impressive and to the over-inflated connection with the ‘dot-com’ world of ‘information’ or ‘knowledge’ economy. In the same line of criticism is positioned Pratt (2005), arguing that the information or knowledge involved in creative industries, science, R&D, business-to-business services are very different from each other, and Healy (2002a), which affirms that tying together under the ‘creative’ umbrella a whole range of activities and businesses covered by intellectual property in some form – design, trademark, copyright and patents, is not useful and might be confusing. Garnham (2005) also suggests that the concern with intellectual property rights is an attempt to overcome one of the key restrictions on profitability in the cultural industries: the tendency of cultural goods to become public goods.

Unlike the GLC’s policy, that had emphasised the cultural sector as a whole, DCMS definition struggles to describe its complex structure; creative industry relies on entrepreneurial creativity generating intellectual property rights, where ‘creative’ is considered a quality which is exploited by individuals that possess ‘individual creativity, skill and talent’ (Creative Industries Task force, 1998). The lack of reference to a specific cultural or artistic dimension makes it difficult to distinguish between what is to be considered ‘creative’ in this sector with respect to the others. The list of creative industries, framed within an economic agenda that had nothing to do with traditional cultural policy, included the ‘arts’, the ‘classic’ cultural industries and creative industries such as design, fashion and, more controversially, ‘software’. As it was easy to be expected, ambiguities provoked criticism (Reeves, 2002; Selwood, 2002; 2004) that, however, did not arrest the commitment to ensure to the ‘creative industries’ a theoretical legitimacy (Cunningham, 2002; 2004; Flew, 2002; Hartley, 2005).

Subsidised muses constitute a constant presence in classification schemes of creative industries, although quantitatively irrelevant. Contextually they still account for the vast majority of national and local government spending in culture (Feist, 2001). This centrality of ‘the arts’ to national governments cultural policies as well as to international policy platforms appears in contradiction with today’s claims for the universality of creativity. This may be one of the reasons why Pratt (2011b) writes about the notion of ‘culture as ornament’, albeit justified by its potential instrumental value.

Undoubtedly the arts constitute a problematic node for classification since it is not easy to frame them as industry categories. On this basis, there are authors that exclude arts from the ‘list’ of cultural industries (Garnham, 1990; Towse, 2003). Others try to separate the flavours, by ‘downgrading’ the category for the purposes of classification.

David Hesmondhalgh considers the arts as ‘peripheral cultural industries’ because they engage in semi-industrial or nonindustrial methods. Instead, he focuses on ‘the core cultural industries’ that ‘...deal with the industrial production and circulation of texts [the production of social meaning] and are centrally reliant on the work of symbol creators’ (Hesmondhalgh, 2002). Core cultural industries include: advertising and marketing, broadcasting, film industries, internet industry, music

industries (recording, publishing and live performance), print and publishing, video and computer games.

By setting aside a sector with a high prestige but also highly commercialised and integrated within the cultural industries production system in certain segments, this classification model underrates the inputs and spillover effects deriving from artistic activity, which are recognised by other authors as driving forces of creative clusters (Scot, 2004; Evans, 2009) and innovative milieus (Hall, 2000; Landry, 2000).

Looking at the arts from a different perspective, David Throsby (2001) suggests a concentric model of the cultural industries composed by: core creative arts (literature, music, performing arts, visual arts), other core cultural industries (film, museums and libraries), wider cultural industries (heritage services, publishing, sound recording, television and radio, video and computer games) and related industries (advertising, architecture, design, fashion). According to Throsby, cultural industries are defined as activities that involve some form of creativity in their production, are concerned with the generation and communication of symbolic meaning and their output embodies, at least potentially, some form of intellectual property (Throsby, 2001). This definition has the merit of providing a clear set of criteria in defining the cultural industries, but problems may arise while determining whether, and to what extent, individual activities are to be considered cultural industries.

UNESCO (2009), following its seminal approach to cultural industries, defines them as *‘those industries that combine the creation, production and commercialisation of contents which are intangible and cultural in nature. These contents are typically protected by copyright and they can take the form of goods or services’*. Other international agencies, such as International Labour Organisation (ILO), International Trade Centre (ITC), World Intellectual Property Organization (WIPO), have adopted more or less converging definitions on cultural industries for their programs and initiatives.

The other problematic node for classification (a part for the position of the arts) is the concept of creativity and its relationships with culture. ‘Creative industries’ are considered by Flew (2002) as an extension of the term ‘cultural industries’ that has created definitional problems so that it has become increasingly difficult to recognise the distinctive nature of the sector and thus to determine its ‘exact boundaries’ (see also Galloway and Dunlop, 2007; Hesmondhalgh and Pratt, 2005).

Creativity is defined in many ways, proving the complex multidisciplinary nature of the concept. According to Boden (2003), it is *‘the ability to come up with ideas and artefacts that are new, surprising and valuable’*. The Cox Review of Creativity in Business defines it as *‘the generation of new ideas – either new ways of looking at existing problems, or of seeing new opportunities, perhaps by exploiting emerging technologies or changes in markets’* (HMT, 2005). Florida (2002) suggests that *‘creative work is often downright subversive, since it disrupts existing patterns of thought and life’*.

It has been widely argued that any industry is potentially creative (Howkins, 2002; Pratt, 2011b; Hesmondhalgh and Pratt, 2005). Galloway and Dunlop (2007) warn about the fact that mixing cultural creativity with all other forms of creativity fails to take adequate account of important differences between cultural and creative industries.

The previously mentioned DCMS Mapping Document (1998) defines creative industries as *‘those activities which have their origin in individual creativity, skill and talent and which have the potential for wealth and job creation through the generation and exploitation of intellectual property’*. According to this definition the creative industries include: advertising, architecture, arts and antique markets, computer and video games, crafts, design, designer fashion, film and video, music, performing arts, publishing, software, television and radio. This definition excludes the heritage sector, archives, museums, libraries, tourism and sport although they remain part of the DCMS remit (De Propriis et al., 2009).

Howkins (2002) suggests that the term ‘creative industry’ should apply in all the cases where ‘brain power is preponderant and where the outcome is intellectual property’. The same argument is

taken up by Towse (2003), who considers the copyright concept as too wide-ranging, and criticises its usage as a determinant for defining the cultural industries. On this basis, there are no reasons why definitions such as the one by DCMS and others similar to it, should not include other sectors such as science or business.

It seems that confusion over terminology is bound to continue, as conflict persists between the two different viewpoints: the one which sees cultural production as just one type of creativity, and the other that considers culture and cultural products as something distinctive. Different labelling exercises, enacted for the purpose of uttering a sense of order in a sector that is strongly marked by large overlapping areas/non coinciding borders between the cultural and creative domains, have forced the problem of classification beyond the breaking point.

Indeed, subcategories that more often recur in classification schemes are highly inhomogeneous and the same distinctive characteristics may apply to different groups of industries; this leaves room for ambiguities. To clarify the concept: industries such as advertising, architecture, design, software, film, TV, music publishing, performing arts are strongly dependent to the **nature of labour inputs**, that is ‘creative individuals’; industries such as commercial art, creative arts, film and video, music, publishing, recorded media, software, are ‘copyright driven’, their performance relates to the **nature of asset and industry output**; digital content industries such as the commercial art, film and video, photography, electronic games, recorded media, sound recording, information storage and retrieval, rely on the **technology applied to the production process**; cultural industries such as museums and galleries, arts education, broadcasting and film, music and performing arts, literature, are often related to **public policy function and funding**. Defining criteria for classification of creative industries when dealing with such a complex organizational character, it is not an easy path to undertake. Furthermore, definition criteria are often subject to specific political and policy requirements.

In an attempt to capture the complexity of the subject and to provide a comprehensive definition of creative industries, UNCTAD (2008) proposes a ‘large sleeve’ scheme, that includes also manufacturing and service industries: *‘creative industries are cycles of creation, production and distribution of goods and services that use creativity and intellectual capital as primary inputs; constitute a set of knowledge-based activities, focused on but not limited to arts, potentially generating revenues from trade and intellectual property rights; comprise tangible products and intangible intellectual or artistic services with creative content, economic value and market objectives; are at the cross-road among the artisan, services and industrial sectors; and constitute a new dynamic sector in world trade’*. This classification has the advantage of being less restrictive because it encompasses both cultural and technological dimensions of creative industry. On the other hand, problems may arise when it comes up to mapping such a manifold definition. One question would be how ‘sharply’ the sector boundaries can be identified, in the presence of industries that are not intrinsically creative. The other concern is about the difficulty of providing homogeneously detailed statistical cover to all the subcategories.

These issues are addressed in detail in mapping documents that have proliferated in recent years. Reports analyse the state of the art of creative industries definitions, argue their own choices, and suggest a ‘newer’ classification. The lack of a common framework for classification brings about the inclusion or exclusion of entire groups of activities from classification schemes, returning in highly diversified measures of the economic weight of the creative sector. To illustrate this, in Figure 1-1 we have schematised the different weights that groups of economic activities (associations of SIC/NACE codes) might reach, as a function of the combination between the categories type (arts – cultural industries – creative industries) and their respective position in the value chain (creation – production – distribution). The further we move from the ‘core cultural’ categories and from the sphere of creation, the larger and undefined the codes associations become. Including or excluding these categories from the classification scheme involves the introduction of macroscopic differences with respect to other classifications.

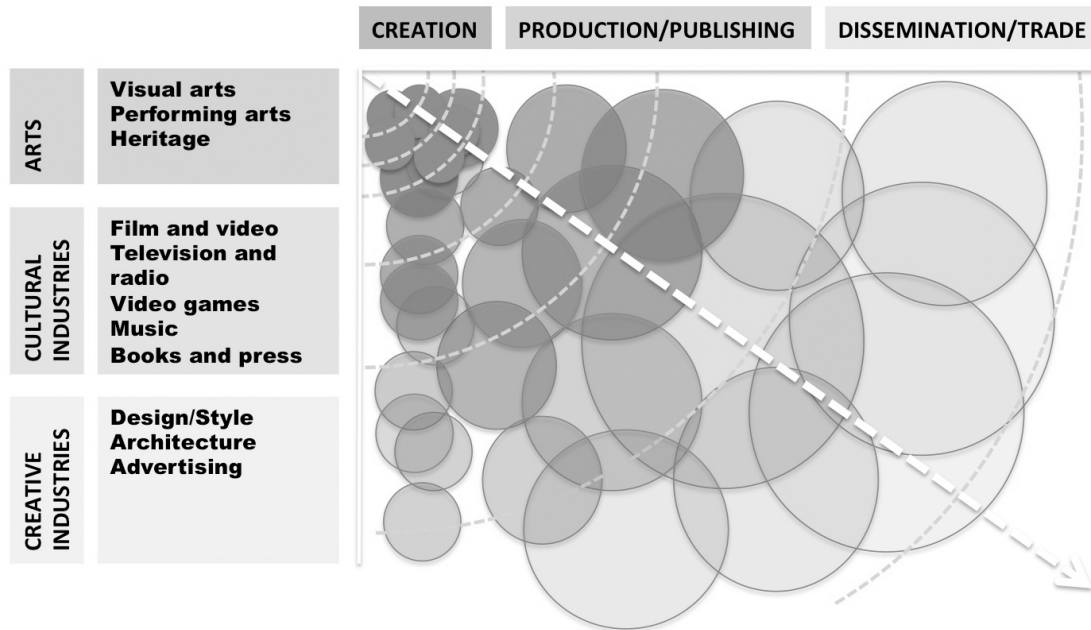


Figure 1-1 Schematic representation of different levels of creative activities associations.

### 1.3 Other conceptual issues

By now the creative sector embodied at its best by the cultural/creative industries is very fashionable in the academia and in the political scene. Its growing importance for the modern economy and for its post-ideological administrators cannot pass unnoticed. There is plenty of enthusiasm about the sector, both at international and national policy-making levels, to tap into its development potentials, ‘to unlock the full power of creativity’ upon the devastations of the recent economic crisis (European Commission, 2010b). Yet, there is one thing that risks to go unnoticed in the hype about the creative sector: the risk that beyond mere rhetoric about ‘creative cities’, ‘creative industry’, ‘creative technology’ lurks little of real understanding of what the concept really means, of the multiple dimensions it stands for. Pratt (2011b) argues that ‘...it is debatable whether a depth of understanding of the creative/cultural industries has been achieved. There remain a number of problematic relationships that are not fully understood: public and private, formal and informal, production and consumption, commercial and non-commercial...’.

In this endeavour the relatively large symbolic aura of the concept of creative/cultural industries ought to be properly taken into account so as to avoid distortion in its perception. Cultural industries are often defined in terms of their symbolic meaning (O’Connor, 1999), and according to the notion of ‘use value’ (Bilton and Leary, 2004; Martin, 2004). It is the communication of ideas rather than the functional value that really counts for the use of symbolic goods and services. This falls very much in line with the sociological insights of Luhmann’s grand theory of ‘society as communication’ (‘only what is communicated exists’ – Luhmann, 1984). Consequently all those activities that have as their final aim the communication of ‘representative production’, that is, of books, films, theatrical plays or music are considered to be part of the cultural industries. On the other side activities such as fashion design, advertising and architecture, even though they produce a highly symbolic content, yet do so by putting functionality as the first in line, are generally not considered as cultural industries. What these activities share in common, is that they all are about ‘personal experiences’. They create consumer demand by feeding ‘distinction’ (Bourdieu, 1984)

and by feeding on distinction. In so doing, they reduce consumer's sensitivity towards price by stretching from pure luxury to functional goods (Evans, 2009).

### 1.3.1 Key characteristics of cultural goods

Theodor Adorno was the first to point at the significance of the method of production in cultural industry when it comes to distinguishing between traditional or 'pre-industrial' means of production, and 'industrial' means of production of cultural industries (Garnham, 1990). Today's cultural industries are characterized by a more complex intertwining of industrial-scale production methods and symbolic meanings (Hesmondhalgh, 2002).

Yet, Adorno's dualistic viewpoint still holds, even though transposed to a different, more complex, virtual and post-industrial context, in the division/antagonism between the so-called 'classic' cultural industries (broadcasting, film, publishing and musical records), and 'new' cultural/communication communities (search engines, online video platforms such as Youtube, online social communities such as Facebook) also with a high level of specific branding and symbolic and social production through the means of 'social media'. One by now 'classical' definition of cultural industries that takes into account the intertwining of industrial with cultural production comes by Towse. According to Towse, cultural industries actually '*mass-produce goods and services with sufficient artistic content to be considered creatively and culturally significant. The essential features are industrial-scale production combined with cultural content*' (Towse, 2003). Towse makes another clear distinction between 'creative arts' and 'cultural industries'. The difference according to Towse is a difference of scale and it can be considered as the key for the definition of industrial versus non-industrial production: cultural industries employ industrial scale methods of production, creative arts don't. This sheer difference of scale was also pointed out by Williams, who distinguished between the corporate ownership methods of production associated with the development of mass reproductive technologies, and the survival of older artisanal methods of production (Williams, 1981).

The growing reproduction capacities of modern technology are often considered responsible for the so-called 'industrialization of culture', even though commodification of cultural products goes back to ancient history. As it is often the case in our modern world, also in the ancient world unique artistic products associated with symbolic and even sacred meaning, were nonetheless put for sale or exchanged for other objects. Here the production of coins in the ancient world or the early Chinese production of porcelain is brought as a typical example of increasing productivity via labour division (O'Connor, 2007).

In the early 20<sup>th</sup> century audio and video were first stored 'physically', now they are stored digitally and shared virtually with the entire globe. The cost for storing and sharing continues to fall, in what seems to be at first sight a total democratic push forward through the commons of information technology. Storage and reproduction are a central theme with regard to the commodification of art and of cultural products. The core of a cultural commodity contains an inherent tension between its use value and its exchange value. Cultural commodities are always cheaper to reproduce; yet the cost for *producing* them is always on the rise. Again, the more copies are sold, the greater is the return on the investment that includes the growing cost for the production of the original 'concept'. What we now witness is the collapse of the 'conceptualization' of a cultural product in its 'marketization' – the more they are harmonized, the less they differ. In a perfect vicious circle, marketization defines the cultural product before the latter is conceived, produced and reproduced as such. Caves (2000) maintains that the management of the marketization of cultural products is just another difficult business cycle management issue, whilst Ryan (1992) argues that there is a fundamental contradiction in it.

Regardless of the side one might take in this debate, it is clear that the level of unpredictability in consumer's behaviour towards cultural products is high, as the prediction and 'pre-programming' of the consumer's taste in the products proposed by the cultural industry is not possible (Peterson,

1990). Thus, the need for new, highly marketable cultural products is always intertwined with high demand unpredictability.

Another important question related to the cultural products is the computation of their exchange value. Miede (1989) proposes three archetypical modes for realizing exchange value. The first mode is the sale of physical objects that were seen as carriers of cultural content. These objects (books, videos, CDs) are sold to individuals. The second mode is the TV/radio broadcasting (TV/VOD 'Video on Demand') available to subscribers, or free of charge to TV viewers (in such case money was made through ads or by sponsorship, or even by taxation money in the case of public broadcasters). In this second mode of realising exchange value of cultural products, newspaper stay somewhere in the middle with part of the earnings made by direct sales, but with the most of the income realized by selling advertisement. The third mode relates to public performances (as cultural products) – theatre performances, concerts and cinema, which are offered to a limited numbers of direct viewers whom are charged the ticket price. Taking these three modes into account we see that the different specialized subsectors realize exchange value in their specific ways and manage demand and creative labour through greatly differing modalities and levels of capital investment and administration arrangements.

Creative labour is another bone of content in the cultural industries. Since the 17<sup>th</sup> century the free creative / free artist has been a central theme in the European and then American art tradition. The post-modern enslavement of the artist into the 'art factory' was taken up by Adorno, who predicted that any artist who wanted to remain free could do so only to starve. On the other side, the school of political economy with Williams (1981) argued that the 'free artisan' would not disappear under the conditions of mass production of cultural products. Williams accounted historically on the status of the artist as he moved away from patronage into a freelance market agent. Williams started his historical consideration with a post-artisanal phase, in which artists relied on intermediaries for distributing their products in the free market. As the intermediaries gradually invested more and more in the purchase of cultural products for the purpose of selling them at a profit, they controlled more and more the market, and their position vis-à-vis artists was growingly superior. At some point they could freely dictate to the artist the market demand and thus effectively influence (if not totally dictate) the supply. Finally, the intermediary, and not the artist, had direct relations with the market. The next stage of the status of artist was set in the 19<sup>th</sup> century, in which the artist was more of a market professional, that is, more of a freelance, involved directly in the marketing of his own products. By the active management of copyright and royalties the artist was able to receive a direct share from the exchange value of his merchandise. Williams set the final development stage of the status of artist in the 20<sup>th</sup> century, where the artist is transformed into 'a creative' – a corporate professional, employed full-time by corporate cultural producer. This phenomenon is seen very clearly in the 'new media' – cinema, TV, radio channels, online blogs, and so on, requiring a very high levels of capital investment in infrastructure, operations and technology.

To the definition of cultural industries the concept of joint goods is pivotal. Certain industries may produce certain cultural goods, yet in addition to, or as a complement to non-cultural goods. In sheer quantitative (financial) terms, the share of the cultural goods to the company's turnover might be considerable inferior to the share of the non-cultural goods. It is clear that the proportion of cultural versus non-cultural goods in this case is immeasurably bigger than in the creative arts sector. Martin (2004) claims that it is possible to clearly define whether a certain product is functional or cultural. Yet, this difference at times is hard to make. Architecture may be invoked here as an example: it is both functional and cultural. Facades and interiors of public and private buildings are more often than not clear cultural statements. In this case it would be up to us to decide to what extent this 'architectural product' is cultural versus functional.

This, to a certain extent, brings us back to the discussion about the symbolic meaning and the use value considered as a benchmark between the cultural and creative domains, and the consequent distinction that it is often made in classification schemes between economic activities having as 'first use' the communication of ideas, such as books, films, theatrical plays or music, and activities that have a primary functional value, such as fashion design, advertising and architecture.

Whilst methods of production and commodification cannot ultimately define the meaning of what culture is, they are key to understand why and how these industries should be addressed by economic and cultural policies.

### *1.3.2 Quantitative leaps*

There exists unquestionable proof on the profound impact of the quantitative leaps in the amount of cultural production in the course of human history. The invention of printing, in 1452, radically changed the dynamics of cultural production and consumption. In this context it is of paramount importance to note that the explosive development of the print media followed the golden rule of the free market press; the cheaper the copy, the more the potential profit. Every new technological improvement of the printing press reduced the time and effort for the reproduction (Briggs and Burke, 2005). This paved the way for the establishment and consolidation of a wide range of newspapers, political, religious and civic organizations. The new print media were market-oriented. The more viable they became, the more they grew. The more they grew, the more complex became the range of civic institutions living in symbiosis with them – salons, humanistic societies, private charitable societies, religious groups and their affiliated press, political newspapers, scientific communities and the like. These developments are certainly associated with the birth of the modern democratic state.

It can be easily argued that the new mass media (print media at that time, social media in the present time) became the incubator, the basic infrastructure, the carrier of the new ‘public sphere’ (Habermas, 1989). Habermas - a pupil of Adorno - contended that the public sphere was located somewhere between the State and the individual, and its vehicle was ‘public opinion’, which since then became responsible for the legitimation or contestation of all political, social or economic power.

In a similar manner, the explosion of digital social media is considered as a direct challenge to the ‘established’ methods of today’s cultural production and reproduction. In all cases, by drastically influencing the media these ‘initially technically-bound revolutions’ radically changed the landscape of communication, and ultimately society itself. Taking into account their particular role in influencing public perception and in directly or indirectly shaping public opinion through their capacities to articulate the very self-representation of society, to reproduce and change its hallmarks and symbols, cultural industries are thus located at the very centre of the vortex of modern (and post-modern) history.

## **1.4 Policy platforms**

Several international and national studies point at the system of cultural and creative production as one of the most dynamic sectors of the economy in developed countries. The KEA<sup>3</sup> report on the economy of culture in Europe (KEA, 2006) confirms that the weight of the cultural and creative sectors within the feeble European economy has registered a steady growth, yielding a positive impact on employment. The picture of the sector emerging from the data boasts a turnover of about 654 billion Euro, equal to 2.6% of the European GDP, a comparative growth of 12.3% with reference to the European economy as a whole, and an overall employment share of 3.1%.

The trend has been positive ever since. Four years later, the European Competitiveness Report (European Commission, 2010) established that, in the midst of a fully-fledged global economic crisis, the cultural and creative sectors in the EU accounted for 3.3% of GDP providing direct employment for 6.7 million people (3 % of total employment). In the last years, even though there

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<sup>3</sup> KEA is Europe’s leading consultancy and research center on culture and creative industries.



are conflicting accounts on the sectorial data, the creative and cultural industry managed to uphold a higher growth-to-GDP ratio if compared to the remaining sectors of the EU economy.

A recent communication by European Commission to the European Parliament entitled ‘Promoting cultural and creative sectors for the growth and jobs in the EU’ (2012), citing Eurostat EU-LFS, notes ‘... between 2008 and 2011, employment in the cultural and creative sectors proved more resilient than in the EU economy as a whole with growth rates varying however between sub-sectors. This tendency is all the more interesting because some sectors have a higher percentage of youth employment than the rest of the economy’ The communication defines the creative sector as ‘a largely untapped resource’ for future EU strategies.

Figures matter when looking at the fashion industry (including design, manufacturing of fashion materials and goods, and their distribution) and high-end industries (covering in particular high-end fashion, jewellery and watches, accessories, leather goods, perfumes and cosmetics, furniture and household appliances, cars, boats, as well as gastronomy, hotels and leisure), which rely on a strong cultural and creative input. They account for 3% of the EU GDP each and employ respectively 5 and 1 million people, with employment in the high-end industries expected to reach 2 million by 2020 (Idea Consult, 2012; Frontier Economics, 2012).

There is agreement on the fact that in developed countries creative industry is in a strategic position to trigger positive spill-overs in other industries, in particular in high-end industries and on innovation in general, by contending the importance of culture and creativity as a key underlying aspect in the value chain of an increasing number of sectors of economy. In other words, culture and creativity boost the added value of the economy. The increasing weight of design in the manufacturing industries is brought as an example to prove the point, through the markedly positive correlation between investment in creativity and innovation (Oakley et al., 2008).

These features perhaps help to better account for the recent shift towards creativity discussed in the previous sections, as well as the efforts in building up policies and programmes, which, from the year 2001 onwards, have resulted in a large number of documents on culture and creative industries.

#### *1.4.1 Framework policy documents: the global and European level*

Among the key reference policy documents on the field, the following are of particular note: the UNESCO Universal Declaration on Cultural Diversity, the Agenda 21 for Culture, the Convention on the Protection and Promotion of the Diversity of Cultural Expressions, and more specifically at the European level, the European Agenda for Culture, the EU Green Paper on Cultural and Creative Industries, and the EU Work Plan for Culture 2011-2014.

The UNESCO Universal Declaration on cultural diversity, adopted in 2001 by the UNESCO General Conference, focuses on the preservation of cultural diversity as a necessary element for humankind (UNESCO, 2001). Along with the Declaration, an Action Plan for its implementation was issued, providing guidelines for the development of public policies in the field of culture. The main lines of the Action Plan include, amongst others, the preservation of cultural heritage, the strengthening of cultural industries in all the countries, the recognition of the rights of authors and artists.

The Agenda 21 for Culture (2004) is the EU reference policy document on culture for cities and local governments. Based on the UNESCO Declaration, it develops detailed priorities for local cultural policies by addressing governance, sustainability, social inclusion and economy. Decentralization of cultural policies and intergovernmental coordination cultural indicators are considered key issues to be addressed by local governments. In analogy to the UNESCO Declaration, cultural heritage, cultural industries, access to the digital dimension of culture, rights of authors and artists are listed amongst the Agenda 21 for Culture priorities. This document considers cultural promotion “as a catalyst for creativity and innovation in the context of the Lisbon Strategy for jobs and growth”. To be noted here the direct link between culture and economic growth.

The European Agenda for Culture in a globalising world – issued by the European Commission in 2007– is the first ‘comprehensive’ cultural policy at the European level. It lists amongst its

general objectives the promotion of cultural diversity and intercultural dialogue, the promotion of culture as a catalyst for creativity and as a vital element in the EU's international relations (European Commission, 2007). The Agenda was followed by the publication in 2010 of the document 'Green Paper, unlocking the potential of cultural and creative industries' whose aim was '*...to spark a debate on the requirements of a truly stimulating creative environment for the EU's Cultural and Creative Industries...*'. This document identifies priorities for cultural policies, such as: cultural diversity; the digital shift; new spaces for experimentation, innovation and entrepreneurship; new skills; access to funding; and mobility of cultural workers.

The Work Plan for Culture 2011-2014 is a more 'pragmatic' document that proposes concrete guidelines and actions for achieving the priorities pointed out in the European Agenda for Culture. It is based on the Europe 2020 Strategy, issued in 2010, introducing key concepts of smart, sustainable and inclusive growth, obviously linked to knowledge and innovation. Cultural and creative industries, cultural heritage and culture statistics are listed amongst its priority areas (Council of the European Union, 2010).

These concepts and strategies are closely linked to how the funding mechanisms on the creative sector are developed. In times of crisis access to EU funds becomes more and more strategic. In this situation, EU funding for culture has undergone substantial transformations.

#### *1.4.2 Programmes at the EU level*

The most notable programmes aimed at sustaining culture policies at the EU level are Creative Europe, Horizon 2020, EuropeAid, the European Years, and the European Capitals of Culture.

Creative Europe is by far the largest culture-specific funding mechanism of the EU. It particularly targets creative and cultural sectors with over 1.8 billion Euros earmarked for the timeframe 2014-2020 inline with the Europe 2020 strategy (European Commission, 2010a). It intervenes directly on the economic dimension of culture, through loans and financing for the cultural sector. Creative Europe proposes to address several challenges related to 1) the lack of access to finance for European cultural projects 2) the fragmentation of the cultural space across the EU member states; 3) the digital revolution and 4) lack of available data on cultural/creative industries (European Commission, 2012a). The overarching objective of Creative Europe is '*To foster, to safeguard and to promote European cultural and linguistic diversity and to strengthen the competitiveness of the cultural and creative sectors with a view to promoting smart, sustainable and inclusive growth*' (ibid.). It proposes to do so by direct funding for the cultural sector, for the development of new audiences and for cross-border and transnational cooperation.

Horizon 2020 (European Commission, 2011b) is main EU instrument for funding research, including research into cultural/creative industry projects, with a specific focus on innovation. The three strategic work directions of Horizon 2020 are competitive industries, excellence in science and better society. The common thread linking the three main goals is innovation. Cultural industries may make the difference in all three fields as far as research and development is concerned, even though their contribution in the 'excellence in science' may not be visible at first sight. In the work direction of competitive industries, they can promote job creation through research into 'creative jobs. The creative and cultural industries can create jobs themselves through small and medium-size companies that constitute a specific field of interest for Horizon 2020 with regard to the promotion of competitive industries.

The European Capitals of Culture and the European Years are two additional formats that may impact promotion of cultural industries. The topic of the European Years changes annually. Depending on the topic, cultural industries and the initiatives related to them can be supported directly or indirectly. For example the year 2009 was the European Year of Innovation and Creativity. That made a good opportunity for the promotion of cultural industry projects and concepts, and for research project into cultural industries in particular.

### 1.4.3 Challenges to implementation of EU cultural policies

The juxtaposition of the political documents on culture and EU programmes providing funds for cultural and creative industries, points at several important conclusions. There is, above all, widespread consensus about the importance of culture as a key ingredient for the functioning of the creative economy as an economic driver in Europe. Based on this premise, EU policy documents focus on the development of CCIs, on the connection between culture and employment ('new skills for new jobs'), creativity and innovation. These policy documents are reflected in dedicated funding instruments, geared on cultural/creative industries as an European economic driver –, more specifically, on CCIs as the economic incarnation of this driver. Out of these EU policy instruments, Horizon 2020 has a prominent focus on creative/cultural industries.

European culture is more and more considered as a catalyst for economic innovation and creativity, export and internalisation of culture, new skills and new jobs. Funding culture is considered as a direct or as an indirect means to this end. Hence culture becomes a sort of excellent provider of 'added value' and a source of comparative advantage for European products. Documents such as the Green Paper are aimed at making the point to definitely prove the undisputable contribution of culture to the European economy. Creative Europe and Horizon 2020 are two examples of policy backed by consistent funding instruments. In order for the European institutions to gauge the impact of cultural policies on economy, the above-mentioned policy documents such as Agenda 21, the European Agenda for Culture and the Work Plan for Culture urge for the development of new cultural statistics and indicators able to measure the effectively and effectiveness of programs in terms of economic output at the overall EU and at the regional cross-country level. To be noted that in the period 2007 - 2013 the EU was able to allocate over 6 billion EUR on supporting regional cooperation among EU countries in the areas of culture, creativity or creative industries<sup>4</sup>. That accounted already for 1.7% of the total budget, of which:

- € 3 billion were allocated for the protection and preservation of cultural heritage;
- € 2.2 billion were allocated for the development of cultural infrastructure, and
- € 775 million were allocated to provide support for cultural services.

Further support is provided to creative industries under other budget lines: research and innovation, promotion of SMEs, information society and human capital. Yet, beyond the glamour and the rhetoric, the importance of such support is easy to be overrated. It is very likely that the overall percentage of funding for purely culture-based projects in the EU structural funds is considerably inferior the percentage of funding for purely economy-based projects. It is arguable that such division puts culture markedly below its potential to contribute towards the achievement of the Union's Cohesion policy. In fact, investments in culture per se (as detached by the CCIs), starting from 2007 were mostly related to the protection and/or promotion of cultural heritage, funding for infrastructure and services with a view of enhancing the touristic potentials of cultural heritage sites. The ERDF Regulation (Art 4) explicitly states that certain priorities for investment address directly culture: '*protection and preservation of cultural heritage; development of cultural infrastructure and cultural services*'<sup>5</sup>. At any rate, in terms of factual funding, culture-related projects may lag behind other types of projects supported by Structural Funds, such as creative industries. In the latter case, support through Structural Funds goes to research and innovation (networks, entrepreneurship, SMEs, clusters), information society (digitisation), education, urban requalification (in the framework of integrated projects), investment in human capital<sup>6</sup>, yet no data

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<sup>4</sup> Statistics by Infoview DG Regio database: [http://ec.europa.eu/regional\\_policy/projects/stories/index\\_en.cfm](http://ec.europa.eu/regional_policy/projects/stories/index_en.cfm) (accessed 24/12/2014).

<sup>5</sup> Regulation (EC) No 1080/2006 of the European Parliament and of the Council of 5 July 2006: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32006R1080> (accessed 24/12/2014)

<sup>6</sup> EU Member States and regions are invited to use Structural Funds to finance their own strategies in this field through investment priorities such as "promoting centres of competence; promoting clusters; developing ICT products and services; promoting entrepreneurship; developing new business models for SMEs in particular for

on the share these industries get through Structural Funds is really available. Very often cultural projects have to compete for their share in Structural Funds with infrastructure projects, such as construction of regional highways that link regions divided by national borders. In this situation, it seems like that direct investment in culture is growingly challenged by a trend towards ‘integration into other budget headings’, as one for critical purposes intentionally biased reading of the following paragraph on the European Agenda for Culture – Policy Handbook may suggest:

*‘The challenge is how to further integrate the cultural and creative sectors into regional innovation strategies for smart specialisation, which in the current Commission proposals will be an ex ante conditionality to access funds. To this end, regions have to fully take into consideration the complex links between traditional cultural assets (cultural heritage, dynamic cultural institutions and services) and the development of creative businesses or tourism’* (European Union, 2012).

Measuring inputs and impact of policy measures in the field of cultural/creative industries is a growingly difficult issue. Cultural policies are highly different in nature and in scope, ranging from the local, to the regional and to the global level. Defining and quantifying cultural/creative sectors and measuring reference variables is very challenging, taking into account the difficulty to measure sectors that are so heterogeneous, interconnected and integrated with other sectors. Official statistics cannot capture the full phenomenon of CCIs. Plenty of creative and cultural activities are run from outside of the ‘official’ functioning of businesses and companies. They are run by non-permanent staff, by freelancers, maybe on short-term, project basis. The digital revolution of the last decades has brought many sectors to converge and overlap, with many innovative forms of doing business, and in particular, culture-related business. These, in turn, are more and more difficult to be accounted for by traditional statistical sources. Suffice to note that the ‘core’ activities accounting for the bulk of the creative industries sector - *advertising, design, communication*, are of a highly transversal nature, and growingly interconnected to other sectors. Very often these businesses are integrated into highly complex consulting firms that have little or nothing to do with downright cultural and creative industries. The approach based on classification schemes of economic activities according to their SIC/NACE code is subject to severe limitations when it comes to CCIs. Yet, for many national and international institutions dealing with cultural statistics, this approach appears to be the only viable way for measuring the economic impact of the sector.

## 1.5 The mapping issue

The statistical challenge regarding cultural and creative industries is matched in its complexity by the sector-specific strategic challenge, as its limits are vague and vary according to the definitions and approaches used. Recent developments at European level have shown the willingness to produce reliable and comparable statistics, which would be able to assess the actual contribution of the sector to the economic and social development of Europe. Since 1997 Eurostat, the statistical office of the European Union has developed statistics on culture with the contribution of the Leadership Group on Culture (known as LEG).

The European Union approach on defining the cultural and creative sector has evolved during the years. The initial LEG classification on ‘cultural’ industries, based on 17 sub categories, was

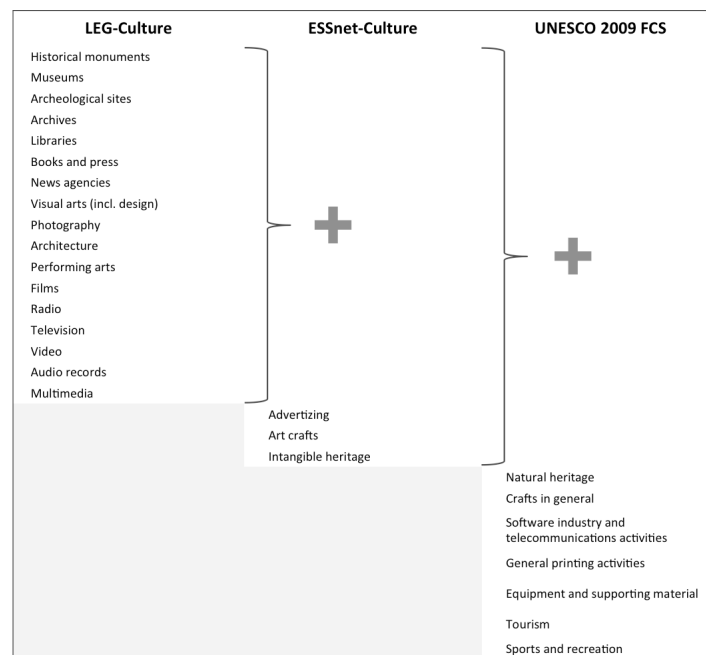
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internationalisation; improving the urban environment; developing business incubators; supporting the physical and economic regeneration of urban and rural areas and communities, etc.’ - *Linking thematic objectives of the Commission Staff Working Document “Elements for a Common Strategic Framework” to culture and CCIs*

taken over by the KEA (2006) classification scheme, adopted for the purpose of measuring the economic weight of the cultural sector at European level. KEA classification builds on the following three conceptual layers to define the constitutive elements of the sector: arts; cultural industries; creative industries. The ‘arts’ gather a host of activities – the so-called Subsidized muses – that include: visual arts, performing arts, historical and artistic heritage, which are predominantly not oriented towards profit, except for relatively limited sub-domains. The ‘cultural industries’ refer to the industries of mass reproduction and distribution – as suggested by Adorno –, plus the new media. They are organised in six categories: publishing, film, music, radio, television and video games. Cultural activities are complemented by production activities in which the cultural experience is a non functional asset (no additional value with respect to the cultural fruition). The ‘creative industries’ include three sectors, in which the creative component is balanced by considerations of utility related to extra-cultural fruition, which include fashion, architecture and advertising. This classification scheme, inspired by the work of Australian cultural economist David Throsby, reflects the historical phases of the development of the CCIs concept and, most importantly, accounts for the distinction between cultural productions that necessitate the ‘visible hand’ and those that are distributed through the market.

The disjointed term ‘cultural and creative industries’ appeared first in the document ‘Green Paper, Unlocking the potential of cultural and creative industries’ (European Commission, 2010). This policy document dismisses the previous conceptual organisation, considering the cultural sector as a whole. In so doing, it assimilates both the corporate and public sector into the ‘new’ conceptual definition of the ‘cultural and creative industries’. As a result, predominantly public-funded branches of the cultural industries, such as theatres, museums and libraries and so on, are considered jointly to the private sector.

ESSnet, a centre and network of excellence, was created in 2009, under the aegis of Eurostat and funded by the European Commission. Its assignment was to improve methodology and production of data on cultural sectors so as to meet the needs for better comparability at European level. The ESSnet-Culture report, dated 2012, highlights the fact that there are various concepts of cultural industries and that the term of Cultural and Creative Industries (CCIs) is widely used in the EU-policy. Thus, extending the notion of the cultural industries to include specific creative sectors was seen as an expedient for remaining ‘*part of the international creative industries debate*’ (ESSnet-Culture, 2012).



**Figure 1-2** Comparison of cultural domains covered by the European and UNESCO statistics frameworks (from ESSnet-Culture Final Report, 2012).

ESSnet-Culture has as primary objective the production of comparable data, therefore it suggests a *'minimal but solid and realistic approach based on common standards and existing classifications'* based on the NACE classification codes for economic activities. The 'cultural and creative industries' (CCIs) include ten cultural domains (heritage, archives, libraries, books and press, visual arts, performing arts, audiovisual and multimedia, architecture, advertising, art and crafts) and six economic functions: creation, production and publishing, dissemination and trade, preservation, education, management and regulation. With this approach, software and ICT sectors are not included in the cultural and creative industries. Figure 1-2 illustrates the cultural domains identified by ESSnet-Culture, as compared to the previous LEG-Culture definition and the wider UNESCO definition.

The cultural and creative sector is by no means easy to map, considering its heterogeneous nature, its complexity and its elevated fragmentation. In measuring the economic impact of the sector, national approaches often favour specific fields of cultural activities, on the basis of local cultural traditions or explicit policy needs. Suffice to note that the British approach, which advocates the economic concept of 'creative industries', places creativity at the heart of production processes and considers its products as intellectual property (and not only as copyrights). The French approach of 'cultural industries' is centred on the concept of 'content industry', which is based on mass reproduction and copyrights. The Scandinavian approach of 'culture and experience economy' is largely based on technological progress that facilitates the access and the distribution of cultural products (Santagata, 2009; Bille, 2012).

There is a clear dualism in Europe, distinguishing between countries that have developed functional strategies for the cultural and/or creative sector, such as the UK, France, Holland, Nordic countries, German-speaking countries, and the countries of the Mediterranean (Greece, Italy) as well as some former Socialist countries (Romania, Czech Republic) which focus their strategies on cultural heritage and cultural tourism, with cultural industries and creativity playing a subordinate role (Interarts and EFAH 2003).

By looking closely to the case of Italy, there might be historical and structural factors accounting for such approach. The country is deeply marked by the sheer weight of its heritage. It also has other important peculiarities, such as the fashion and style production, and a long-standing tradition of tourism. This, in turn, makes it difficult for Italy to align itself to Northern European schemes of cultural/creative sector policies, which are trending throughout the globe. However, something is changing in the direction of policy guidelines that are coherent with European Union vision for cultural and creative industries. A strategic achievement was the establishment of the Commission on Creativity and Cultural Production (*DM 30 November 2007*), which produced in 2007 the *White Book of Creativity*, which focus was prevalently on quality of life and well-being, and which included amongst cultural and creative industries the industry of 'gusto'. However, this document did not find implementation into concrete measures of cultural policy.

Arguably, there might be a conceptual limit preventing Italy from fully integrating culture in the productive sectors of the economy. In Italy, the cultural and creative activities that have a higher affinity with manufacturing, such as design and fashion, are perceived and considered as belonging to the 'traditional' manufacturing sector, rather than to the cultural and creative sectors. As a result they are assimilated to sectors more closely linked to the production of household appliances or machines for packaging rather than to visual arts, film or architecture. The consequence of this limitation is loss of information on structural interdependencies between the various areas of creativity, ending up with a failure to sustain sectors that, although non profitable, constitute important fields of experimentation and innovation having a very strong impact on the 'manufacturing' creativity of design and fashion (Santagata, 2009). On the other hand, Italy has some 'own' relevant and interesting specificities in its system of production interdependencies which, if properly understood and exploited, could be at the basis for a 'native' strategic, effective and competitive approach, in the global developments scenario.

As for the rest of the continent, different interpretations of cultural industries have been published for Italy, resulting in highly different estimates. According to the KEA study on the economic weight of cultural industries in European countries, the share of the cultural sector in 2003 was 2.3% of Italy's GDP (KEA, 2006). One year later, the Italy's 'White Book on Creativity' estimated the weight of the cultural sector at 9.3% of the 2004s GDP, by factoring in the entire value chain production related to culture and creativity (including distribution), and by adding up 'Enogastronomia' to fashion and design for a comprehensive Made in Italy creativity/cultural brand (Santagata 2009). The recent study 'Io sono Cultura' gave a different assessment, reflecting a methodological approach, which is similar to the KEAs conceptual classification, but rather more inclusive. According to this study, in 2013 the cultural industries share in the country's GDP was 5.4%. This sector accounts for 7.3% of the total industries and for 5.8% of the total employment (Symbolia, 2014). 'L'indagine Civita', avowedly in line with the ESSnet-Culture approach but adopting a more restrictive definition, maintains that in 2010 the cultural and creative industries account for 4.5% of the total industries and for 2.3% of the total employment (Valentini, 2012).

These figures confirm what we have argued ever since, that is the resulting fallacious image of the cultural sector, determined by the lack of univocal criteria for its delimitation. To illustrate this aspect, hereinafter we compare three classification schemes and the resulting delimitation of the CCI sector in the Metropolitan region of Rome, in year 2009. The data used for this purpose are from The Statistical Archive of Local Units of Active Enterprises (Archivio Statistico delle Unità Locali delle Imprese Attive: ASIA-UL), provided by the National Institute of Statistics. This is a business register annually updated through a process of integration of administrative and statistical sources. ASIA-UL is constituted by economic units exercising trades and professions in industrial commercial and services activities. It provides identification information (name and address) and information about the structure (economic activity, dependent and independent workers, legal form, turnover) of such units. The data concern the economic activity (5 digit ATECO code) and the number of employees of local units dependent on the main enterprise, being active for at least six months during the reference year. ATECO database refers to private economic activities only, thus cultural activities owned by the state are invisible in the classification schemes that make use of this data.

The first definition is from the 'Report on the creative industries' by DCMS, that uses 5 digit SIC codes (De Propriis et al., 2009), adapted for the Italian ATECO categories. According to this definition, for every creative sector activities are classified in 'layers', which can be interpreted as stages in a creative value chain. Content creation is located at the 'core' and other functions such as distribution and production of complementary outputs lay in the 'periphery' of the classification system (Wilkinson, 2007). Layer one includes more intrinsically creative activities at the top of each supply chain (for example, composition for the music industry, programming for the computer games industry and writing for the publishing industry). Layer two includes those activities that directly support layer one activities in the supply chain (for example, casting for the performing arts). Layer three includes the manufacture of the hardware that directly supports the creative process (for example, the manufacture of television cameras and other hardware directly used in creating television programmes). Layer four includes the manufacture and wholesale of raw materials and the manufacture of hardware used in the consumption of creative industry products (for example, arcade machines for computer games). Layer five includes the sales of creative products (for example the sale of games consoles for the computer games industry). This value chain approach is aligned with other international models, such as the one by UNCTAD (2008) and, to a certain extent, can be considered as a precursor of the ESSnet-Culture (2012) concept of 'economic functions'.

Two Italian classifications ('Io sono cultura' (ISC) and 'Civita') are compared to the DCMS 'reference definition', taken as a whole and, successively, restricted only to the intrinsically creative activities and the activities that directly support them (layers one and two). Table 1-1 and Table 1-2 report the number of creative firms and employees respectively, in the year of observation 2009. Sectors are grouped according to their belonging to the conceptual fields of 'arts', 'cultural

industries' or 'creative industries', to allow an assessment of their specific weight according to the different classifications.

When looking at absolute values, we find that the CCIs sector counts for almost 30 % of the firms in the Metropolitan region of Rome, if we consider the DCMS inclusive definition. This feature drops down to 6.30 % when the restrictive definition by 'Civita' is applied. The 'in-between' classification by ISC returns an estimate on almost 14% of share, which is in line with current estimates of the CCIs share in metropolitan areas in the more advanced economies (Scot 2000).

**Table 1-1** Firms in the CCIs industries in 2009 in the Metropolitan area of Rome, according to the different classification schemes.

	<b>Sectors</b>	<b>DCMS</b>	<b>DCMS-L1L2</b>	<b>ISC</b>	<b>CIVITA</b>
ARTS	Visual arts	961	755	961	961
	Performing arts	5204	4428	5283	3739
	Heritage	122	122	122	50
CULTURAL INDUSTRIES	Books and press	7133	3777	5717	3892
	Film, video, radio and TV	2340	1843	2200	2175
	Video games and software	7579	5918	5923	5
	Music	401	0	246	190
CREATIVE INDUSTRIES	Design	1906	1906	1906	1906
	Style	15053	1397	11083	0
	Architecture	51000	11512	11512	6758
	Advertising	1900	1494	1900	1900
<i>Total CCIs</i>		<i>93599</i>	<i>33152</i>	<i>46853</i>	<i>21576</i>
<i>Total MA Rome</i>		<b>342296</b>			
<i>CCIs weight %</i>		<i>29.18</i>	<i>9.63</i>	<i>13.69</i>	<i>6.30</i>

**Table 1-2** Employment in the CCIs industries in 2009 in the Metropolitan area of Rome, according to the different classification schemes.

	<b>Sectors</b>	<b>DCMS</b>	<b>DCMS-L1L2</b>	<b>ISC</b>	<b>CIVITA</b>
ARTS	Visual arts	1254	895	1254	1254
	Performing arts	9013	7244	9224	5306
	Heritage	1459	1459	1459	955
CULTURAL INDUSTRIES	Books and press	22708	9474	21097	10776
	Film, video, radio and TV	29544	25999	29061	28857
	Video games and software	49245	42209	42256	47
	Music	868	0	538	307
CREATIVE INDUSTRIES	Design	2526	2526	2526	2526
	Style	38614	2401	43599	0
	Architecture	145494	18263	18263	7272
	Advertising	4810	3530	4810	4810
<i>Total employees in CCIs</i>		<i>305535</i>	<i>114000</i>	<i>174087</i>	<i>62110</i>
<i>Total MA Rome</i>		<b>1263262</b>			
<i>CCIs employment weight %</i>		<i>25.41</i>	<i>8.87</i>	<i>13.78</i>	<i>4.92</i>



The weight of the CCIs sector reduces when we look at the employment features, which reveal lower percentages of share if compared to the number of firms. This may be explained by the very high incidence of SMEs, in the DCMS and in the Civita classifications. The ISC classification is an exception, since its weight compared to the whole production system in the study area remains similar both for the number of firms and for the number of employees. The principal difference between this classification and the one by Civita is the inclusion of a major number of ‘related’ industries in the fields of performing arts, books and press, music, as well as the sector of ‘style’, composed by manufacture activities related to fashion and high-end industries (jewellery, watches, accessories, cosmetics, furniture, gastronomy). These industries, omitted by Civita classification, account for a larger employment share if compared to the micro-firms that are typical of the creative sector. The same holds for some ‘support’ segments, such as construction activities for architecture, which have been included as a whole in the DCMS classification, causing the employment share to shrink, if compared to the number of industries.

Another striking feature relates to the differences between the DCMS classification, considered in its restricted form of ‘core’ activities only (L1 and L2 layers), and the classification by Civita, which admittedly leaves out of the CCIs sector all production and trade activities. To illustrate this we take as an example the music subcategory. If we look at the ATECO codes inherent to music, we find ‘music recording activities’ and ‘editions of printed music’. These activities are included by the Civita classification but excluded in the DCMS-L1L2 classification, none of them being ‘content creation’ activities.

Figure 1-3 illustrates the robustness of the definition of various subsectors within different classifications. For each subsector we have identified the ATECO codes used at least once by the classification schemes, and counted the percentage of activities that are included and excluded in each subcategory. We observe that ATECO codes associations belonging to: visual arts, heritage, design and advertising activities are fully included in the three classification schemes. Performing arts, video, film, radio and television also show a high degree of inclusion, while the rest of the sectors are included or excluded at different degrees in the classification schemes. These are the areas with greater economic relevance: architecture, style, video games and software, books and press. In addition, their value chains are more complex, so as subjectivity in the selection criteria may easily occur, causing discrepancies and imbalances (for example: one would tend to include the construction of musical instruments in the classification scheme, but would think twice before including the construction firms).

Perhaps this evidence provides some explanation for highly discordant numbers and the blurred boundaries of the CCIs sector. Discrepancies become evident when comparing national classifications. Each county has productive sectors that count more than others, depending on the historical, cultural and economic context; CCIs numbers are function of these peculiarities. Therefore, it is hardly surprising the fact that the UK includes the whole software sector and Italy the whole ‘style’ sector.

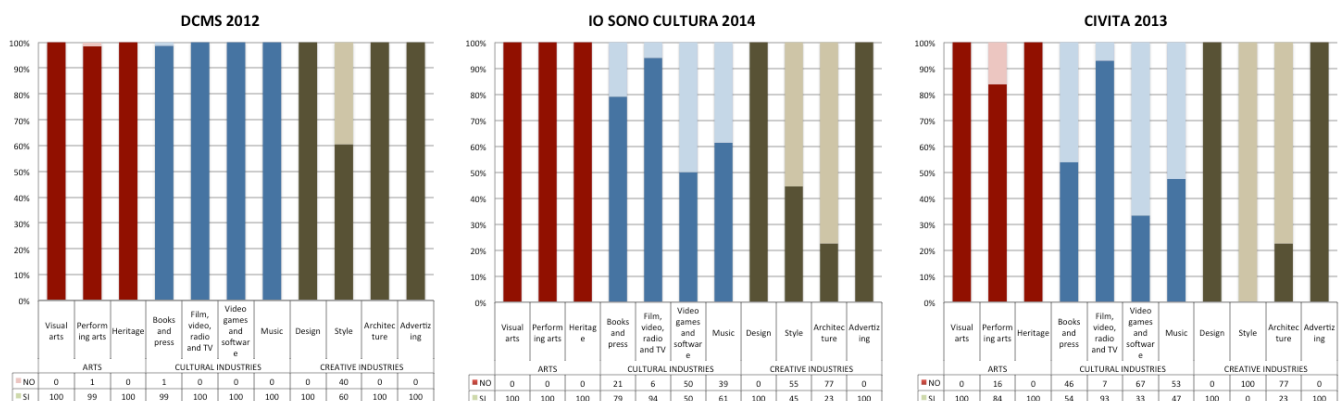
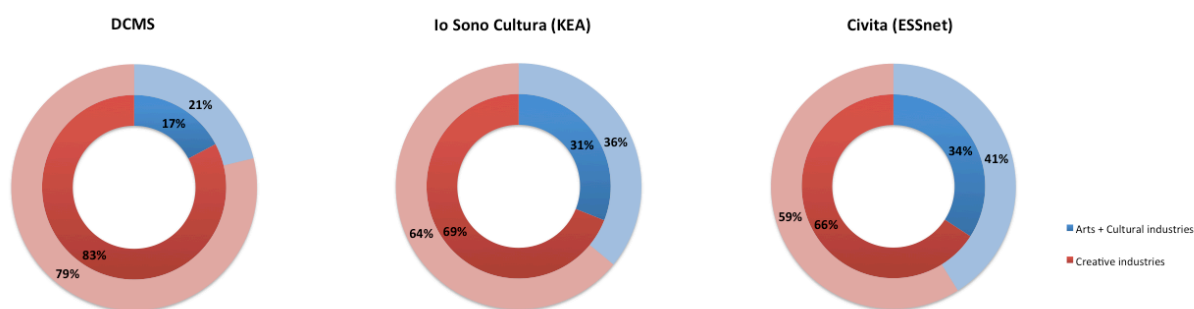


Figure 1-3 Level of inclusiveness of the CCIs sectors according to the different classification schemes.

Figure 1-4 illustrates the specific weight of the creative activities (design, style, architecture and advertising) within each classification. In the case of DCMS this feature counts something more than 80% of the total CCI sector. The two Italian classifications have similar proportions (a bit less than 70%), although having different dimensions. The more extensive the creative sector, the greater is the share of productive sectors in the value chain, and the presence of activities operating in the field of High Tech. These are highly attractive to policy makers, because of their capacity to boost access to funds.



**Figure 1-4** Relative weight of the creative macro sector within the CCIs, according to the different classification schemes.

In this context the EU efforts for better comparability of the cultural sectors, through the establishment of a common methodology for data production, is valuable. Being aware of the definition dilemma, ESSnet – Culture ‘*recommends strongly when speaking about cultural and creative industries, to clearly mention the sectors that are covered, so that the scope is clearly indicated for the sake of comparability*’ (European Commission, 2012).

In order to fully understand the CCI sector and its complexity, mapping its economic weight is a useful exercise, but it is not enough. It would be necessary to look to the relations of the sectors with each other and with the territory.

## 1.6 Spatial dimension of creativity

### 1.6.1 Knowledge economy

Creative economy is clearly linked to the process of metropolization, to the knowledge economy and their economic background. The semantic profusion that characterizes research on these topics might show some confusion: the knowledge economy promotes learning regions/cities (Florida, 1995; Storper, 1997; Morgan, 1997; Glaeser, 1999), intelligent cities (Komninos, 2002), innovative milieus (Aydalot, 1986; Maillat and Vasserot, 1986; Camagni, 1995), creative cities (Landry, 2001; Cohendet et al., 2010), nursery cities (Duranton et Puga, 2001), knowledge cities (Ovalle et al., 2004; Yigitcanlar et al., 2007), urban clusters (Gaschet and Lacour, 2007). Theoretical proposals share a common set of inspirations; yet, they remain heterogeneous and sometimes contradictory. Research traces that more clearly emerge relate to economic geography and the inclusion of dynamic externalities in the process of urban growth, the economy of knowledge and its deployment to the concept of ‘knowledge city’, the concept of creativity and creative clusters (Gaschet, Lacour and Puissant, 2011).

The acknowledgment of the active role of cities in the process of economic growth was renewed since the work of Romer (1986) and Lucas (1988) on knowledge spillovers and, later on, with the Krugman's core-periphery model that launched the new economic geography (Krugman, 1991). These influential contributions, highlighting the geographically localized character of interactions, have stimulated the economic analysis of spatial issues, integrating economic geography with mainstream economics and the more traditional research in urban and regional economics (Fujita and Krugman, 1995, Fujita, Krugman and Venables, 1999; Fujita, Krugman and Mori, 1999). Several studies have shown the superiority of dense and diversified urban environments that have a higher capacity to innovate (Henderson et al., 1995; Audretsch, 2002; Feldman, 1996; 1999; Duranton and Puga, 2001; Boshma and Iammarino, 2009). Cities are not only places that benefit from the presence of infrastructure and of specialized and diversified suppliers; they are also the places where benefits associated with urban concentration are produced over time and endogenously.

The rich debate on these issues has reanimated the opposition between localization and urbanization economies, transposing it in terms of opposition between Marshall-Arrow-Romer-type of dynamic externalities, which refer to technological spillovers between firms in the same industry, and externalities theorized by Jacobs (1969) which consider industrial externalities related to the diversity as the main source of innovation and growth (Eaton and Eckstein, 1997; Peri, 1998; Henderson et al., 1995; Black and Henderson, 1999; Glaeser and Maré, 2001; Rosenthal and Strange, 2008). Recently, a new stream of research presents a more nuanced view of the benefits brought by 'specialisation' and 'diversity'. Proponents of the 'related variety' concept have argued that beneficial externalities are more important in geographical areas where diverse sectors are able to develop intense relationships. Variety is indeed a source of competitive advantage for the firms located in a place, but only if the diverse sectors that are located together have complementary capabilities and resources. In these cases, 'knowledge spillovers' take place around a 'theme', rather than around a sector (Asheim et al., 2007; Cooke, 2007; Boschma and Iammarino, 2007).

Other studies focus more specifically on the relationships between the metropolization and the 'knowledge economy'. This term identifies emerging industries and activities that differ from the traditional sectors for a systematic and extensive use of knowledge. Many activities within high-technology manufacturing, business and financial services and creative industries, fit this description (Lash and Urry, 1994; Scott, 2001a; Healy, 2002b). The rise of 'knowledge-intensive services', often cited as the main metropolization force (Duranton and Puga, 2005), is not the only component of the process of structural change affecting the transition to the knowledge economy of metropolitan areas; Van Widen et al. (2007) define knowledge city through the interaction between the knowledge base and other components of urban dynamics (industrial structure, urban amenities, accessibility). Wood (2006) also stresses the notion of the spatial reorganization of metropolitan economies under the impulse of knowledge-intensive services.

The process of metropolization is as well influenced by the so-called 'advanced producer services' providing intermediation between production and consumption (Marshall and Wood, 1995) and centred around the financial sector, which are considered by Sassen (2001) as a distinctive characteristic of global cities. Creative activities such as design and advertising or media and new media are identified in literature as advanced producer services (Beaverstock et al. 1999; Krätke, 2003; Krätke and Taylor, 2004). Pratt (2011a) underlines the fact that creative industries in general might be considered as advanced producer services when they are in the conditions of acting as nodes within international production systems.

According to Florida (2002, 2004), creativity has become the key competence in the knowledge economy, giving rise to the emergence of a distinct 'creative class'. The presence of creative people has become the driving force of local economic development, promoting innovation and production of knowledge. The capacity of cities to attract creative individuals in their choice of residential location fosters the location of knowledge-intensive activities and job creation. Florida's

controversial thesis on the rise of the ‘creative class’ and its role in the regional development has undergone increasing popularity in North America and in Europe, as witnessed by different national and international initiatives (Asheim, 2009; Andersen and Lorenzen, 2007; Chantelot, 2006; 2009). This approach introduces alternative measures of human capital such as tolerance, bohemian index or gay index, much discussed and criticized (Peck, 2005; Montgomery, 2005; Nathan, 2007; Glaeser, 2005; Markusen, 2006; Donegan et al., 2008). Storper and Scott (2009) disapprove the excessive focus on residential amenities as the foundation of the metropolitan dynamics and point out the theoretical weaknesses of this approach who neglect the essential, structural contribution of productive logics as well as institutional forms by which the concentration of human capital can generate creative innovation dynamics and collective knowledge (Landry, 2000; Rosenthal and Strange, 2004).

The debate has fuelled further research focusing on the role of creative professions, the processes and the determinants for creative clustering and their impacts (Markusen and King, 2003; Florida, 2002, 2004; Lee et al., 2004; Markusen, 2006; Scott, 2006; 2010; Lacour and Puissant, 2007; Asheim and Hansen, 2009; Lazzarretti et al., 2012).

### 1.6.2 Creative milieu

The specific role of the city and the connections between the cultural significance of places and their economic performance constitute a fertile research stream. There has been increasing emphasis on the ‘atmosphere’ (Marshall, 1890), the buzz, the scene, the *genius loci*, which make up a ‘creative milieu’ (Hall, 1998; 2000). Charles Landry has drawn attention to the significance of a *creative milieu* to the development of creativity in modern cities and regions, which he defined as a combination of *hard infrastructure*, or the network of building and institutions that constitute a city or a region, and *soft infrastructure*, defined as ‘the system of associative structures and social networks, connections and human interactions, that underpins and encourages the flow of ideas between individuals and institutions’ (Landry, 2000).

To exist, creative milieus necessitate the support of facilities, institutions, embedded knowledge and practices; thus, they are rooted in dense urban environments. Scott (2004) associates what he calls ‘cultural commodity production’ to cities, which are defined as ‘*collectivities of human activity and interest that continually create streams of public goods that sustain the workings of the creative field*’ (Scott, 2001b). Cultural production and consumption transform the city through its ‘*shopping malls, restaurants and cafés, clubs, theatres, galleries, boutiques*’ (ibid).

There is a direct link between creative milieu and urban quality, witnessed by high urban real estate values. The so-called ‘independents’ - micro businesses and freelancers on the cultural and creative sectors - have proven to be active players in the process of gentrification and the construction of the cultural identity of urban neighbourhoods where they reside (O’Connor and Wynne 1996). Cultural hot spots such as art galleries, concert halls or museums, as well as spatial concentrations of small-scale cultural and creative activities are increasingly becoming a key element of culture-led urban regeneration strategies, much in vogue amongst city governments. This process is fostered by the optimism shown by many authors over the last decades, about the role of cultural and creative economy for job creation and urban regeneration (Bianchini, 1993; O’Connor, 1998; Landry, 2000; Throsby, 2001; Scott, 2001b; 2004; 2006; 2010).

### 1.6.3 Creative networks and creative clusters

The structural characteristics of creative industries have an evident impact on their spatial structure. In a context of achieving its largest spatial extension, thanks to the existence of organizational networks across the globe held by multinational corporations which are expanding

into all the segments of new cultural economy, and the opportunity of transmitting both explicit and tacit knowledge over the globe, thanks to the new communications technologies, creative production appears even more polycentric and geographically differentiated (Scott, 2010). Global and local cultural networks are defined by Grabher (2001; 2004) as ‘heterarchies’, self-regulating and learning systems that allow for future-orientated ‘adaptability’.

It has been widely argued that creative industries are faced with a difficult business model; in this context, local networks help actors to manage the inherent riskiness of their business (Banks et al., 2000; 2006; Bilton, 2007). Spatial proximity of small and medium enterprises networks produces economic benefits such as common knowledge or specialized and flexible human resources; a pool of ‘untraded externalities’ within each local network (Porter, 1998a; 1998b; Cooke and Morgan, 1998; Gordon and McCann, 2000; Martin and Sunley, 2003), complemented by shared knowledge rooted in cultural identity. These offer to local companies operating in the creative sector a competitive advantage because the (mostly tacit) knowledge produced and exploited locally would not be easily transferred or replicated elsewhere (Bathelt, et al. 2004). O’Connor (2004), argues that tacit knowledge -as opposed to codified knowledge- is tied to place, and cultural industries heavily rely on learning-by-doing practices and on skills diffused through specific related networks.

An increasing number of studies on creative places operate a ‘creative cluster’ approach. These studies examine the processes by which creative clusters generate externalities and the relationships with the urban *milieu* where they are located. Lorenzen et al. (2008) explain how the new cultural economy is characterized by a tendency to agglomerate in specific places where inter-sector knowledge spillovers are likely to occur. Lazzerati et al. (2008) analyses creative Local Production Systems in Spain and Italy, showing their urban nature and their tendency to cluster. De Propris et al. (2009) demonstrate that creative industries tend to locate near each other depending on their technological complementarities. Urban creative clusters involve complex divisions of labour, driven also by new ICT developments, and they are characterised by the preponderance of small, often micro-businesses, and freelancers (O’Brien and Feist, 1995; 1997; Pratt, 1997; Creigh-Tyte and Thomas, 2001).

Other case studies have closely looked to the structure of creative clusters, demonstrating that different sub-sectors of creative industries, such as music, visual arts, film, fashion, media, crafts, and so on, are highly networked at the local level and that they operate as clusters (Pratt 2000; 2002; 2004a; 2004b; 2004c; 2006; Kebir and Crevoisier, 2008; Turok, 2003; Wenting, 2008; Kratke, 2002; Bathel, 2002; Tremblay and Rousseau, 2006).

As Scott (2010) argues, place, as a container of knowledge, traditions, memories, and images, is an important ingredient in the creative mix of inter-firm networks and local labour market relationships. Creative clusters, embedded in residential neighbourhoods, support processes of urban regeneration and contribute to creating employment. Understanding the mechanisms through which creative industries contribute to the economic performance of cities, but also its relations with the urban structure, represent an important challenge.

## 1.7 Conclusions

Creativity is considered a key competitiveness driver in the knowledge-based economy. Creative sectors account for substantial shares of income and employment in developed countries. They offer important opportunities to policy makers to raise local levels of urban quality and social well-being (Scott, 2004). These strengths are the basis for important potential contributions of creative industries to the ‘smart’, ‘inclusive’ and ‘sustainable’ growth that are placed at the core of Europe 2020 economic strategy.

The claimed success of the creative industries is related to the fact that, differently from the ‘Subsidised muses’, they are driven by market imperatives to attract the widest possible range of consumers and precisely for that reason do not sustain a hierarchy of artistic forms and practices (Granham, 2005). Even though there are conflicting accounts on sectorial data, it is clear that manufacture activities related to fashion and high-end industries make up the bulk of the economic weight of creative industries (Frontier economics, 2012). This might perhaps be an explanation for the drift that economic policies for cultural and creative industries have taken during the last decade. Innovation, entrepreneurship and market development are the most popular economic policies for creative industries. These have recently started to apply also to funds for general industries, such as start-up funds or technology funds (Braun and Lavagna, 2007), appearing perfectly alienated with the fact that EU structural funds support mainly research and innovation (networks, entrepreneurship, SMEs, clusters), information society (digitisation), education, urban requalification (in the framework of integrated projects), investment in human capital, while funding for purely culture-based projects is considerably less (CESS, 2010).

The quantitative economic irrelevance of arts and culture, evidenced by numerous mapping documents, puts them markedly below their potential to contribute towards the achievement of the European Union’s Cohesion policy. Considering the cultural sector as part of the wider creative economy can distort cultural policy objectives, losing sight of the important public benefits provided by culture and of the reasons for public support. This acknowledgement to culture, recognized by the dawn of time, is now undermined by the confusion surrounding the terminology and definitions of cultural and creative. The hype about ‘culture as a key ingredient for the functioning of the creative economy’ (ESSnet, 2012), by affirming the opposite of what one might think about the cultural-creative relationship (creativity feeds culture), lifts the fog about cultural creativity being distinct from other types of creativity, and being more than simply one further knowledge economy asset.

It is arguable that the explosive development of technological reproduction puts an enormous pressure on the distinction between art as a commodity and art as an independent, sublime creation, whilst the artist is by now replaced by ‘the creative’, efficient, competitive worker, nerd, ‘smart’ executive directing ‘creative industries’, with pragmatic goals and measurable financial results.

Massive reproduction of cultural products, their branding and the collapse of the individual artist into the collective culture factory, recuperation of ideological adversaries and the absorption of discords into ‘a liberal culture of tolerance’ are hallmarks of post-modernity. For some, creative economy is the ultimate assault of the market on cultural independence, for others it is another attempt to pursue more profit through more ‘creativity’, which in turn is just another term for the commercial marketing of culture.

The binomial creative production / cultural consumption involves variable geographies of creativity, ‘...*bringing the symbolic city and urban economy together ‘glocally’*” (Evans, 2009). The creative neighbourhoods are often rooted on fringe industrial and post-industrial areas where they benefit by the lower land rents and by the comparatively loose state control in terms of planning restrictions. The process of gentrification and the emerging of ‘cool creative places’ in many large and medium size cities of developed countries, counts some excellent examples, such as the bohemian quarters in Paris and New York, the squats of Berlin or the Silicon Valley garages, where ‘creative innovators’ such as Jobs and Gates were able to start their post-modern global fortunes.

Increasingly cities and regions have sought to develop their creative and cultural industries through public intervention, either in response to the decline of other sectors such as industrial manufacturing, or in response to the absence of a perceived economic base in other sectors. In this

context, culture is not seen any more as a marginal supplement to everyday leisure; it is rather considered as a pivotal element of the generation of wealth for the new economy (Flew, 2010). Yet, creative industries have rather ephemeral foundations. This may prove quite a challenge when it comes to meaningfully integrating them in territorial planning.

Despite the uncertain path, creative clusters represent a good hook with the economic policies and innovation. Promoting the development of economic clusters is fashionable in economic policies, both at national and at local levels. The idea behind the development of creative clusters is that cultural industries have strong place-bound characteristics, relying on local production networks. The main trend emerging at national level is the development of creative clusters fostering innovation through strong links between art, new media and technology, education and businesses. The creative cluster policies are therefore strongly linked to innovation and entrepreneurship policies. There are many ways to conceive and manage economic clusters, ranging from consumption-oriented to production-oriented, from art-based to entertainment-based. Also, planning approaches on clusters can be top-down or bottom up (based on identifying/allowing for organic growth); in their turn these approaches greatly affect financing and management arrangements. In reality, most of the existing creative cluster initiatives do not come as a result of a clean-cut decision that singles out the best development model; they come rather as a result of a heterogeneous mixture of local initiatives, mixed conceptions of arts as development opportunities in a post-industrial city environment. Therefore, there exist no clear connections between the existing models of creative clusters and the explanations deployed to ground them (Momaas, 2004).

The hypothesis of convergence of economic and cultural policies, applicable to the concept of creative cluster, appears a way of addressing in 'practical' way the complexity of the sector. But may not compensate for the lack of an univocal definition and the impossibility of building up an economic theory on cultural industries.

## 1.8 References

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## 2 Cities and the creative industries: the case of Rome

### Abstract

Creative industries in the Metropolitan region of Rome are geographically concentrated. The purpose of this paper is to empirically test the hypothesis that this geographic concentration arises from the benefits of the innovative urban *milieu*, which is characteristic of specific metropolitan areas. A spatial regression model is estimated using data on the creative industries in the Metropolitan region of Rome by census blocks. We estimate the number of creative firms by census block unit with a spatially lagged dependent variable. The empirical results show that the estimated coefficient of the spatially lagged dependent variable is significantly positive, indicating that the number of creative firms in a census block is influenced by the number of creative firms in neighbouring census blocks. This enables us to explore the conditions that account for the concentration of creative industries.

**Key words:** creative industries, innovative urban *milieu*, spatial econometrics.

### 2.1 Introduction

The competitive advantage of metropolitan economies under the impulse of emerging industrial activities and knowledge-intensive services widely involves the creative sector. Over the last decade, the European Union has shown a growing interest towards creative industries (CIs). This interest is based on hard facts. The European Competitiveness Report (European Commission, 2010) established that in the midst of a fully-fledged global economic crisis, the cultural and creative sectors in the EU accounted for 3.3% of GDP providing direct employment for 6.7 million people (3 % of total employment). In the last years, even though there are conflicting accounts on the sectorial data, the creative industry managed to uphold a higher growth-to-GDP ratio if compared to the remaining sectors of the EU economy. In a context of decline of the manufacturing sector, creativity is considered a key growth sector of the economy; a source of transformation of existing practices and products, future employment growth and export earnings (Pratt, 2007).

Creativity is also a social phenomenon. Creativity ‘matters’ because “...it has the power to influence people” and “...to bring about general, industrial, social and cultural change” (Hesmondhalgh, 2007). Creative people ‘matter’ because they are “...a key driving force for economic development; their presence promotes tolerance and openness” (Florida, 2002). These strengths are the basis for important potential contributions of creative industries to the ‘smart’, ‘inclusive’ and ‘sustainable’ growth that are placed at the core of Europe 2020 economic strategy.

Creativity is defined in many ways, proving the complex multidisciplinary nature of the concept. Confusion over terminology is due to the large overlapping areas/non coinciding borders between the cultural and creative domains. As pointed out in the UNCTAD report (2008): “there is no unique definition of the ‘creative economy’. This is a subjective concept that is still being shaped”.



Perhaps the most widely quoted, utilised - but also criticised - definition of creative industries is by Britain's Department for Culture Media and Sports (DCMS) *Creative industries: 1998 mapping document* (Creative Industries Task Force, 1998). The fortune of this definition is due to the fact that it provides specific solution to the problem of measuring the CIs economic impact. According to the DCMS CIs are "...those activities which have their origin in individual creativity, skill and talent and which have the potential for wealth and job creation through the generation and exploitation of intellectual property". They include: advertising, architecture, arts and antique markets, computer and video games, crafts, design, designer fashion, film and video, music, performing arts, publishing, software, television and radio. This definition excludes the heritage sector, archives, museums, libraries, tourism and sport although they remain part of the DCMS remit (De Propris et al., 2009).

A more comprehensive definition is the one proposed by UNCTAD (2010), that defines CIs as "cycles of creation, production and distribution of goods and services that use creativity and intellectual capital as primary inputs; constitute a set of knowledge-based activities, focused on but not limited to arts, potentially generating revenues from trade and intellectual property rights; comprise tangible products and intangible intellectual or artistic services with creative content, economic value and market objectives; are at the cross-road among the artisan, services and industrial sectors; and constitute a new dynamic sector in world trade".

Despite broad convergence both at academic and political level on the relevance of creative sectors, Pratt (2007): "...it is debatable whether a depth of understanding of the creative industries has been achieved. There remain a number of problematic relationships that are not fully understood: public and private, formal and informal, production and consumption, commercial and non-commercial..."

Indeed, the creative sector has a complex organisational character, bearing significant differences if compared to conventional ones. The production-consumption processes are difficult to delineate, because of the complexity that characterizes both the organizational and structural aspects of creative industries (Bathelt et al., 2004; Storper and Venables, 2004; Asheim et al., 2011). First, the nature of product, 'experience goods', whose value cannot be calculated in the same way as other commercial products. Then, the nature of the production process: initially expensive development process to create a master copy of an intellectual property, followed by the 'low-cost' reproduction process. The nature of consumption is anomalous as well, since consumers value the product for the experience it conveys, not for its material form. A peculiarity of creative industries concerns their ownership structure: part of them are concentrated in the hands of a limited number of trans-national companies who are able to generate huge monopoly profits (this is particularly true for the cultural sector); the phenomenon is counter balanced by the existence of a myriad of self-employed content creators (Hesmondhalgh, 2007; Pratt, 2011). Another key characteristic concerns transactional aspects of creativity. Work is often organized to specifically capture these aspects. This becomes evident in the case of project-oriented teams, where selected individuals are brought together for a period of time in order to pool their know-how and to cross-fertilize each other's thinking in a context of close collaboration directed to problem-solving exercises (Grabher, 2001; Scott, 2010).

The structural characteristics of CIs have an evident impact on their spatial structure. Their tendency to cluster in metropolitan areas it has been widely illustrated in scientific literature, explained by the benefits derived from localization/specialization economies (Mommaas, 2004; Cooke and Lazzeretti, 2008; De Propris et al., 2009; Lazzeretti et al., 2012) and, in more 'inclusive' terms, by the existence of the innovative *milieu*, characteristic of specific urban/metropolitan areas (Aydalot, 1986; Camagni, 1991; Maillat and Crevoisier, 1991; Ratti et al., 1997).

We study the relationships between localization patterns of the creative sector and its 'spatial container' with reference to the Metropolitan Region of Rome. We estimate the number of creative firms by census block unit with a spatially lagged dependent variable. The positive coefficient of the spatially lagged dependent variable indicates that the number of creative firms in a census block is influenced by the number of creative firms in neighbouring blocks, thus supporting the existence

of creative clusters. After controlling for the spatially autocorrelated error, the empirical results indicate that the creative activities benefit from the production system, infrastructures and services offered by the urban environment. In other words, they benefit from the innovative urban *milieu*.

The rest of the paper is organized as follows. Section 2 provides a literature review on creative industries and their geographical concentration. Section 3 describes the study area, the data, and presents some stylized facts on creative industries in the Metropolitan region of Rome. Section 4 specifies the econometric model and discusses the identification strategies. This section also presents the estimated results. Section 5 summarizes the main findings and conclusions.

## 2.2 Literature review

The attention towards the creative economy is a direct response to new economic realities that have accompanied the shift since the late 1970s towards a post-industrial, knowledge-based, global economy (James et al., 2006). In this context, concepts such as creativity, creative class and creative city have emerged as research topics amongst economist, geographers, regional scientists, and sociologists (Crewe, 1996; Sadler, 1997; Banks et al., 2000; Coe, 2000).

Urban space, as a container of knowledge, traditions, memories, and images, is an important component in the creative mix of inter-firm networks and local labour market relationships. As Scott (2010) points out, describing some great city-regions of the modern world like New York, London and Paris, “... *parts of these cities display a more or less organic continuity between the local physical environment (as expressed in streetscapes and architecture), associated social and cultural amenities (museums, art galleries, theatres, shopping and entertainment facilities, and so on), and adjacent industrial/commercial districts specializing in activities such as advertising, graphic arts, audiovisual production, publishing, or fashion design .... These complex urban ecologies furnish many of the raw materials of the contemporary cultural economy*”. The process of gentrification, that characterizes parts of consolidated cities, encourage the concentration of skilled people providing them access to creative work basins and cultural amenities. Creative clusters embedded in residential neighbourhoods, support processes of urban regeneration and contribute to creating employment (Del Castillo and Haarich, 2004).

The superiority of dense and diversified urban areas in the transfer of knowledge and innovation output has clearly emerged in research over the last decades (Henderson et al., 1995; Feldman and Audretsch, 1999; Duranton and Puga, 2001; Audretsch, 2002; Andersson et al., 2005; Boshma and Iammarino, 2009). Conceptually these topics are related to the idea of innovative *milieu* (Aydalot, 1986; Camagni, 1991; Maillat and Crevoisier, 1991; Ratti et al, 1997). An innovative *milieu* is defined as “*the set of relationships that occur within a given geographical area that bring unity to a production system, economic actors, and an industrial culture, that generate a localized dynamic process of collective learning and that acts as an uncertainty-reducing mechanism in the innovation process*” (Camagni, 1995).

Relationships between city and the innovative *milieu* are analysed in a conceptual perspective by Camagni (1999; 2004), who identifies two distinct forms of interaction: i) cities operating as innovative *milieu*, and ii) innovative urban *milieu*, consisting of well-defined areas located inside the city, intrinsically exploiting the urban atmosphere. In both cases proximity is crucial, if we consider that close interaction and cooperation amongst firms as well as externalities associated with specialized labour markets are factors that enhance the competitiveness of the local production systems. The latest are often made up of small businesses, which find the necessary externalities in terms of infrastructure and services offered by the urban environment (Leone e Struyk, 1976; Pred, 1977). Whereas city is the natural place for the development of creative industries, it goes without saying that understanding the characteristics and the functioning of innovative urban *milieu* is of crucial importance in the study of the creative sector.

Creative clusters as a form of economic organization are weakly theorized if compared to industrial clusters (Darchen and Tremblay, 2014). Nevertheless, an increasing number of case studies on creative places operate a 'creative cluster' approach, as well as other concepts such as 'cultural quarters' (Roadhouse, 2010) or creative cities (Florida, 2008; Evans et al., 2006). These studies examine the processes by which creative clusters generate externalities (agglomeration and urbanisation economies) and the relationships with the urban space where they are located. By way of illustration, Lorenzen et al. (2008) show that the cultural economy is characterized by a tendency to agglomerate in specific places where inter-sector knowledge spillovers are likely to occur. Lazzerati et al. (2008) analyse creative local production systems in Spain and Italy, evidencing their urban nature and their tendency to cluster. De Propriis et al. (2009) argue that CIs tend to locate near each other depending on their technological complementarities. O'Connor (2004), explains how tacit knowledge -as opposed to codified knowledge- is tied to place, and why CIs heavily rely on learning-by-doing practices and on skills diffused through specific related networks.

There are several case studies that have closely looked to the structure of creative clusters, exploring the existence of specificities and complementarities between creative sectors that influence clustering patterns. When looking at the micro-geographies of media industry in London, Pratt (2011) explains that: "... *analytically there are multiple and overlapping media industries clusters. Moreover, and this is important, the nature of overlap, or interaction, produces a second level of interaction that needs to be analysed. In a very simplistic sense this is the 'spillover'*". The wealth of research on creative clusters includes, amongst others, case studies on the Swiss watch-making cluster (Kebir and Crevoisier, 2008), the Scottish film cluster (Turok, 2003), the development of the fashion designer cluster in Paris (Wenting, 2008), the film industry cluster in Potsdam (Kratke, 2002), the Cologne media cluster (Mossig, 2004), the Liepzig media cluster (Bathelt, 2002), the Montreal multimedia cluster (Tremblay and Rousseau, 2006). There are studies that have looked into the international dimensions of creative places, in the media sector (Nachum and Keeble, 2003) and in the music industry (Power and Hallencreutz, 2007). Nevertheless, the richness in case specific studies does not compensate for the lack of solid analytical bases on affronting creative cluster issues (Boix et al. 2012), as well as for the scarce influence of micro-oriented analytical approach (Fagerberg, 2006).

As evidenced by the literature, the spatial dimension of CIs is treated in research at three different levels: global, regional and local. This hierarchy reflects the fact that creative industries are concentrated in a limited number of densely urbanized areas, many of which are global cities; moreover, they are concentrated in particular neighbourhoods of these cities (Pratt, 2011). Despite the simultaneous existence of local and global creative economy and increasing levels of inter-relation between them, globalization does not yet appear to prompt cultural homogeneity (Graham, 1999; Camagni, 1999; Scott, 2001). In a context of attaining its largest spatial reach, thanks to the existence of organizational networks across the globe held by multinational corporations which are moving aggressively into all the segments of new cultural economy (Sassen, 2001), creative production appears even more polycentric and geographically differentiated (Scott, 2010).

Writing about the state of the art in the study of the spatial localization of economic activities, Duranton and Overman (2008), assert that there is still much work to be done to understand the localization of industries at urban level. This observation is proven to be correct by many studies conducted in the meantime. It draws attention towards an important issue in the study of the distribution patterns of industries, in general, and of the creative industries in particular, revealing that there is a gap between regional studies and local/urban analysis of distribution patterns, that recalls for further attention.

As Martin and Sunley (2003) point out, most of the studies on industrial clustering follow top-down approaches that make use of geographical data aggregated on the basis of administrative and political units – such as metropolitan areas and states in the US, standard regions, local authority areas in the UK, or NUTS regions in the EU. These mapping exercises only provide indirect views of clusters, suggesting their possible location. They cannot provide information on the spatial extension of clusters, the nature and strength of local inter-firm linkages, knowledge spillovers,

social networks and institutional support structures argued to be the defining and distinctive features of clusters.

The difficulty of analysing CIs from a spatial perspective is also related to the existence of conceptual problems as well as to the methodological awkwardness in facing the complexity of this issue. The first consideration concerns the lack of a clear-cut definition of what creativity represents in economic terms. This aspect in the empirical analyses maybe translated to measurement problems due to either multicollinearity or omitted variable bias. In both cases this leads to confusing evidence as the effects of creativity on local performance are inadequately estimated. Another consideration is that, so far, the literature has not provided a specific theory on creative industry clusters. However, enough is known to indicate that important components of a creative industry cluster theory will differ from traditional theories of manufacturing clusters, and from more recent ones on high-tech clusters. The bases of this difference are rooted on the symbolic knowledge-bases of creative clusters (Asheim et al., 2011). While methods deriving from regional studies find it difficult to identify cluster localization patterns and their determinants, and to describe the effects in small scale urban environments, methods deriving from ecology and similar environmental disciplines, that have typically been adapted to explore more detailed patterns of industry location, are struggling to take off. Since the degree of local economic differentiation and specialization tends to increase as the size of geographical units decreases, applications using small scale data may run the risk of exaggerating the number and significance of clusters. In introducing one of their studies dealing with a generalized spatial point-pattern approach, Duranton and Overman (2006), admit that in this field “... *our knowledge is still very patchy*”.

In recent years, an increasing number of empirical studies have dealt with spatial econometric techniques applied to the distribution of economic activities. Some examples are represented by De Dominicis et al. (2013) who analysed the sectorial spatial distribution of economic activities in Italy, Barrios et al. (2009) and their comparative study of Belgium, Ireland and Portugal, Basile (2009) who analysed polarization patterns in the EU, Arbia et al. (2010) who used a space-time version of the Ripley's K-function to identify space-time clusters of high tech industries in Italy, Lazzarotti et al., (2012), who analysed determinants and effects of clustering of creative industries.

The presence of spatial effects in the form of spatial heterogeneity and spatial dependence is increasingly acknowledged in both applied and theoretical econometric work (Anselin 2006a, Baltagi et al. 2007, LeSage and Pace 2009, Pinkse and Slade 2010). In empirical applications a common problem is the presence of unobserved local or regional variables that may give rise to spatial error correlation. In addition, some theoretical models of social and/or spatial interaction require the inclusion of spatial dependence in the regression specification. Estimation and inference of such models necessitates the application of specialized spatial econometric methods, typically based on maximum likelihood or on the use of generalized method of moments (Anselin 1988, Kelejian and Prucha 1998, 1999, 2007, 2010).

Despite the complexity of spatial econometric approaches, bearing evident difficulties in the various phases of model estimation, as well as high computational costs, their application appears to be the most appropriate when analysing economic activities at urban/neighbourhood level, because the use of data aggregated in small spatial units (such as census blocks), allows for modelling the complexity of relationships. From the methodological point of view, interesting suggestions regarding the empirical analysis of creative activities at urban level may arrive from studies treating localization patterns of other phenomena. A growing body of literature in the socioeconomic, planning, and health sciences make use of small-scale spatial data for exploring local contexts. Just by way of example: Shannon et al. (2005) evaluated the spatial accessibility of large “chain” supermarkets in relation to neighbourhood racial composition and poverty in Detroit, using a moving average spatial regression model to adjust for spatial autocorrelation; LaScala et al (2000) used a spatial autocorrelation regression model to determine factors associated with pedestrian traffic injury in S. Francisco. They showed that pedestrian injury rates were related to variables measured at small scale level such as traffic flow, population density and age, unemployment, gender and education; Iwata and Karato (2011) analysed the geographical concentration of

homeless people in Osaka City, with a spatial autoregressive model with autoregressive disturbances. They explored the existence of homeless networks across census blocks by regressing the number of homeless people on explanatory variables such as labour force, housing type and urban infrastructures.

This paper can be framed in this specific research area, which analyses the dependent variable as a function of context variables measured at the level of census block through a spatial econometric model. The choice of variables is based on a careful review of the literature on creative industries (sections 2, 4.2). The interpretation of results is carried out in the light of the analysis of the urban context (section 3).

### 2.3 Creative clusters in the metropolitan region of Rome

The tendency to cluster is a characteristic of CIs. It is clear, even through simple descriptive statistics, that the proliferation of activities falling within this category occur mostly in large and dense urban areas, while many consolidated metropolitan areas have fully developed ‘marshallian’ clusters (Scott, 2010). In distinction from manufacturing clusters, the relevant factors for explaining the clustering of creative industries are not only the benefits of agglomeration economies, but also the effects of urbanization economies. Thus, the creative cluster concept is based on the notion that urban space acts as a catalyst for creativity (Drake, 2003).

Starting from two key assumptions fully argued in the scientific literature, that: (i) creative clusters are concentrated in (a limited number of) densely urbanized areas and (ii) creative clusters are concentrated in particular neighbourhoods of the cities, we will try to delineate some typical characteristics and behaviours of the roman case.

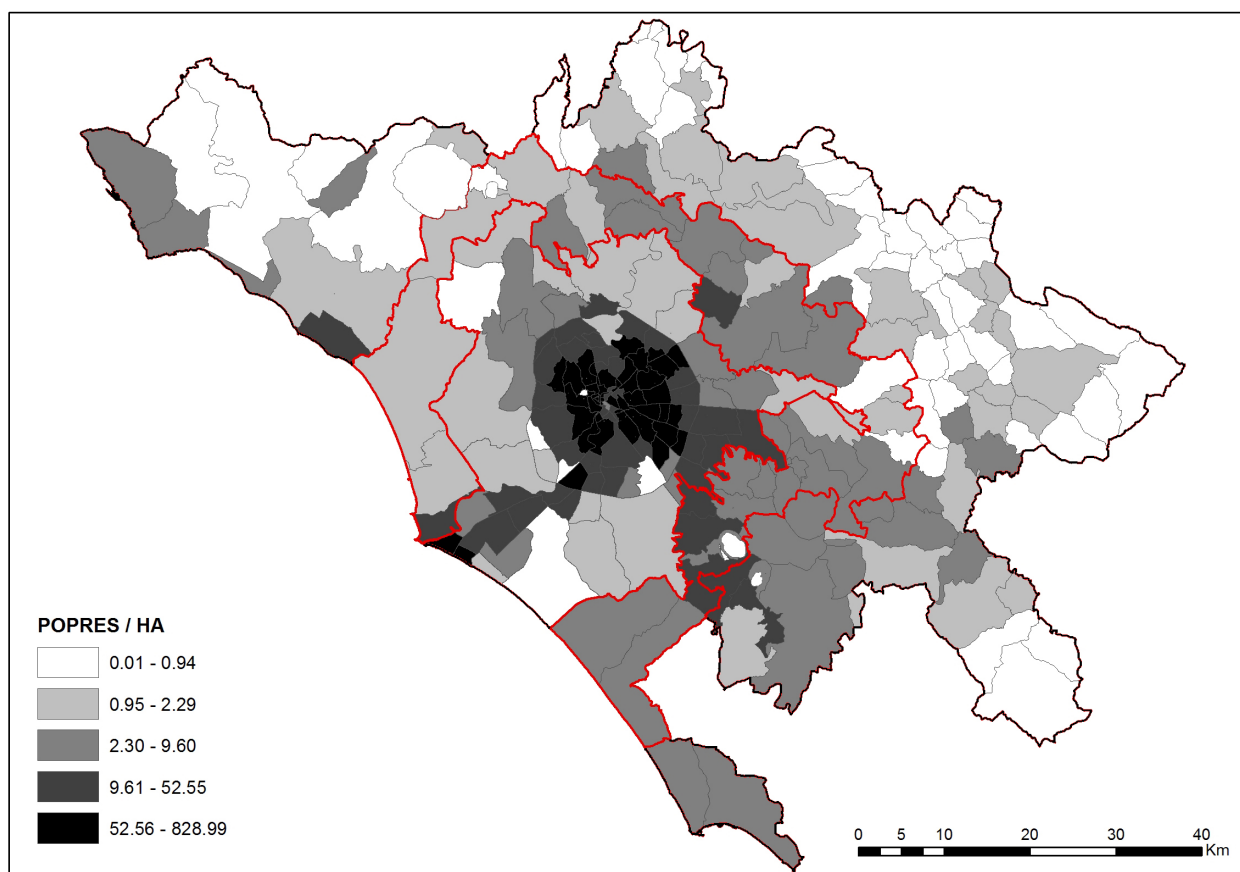
#### 2.3.1 The study area

The Province of Rome<sup>7</sup> is located in central Italy and covers an area of 5352 km<sup>2</sup>, between 42°14’ and 41°24’ Northern latitude and between 13°18’ and 11°44’ Western latitude. The study area is in large part occupied by the alluvial plan of the Tiber River and includes in the North-eastern part the volcanic systems of the Sabatino district and the Castelli Romani. The Tirrenian Sea delimits the area to the west.

The Province of Rome has 121 *comuni* (municipalities). The area is dominated by the presence of the city of Rome and its strongly concentric metropolitan system that accounts for almost 7% of the total Italian population. The municipality of Rome extends for 1.286 km<sup>2</sup>, occupying 24% of the provincial territory. First belt municipalities, related to the capital city by intense interchange flows, occupy 30% of the provincial area. The rest of the territory is divided into small ‘peripheral’ municipalities. According to the last census, the provincial population amounts at 3.997.465 inhabitants, of whom 65% live in the municipality of Rome, 25% in first belt municipalities and 10% in peripheral ones (Figure 2-1). Upon a concentration of tertiary economic functions in the capital, the ‘other’ municipalities have developed in the last decades a strong residential specialization.

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<sup>7</sup> Territorial limits of the Province of Rome formally coincide with those of the Metropolitan City of Rome, established as an administrative body since January 1st 2014 (L. n° 135, 2012).



**Figure 2-1** Monocentric distribution of the population density. Territorial units represent the urban districts composing the municipality of Rome and the rest of municipalities of the Province. Read lines depict the first belt municipalities. Source: Population and Housing Census, 2011.

### 2.3.2 Data

The data used to analyse the CIs in the study area are from The Statistical Archive of Local Units of Active Enterprises (Archivio Statistico delle Unità Locali delle Imprese Attive: ASIA-UL), provided by the Italian National Institute of Statistics (ISTAT). This is a business register annually updated through a process of integration of administrative and statistical sources. ASIA-UL is constituted by economic units exercising trades and professions in industrial commercial and services activities. It provides identification information (name and address) and information about the structure (economic activity, dependent and independent workers, legal form, turnover) of such units.

The data concern the accurate location in space of each firm (X and Y coordinates), the economic activity (5 digit ATECO code) and the number of employees of local units dependent on the main enterprise, being active for at least six months during the reference year. The data utilized refer to the study area in the period 2007-2009.

**Table 2-1** Firms and employees as total number and referred to the creative sector, in the period 2007-2009, in the Metropolitan region of Rome.

Year	2007		2008		2009	
	Total	Creative	Total	Creative	Total	Creative
N. firms	338.856	33.032	343.523	33.161	342.296	32.958
N. employees	1.234.072	106.781	1.268.155	106.679	1.263.262	112.037

Table 2-1 shows the weak upward trend in the number of firms and employees in the study area during the observation period. The total number of firms registered a 2% increment against an increase of 1% in the number of employees. Instead, the creative sector shows a substantial invariability in the number of firms and a sharper increase of 5% in the number of employees.

Some problems related to the use the available ASIA-UL dataset for the purpose of analysing the spatial behaviour of the CIs in the study area, include:

1. The varying localization accuracy (about 1.5% of the firms is located on the centroid of the municipality of reference; 0.6% is located on the centroid of the postal code area), that causes information loss.
2. The re-definition of the economic activities nomenclature operated by ISTAT in 2006 that makes it impossible the comparison between ATECO codes pre and post 2007, limiting *de facto* the time interval of the study to the post-2006 period.
3. The absence of firm demography. The lack of information about firms' births and deaths makes it impossible the use of a spatial panel.

Taking into consideration the data set characteristics and the nearly static pre-crisis situation it was decided to use as dependent variable the number of creative firms in the observation year 2009, while the rest of the local production system it was described as a set of explanatory variables referring at the average number of firms and their variation in the period 2007-2009 (details on explanatory variables are provided in section 4.2).

The definition of creative categories is adapted from the NESTA interim report “*The Geography of Creativity*” (De Propris et al., 2009). Table 2-2 summarises the number of creative firms and employees in the year of observation 2009, according to the above-mentioned classification. The operational definition uses disaggregated 5-digit ATECO codes with the goal of achieving a fine-grained representation of each creative sector and its activities.

**Table 2-2** Distribution of creative categories in year 2009.

Creative category	N. Firms	N. Employees
Advertising	1494	3529.87
Architecture	11512	18263.45
Arts, antiques and crafts activities	2086	4339.37
Design activity	315	449.08
Designer fashion	1591	2076.43
Music and performing arts	3739	5305.72
Publishing	3705	8970.50
Radio e TV	292	11294.05
Software and computer games	5918	42208.92
Video, film and photography	2306	15599.74
Total	32958	112037.13

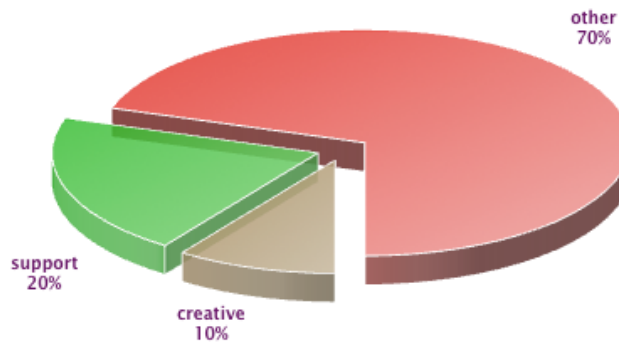
Source: ASIA-UL 2009.

### 2.3.3 Share of the creative sector

Features about the weight of the creative sector may vary significantly depending on the statistic's objectives and classification criteria. Figure 2-2 illustrates the share of the creative sector and of the corresponding support sector in the Metropolitan region of Rome, according to the above-mentioned NESTA definition. This classification scheme uses a value chain approach: functions directly related to the content creation are located at the ‘core’, whilst functions such as

distribution and production of complementary outputs lay in the ‘periphery’ of the classification system (Wilkinson, 2007).

CIs sector in the Metropolitan region of Rome counts for almost 10 % of the total firms, while the share of the service sector reaches the 20%. These features appear to be coherent with CIs shares estimates for other European metropolitan areas (Scot, 2000). For the purpose of this study, only the core creative industries are considered.



**Figure 2-2** Share of the creative sector in year 2009.

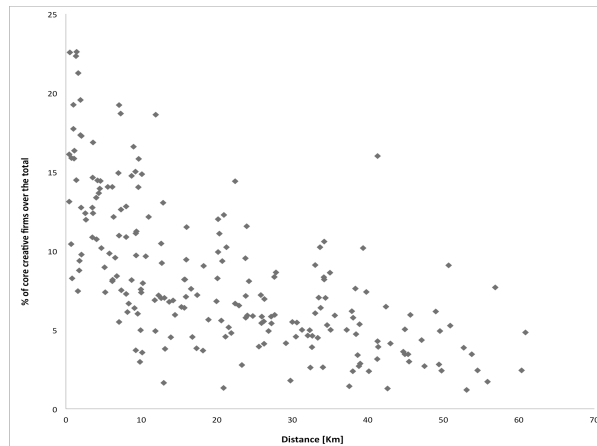
#### 2.3.4 Firm size

The data from ASIA-UL show that, in the observation year 2009: 81,14% of economic activities in the creative sectors are represented by single employee firms; 17,26% of the firms have from 2 to 20 employees; 0,86% of the firms have from 21 to 50 employees; 0,74% of the firms have more than 50 employees. This feature should not be surprising. According to the ‘innovation incubator hypothesis’ (Pred, 1977), the city is the natural place for the development of small businesses, which find the necessary externalities in terms of infrastructure and services (Leone e Struyk, 1976). In the case of the creative sector, the small businesses phenomenon is even more enhanced if compared to other economic contexts, because of the presence of a larger number of self-employed content creators (Hesmondhalgh, 2002; Pratt, 2011). In the case of Rome, this feature appears extremely pronounced, being the share of self-employed people remarkably higher than the 60-70%, generally indicated at the European level (KEA, 2006).

#### 2.3.5 Spatial pattern

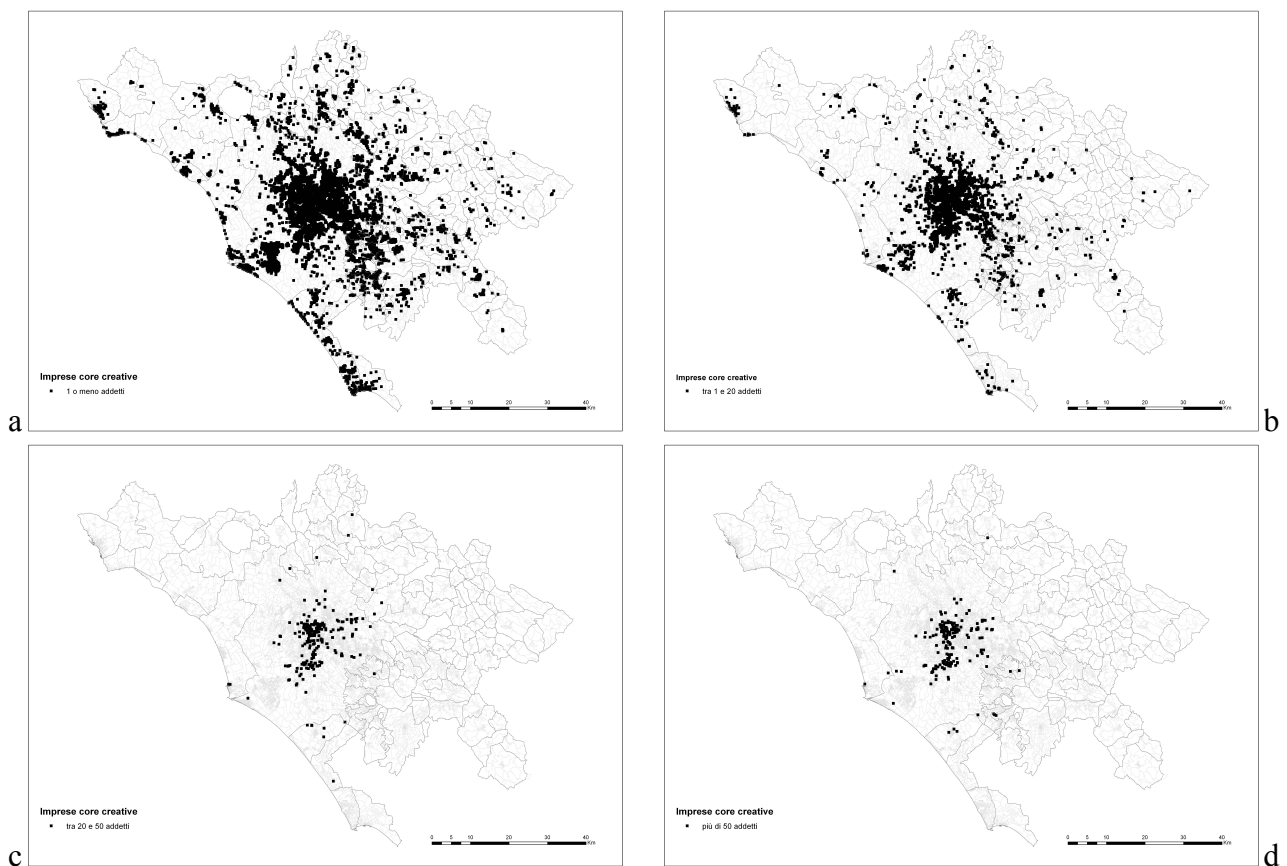
Localization patterns of CIs can be monocentric or polycentric, according to the city size and functional characteristics. Generally, large cities, with sensible land rents variation are characterized by polycentric distribution of activities and functions. In these conditions clusters of the same activity can be found in different parts of the city, partially overlapping with clusters of other activities and taking the form of clouds of clusters. (Boix, Hervas-Oliver, De Miguel-Molina, 2012).





**Figure 2-3** Core creative firms over the total of firms % in relation with the distance from the city centre.

If we look at the percentage of creative firms over the total of firms in the territorial units<sup>8</sup> as a function of their distance from the city centre, we notice a clear negative relationship: the number of units containing a greater share of creative enterprises decreases with increasing distance from the centre (Figure 2-3). Therefore, we can assert that the distribution of creative industries in the Metropolitan region of Rome reflects the monocentricity of its urban structure.



**Figure 2-4** Point pattern distribution of creative firms in the Metropolitan region of Rome: a) firms with 1 employee; b) firms with 2-20 employees; c) firms with 21-50 employees; d) firms with more than 50 employees.

Figure 2-4 illustrates the spatial distribution of firms according to their size. From the maps we can observe that, as the size of firms increases, the spatial concentration also increases: single employee

<sup>8</sup> Aggregations are performed on the territorial units as defined in Figure 2-1.

firms are distributed all over the region, following the metropolitan urban pattern; firms with up to 20 employees show a very similar distribution pattern but much more rarefied; large scale firms are almost exclusively concentrated in the municipal territory of Rome, in particular in the city centre and towards the South.

We can argue that, taken as a whole, CIs show a similar distribution pattern if compared to the rest of economic activities. This pattern generally draws to the urban imprint being, as previously shown, highly monocentric. Large firms are concentrated in some of the central city neighbourhoods. It appears obvious that such patterns cannot be analysed through a macro-scale perspective; thus, the micro-scale analysis becomes indispensable to capture specific cluster characteristics.

### 2.3.6 Spatial interdependence

There is evidence of spatial concentration of creative firms in the Metropolitan region of Rome. Spatial concentration may or may not support spatial interdependence amongst economic activities. The presence of spatial interdependence is manifested by spatial concentration of similar values (in the case of positive interdependence) or of different values (in the case of negative interdependence). In the literature there exist a large group of tests for verifying the presence of spatial autocorrelation. The most widely used test statistic is the Moran's  $I$  (Moran, 1950). The Moran's  $I$  is given by the following expression:

$$I = \frac{N}{S} \frac{\sum_{ij} W_{ij} (X_i - \bar{X})(X_j - \bar{X})}{\sum_{i=1}^N (X_i - \bar{X})^2}$$

where

$x_i$  is the studied variable in region  $i$ .

$\bar{x}$  is the average sample value.

$W_{ij}$  are binary spatial weights: value 1 is given to the spatial units within distance  $d$  from the geographic centroid of the spatial unit, and 0 to all other regions.

$N$  is the sample dimension.

$$S = \sum_i \sum W_{ij}$$

Moran's  $I$  is generally presented as a standardized measure which, when  $N$  is large enough, is distributed as a standard normal. In this case, a non-significant value of the Moran's  $I$  will not reject the null hypothesis (no autocorrelation/spatial randomness), while high positive (or negative) values will indicate the presence of significant positive (or negative) global spatial autocorrelation.

A useful tool to evidence the type and strength of spatial autocorrelation is the Moran scatterplot, which determines the extent of linear association between the values of a variable in a given location and the values of the same variable in neighbouring locations. The spatially lagged transformation of the variable (y-axis) is regressed on the original standardized variable (x-axis). The slope of the Moran's  $I$  represents the autocorrelation coefficient: the steeper the slope is, the stronger is the global autocorrelation. The four quadrants of the scatter plot describe an observation's value in relation to its neighbours: high-high, low-low (positive spatial autocorrelation) and high-low, low-high (negative spatial autocorrelation).

We have aggregated the number of creative industries by census block in the study area, and computed the Local Moran LISA statistics (Anselin, 1995). This yields a measure of spatial autocorrelation for each individual location and provides information about which unit values are statistically significant compared to spatial randomness.

Table 2-3 shows, in the second column, the distribution of the number of census blocks in the quadrants of the Moran scatterplot. Most of the census units are characterised by positive spatial association. A majority of spatial units lie in low-low quadrant. Low-low values associations are to

be considered of little interest in this context, since agglomerations of firms are represented only by significant high-high or high-low census block values. The third column in Table 2-3 shows the distribution of census blocks having a significant  $p$ -value in the quadrants of the Moran scatterplot.

**Table 2-3** Local indicators of spatial association (LISA) statistics. The distribution of significant census units in the quadrants of the Moran scatterplot is expressed as a percentage of the total significant units.

Moran Scatter Plot Quadrant	Total	Significant	% Significant
HH	4087	2496	61.07
HL	1604	341	21.26
LH	3674	1504	40.94
LL	10270	3213	31.29
Total spatial units	19635	7554	38.47

It is interesting to observe that, independently of the number of census blocks located in the various quadrants, the percentage of those with significant  $p$ -value is much higher for spatial units lying in the high-high quadrant, indicating that spatial clustering of high values ('hot spots') may occur in different areas.

If we take a closer look at the significance levels, we observe that census units having a positive relationship of high values represent almost 53% of the total units with  $p$ -values significant at  $p = 0.001$ . Conversely, the share of census units of this type represents 13 % of the total non-significant units. The opposite holds for units having a positive relationship of low values. They have a share of 58% of the total non-significant units, of 51% total units with  $p$ -values significant at  $p = 0.05$  (weakly significant) and of 19% of the total units with  $p$ -values significant at  $p = 0.001$  (Table 2-4). These results further support the assumption of the spatial clustering of creative firms in the Metropolitan region of Rome.

**Table 2-4** Significance levels of census units.

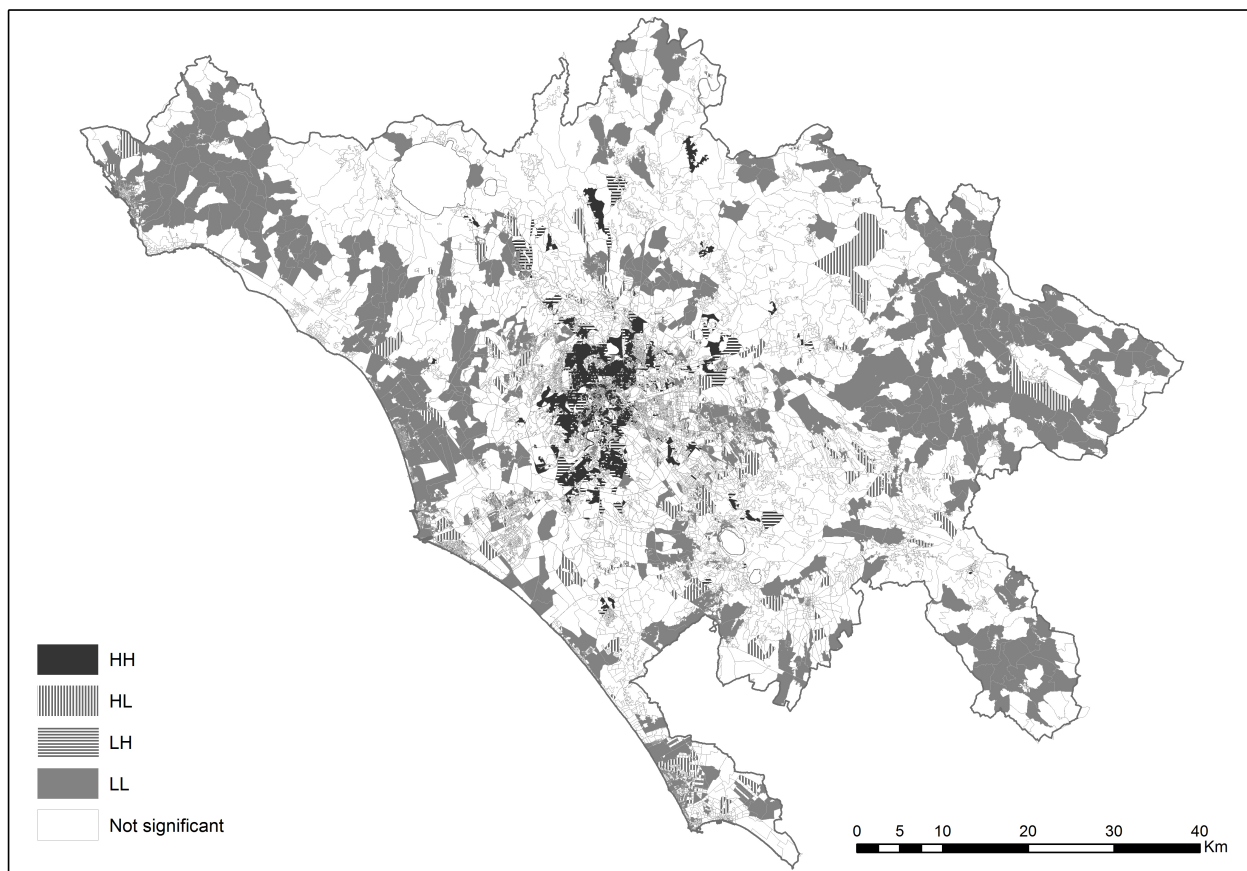
Moran Scatter Plot Quadrant	Significance level			
	0.001	0.01	0.05	NS
HH	52.90	31.42	23.43	13.17
HL	7.15	3.14	4.66	10.45
LH	20.74	18.63	21.01	17.96
LL	19.21	46.81	50.90	58.41

It is possible to map the statistically significant Moran's  $I$  values across the census blocks to identify the location and shape of clusters. Figure 2-5 shows those locations with a significant Local Moran statistic classified by type of spatial correlation: the high-high and low-low locations suggest clustering of similar values, whereas the high-low and low-high locations indicate spatial outliers. As it can be observed from the map, spatial clustering of high values ('hot spots') occurs in different areas of the consolidated city. The phenomenon is particularly intense in the neighborhoods just north to the historic centre (Trionfale, Delle Vittorie, Ottaviano, Flaminio, Trieste, Nomentano, Parioli, Tor di Quinto, Monte Sacro). Consistent hot spots are also observed in the western neighbourhoods (Aurelio, Gianicolense) and in the southern neighbourhoods (Appio Latino, Vigna Murata, Decima, Mostaciano, Spinaceto, Vallerano). It is significant the quasi absence of creative clusters in the eastern sector of the consolidated city, traditionally industrial, which hosts some of the poorest and infamous neighborhoods of Rome.

Spatial clustering of low values 'cold spots' occurs in peripheral areas of the Metropolitan region. The significant geographical extension of these areas is due to the large dimensions of

sparingly populated census units and represents a clear example of the Modifiable Areal Unit Problem (MAUP) (Gehlke and Biehl, 1934; Openshaw, 1984). Spatial outliers of the type high-low, thus interesting from the point of view of the agglomeration dynamics, are represented by a small number of units, mostly located in-between the consolidated city and the peripheral regions. These are typically concentrations of creative industries in small first-belt urban satellites, also affected by the MAUP problem: since the urbanization level of these areas is lower, if compared to those the consolidated city, the census sections have larger dimensions therefore the high-high type of agglomeration amongst census units does not occur.

In order to further investigate the spatial distribution characteristics of the creative activities in our study area, we will define an econometric model that will respond to the following research question: Which are the conditions that account for the observed spatial concentration of creative activities?



**Figure 2-5** LISA cluster map for creative firms in the census blocks in the Metropolitan region of Rome, 2009.

## 2.4 Empirical analysis

### 2.4.1 Econometric model

To capture the effects of the urban *milieu* in the concentration pattern of creative industries, we estimate an econometric model that includes a spatially autoregressive lagged dependent variable  $\mathbf{WN}$ , where  $\mathbf{W}$  is a  $J \times J$  spatial weights matrix, and  $\mathbf{N} = (N_1, N_2, \dots, N_J)'$  is a vector of the number of creative firms in the census block. By convention, the diagonal elements of the spatial weights matrix are set to zero and inside each row the elements are transformed in such a way that they sum to one. The effect of the number of creative industries in another census block can be

expressed as  $\sum_k w_{jk} N_k$ , where  $w_{jk}$  is the elements of the spatial weights matrix, which does not contain  $N_j$  because  $w_{jj}$  is defined as zero.

The spatial lag model is defined as follows:

$$\mathbf{N} = \rho \mathbf{W}\mathbf{N} + \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon} \quad (1)$$

where  $\rho$  is the autoregressive parameter for the spatial lag term,  $\mathbf{X}$  is the matrix of geographic attributes,  $\boldsymbol{\beta}$  is the corresponding vector of coefficients and  $\boldsymbol{\varepsilon}$  is the error vector, assumed to be homoscedastic, independent and identical across the units. A significant estimate of the coefficient of the spatial autoregressive lagged dependent variable  $\mathbf{W}\mathbf{N}$  implies that the number of creative firms by census block unit depends on the number of creative firms in the closest neighbour area. If this is not the case, we assume that  $\rho = 0$ , so we have a spatially independent model:

$$\mathbf{N} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon} \quad (2)$$

The assumption of homoscedasticity, independency and identical distribution across the observations for  $\boldsymbol{\varepsilon}$  is violated if there are spatially dependent omitted variables. Alternatively, we can allow different specifications of the error process and spatially lagged variable. In particular, we specify a first order autoregressive error term:

$$\boldsymbol{\varepsilon} = \lambda \mathbf{W}\boldsymbol{\varepsilon} + \mathbf{u} \quad (3)$$

where  $\lambda$  is the spatial autoregressive error parameter and  $\mathbf{u}$  is an uncorrected and homoscedastic error term.

To check for spatial dependence we define different types of spatial weights matrices and test for spatial autocorrelation on the OLS residuals using Moran's  $I$  statistics. We adapt the model to our data as follows (Anselin, 2006b).

- a) Estimate the spatially independent model (Equation 2) by means of OLS.
- b) Apply the Lagrange multiplier test statistic  $LM_\lambda$  for  $H_0 : \lambda = 0$  versus  $H_1 : \lambda \neq 0$  and  $LM_\rho$  for  $H_0 : \rho = 0$  versus  $H_1 : \rho \neq 0$ .
- c) Apply the Lagrange multiplier test statistic  $LM_\lambda^*$  for  $H_0 : \lambda = 0$  versus  $H_1 : \lambda \neq 0$  (with  $\rho \neq 0$ ) and  $LM_\rho^*$  for  $H_0 : \rho = 0$  versus  $H_1 : \rho \neq 0$  (with  $\lambda \neq 0$ ).

If the Lagrange multiplier test statistic  $LM_\lambda$  leads to the rejection of  $H_0 : \lambda = 0$ , then we refer to the spatial error model (3); while if with  $LM_\rho$  the null hypothesis  $H_0 : \rho = 0$  is rejected we use the spatial lag model (1). When both tests in b) give not enough evidence against the null, we adopt Equation (2) as the final specification. If this were the case, it results that the number of creative workers in a block does not depend on the number of creative workers in the closest neighbour area. If both tests in b) reject the null, we carry out the robust LM tests in c). If  $LM_\rho^*$  test is significant but  $LM_\lambda^*$  is not, we estimate Equation (1) using maximum likelihood or spatial two-stage least squares method. If  $LM_\lambda^*$  is significant but  $LM_\rho^*$  is not, we estimate Equation (3) using maximum likelihood (Anselin 1988) or generalized moments method for the autoregressive parameter (Kelejian and Prucha 1999). The last case implies that the creative network effect across the census blocks is zero. If  $LM_\lambda^*$  and  $LM_\rho^*$  are significant we combine (1) and (3) as follows:

$$\mathbf{N} = \rho \mathbf{W}\mathbf{N} + \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}, \boldsymbol{\varepsilon} = \lambda \mathbf{W}\boldsymbol{\varepsilon} + \mathbf{u} \quad (4)$$

and estimate the resulting spatial lag model with spatial error term using generalized feasible spatial two-stage least squares (GS2SLS) (Kelejian and Prucha 1998).

As a robustness check, we test the spatial dependence of the model using four different types ( $t = 1, 2, 3, 4$ ) of spatial weights matrices:

$$W_t: w_{jk}^t = \begin{cases} \frac{d_{jk}^t}{\sum_{j \neq k} d_{jk}^t}, & \text{if } j \neq k \\ 0, & \text{if } j = k \end{cases},$$

where

- $d_{jk}^1 = 1$  if  $j$  and  $k$  are 1<sup>st</sup> order neighbours, and 0 otherwise,
- $d_{jk}^2 = 1$  if  $j$  and  $k$  are 2<sup>nd</sup> order neighbours, and 0 otherwise,
- $d_{jk}^3 = 1$  if distance between  $j$  and  $k < 1000$  meters, and 0 otherwise,
- $d_{jk}^4 = 1$  if distance between  $j$  and  $k < 2500$  meters, and 0 otherwise.

#### 2.4.2 Key explanatory variables

The literature has provided different interpretations of the processes and the determinants for creative clustering and their impacts (Florida 2002; 2004; Markusen and King 2003; Scott 2006; Lacour and Puissant 2007; Asheim and Hansen 2009). The controversial thesis of Florida focuses on the ability of the cities to attract creative individuals in their choice of residential location overdetermining localization of knowledge-intensive activities and job creation. Storper and Scott (2009) criticize the excessive focus on residential amenities and the theoretical weaknesses an approach that neglects the essential contribution of productive logic in attracting ‘talent’ as well as institutional forms by which the concentration of human capital can lead to innovation dynamics and collective knowledge. The creative economy heavily relies on the urban production system, since creativity and its specific forms of expression are part of the complex socio-spatial relationships and rooted in the local labour market dynamics of the city. Moreover, there are a variety of elements, processes, and effects, related to the urban *milieu*, that contribute to determining the creative potential of places. These include the identity and sense of belonging as well as the production of ‘socialized’ human capital, skills and knowledge and are at the bases of the innovative inclination of the *milieu*, as well as of the ‘progressive’ role of the city (Camagni 2004).

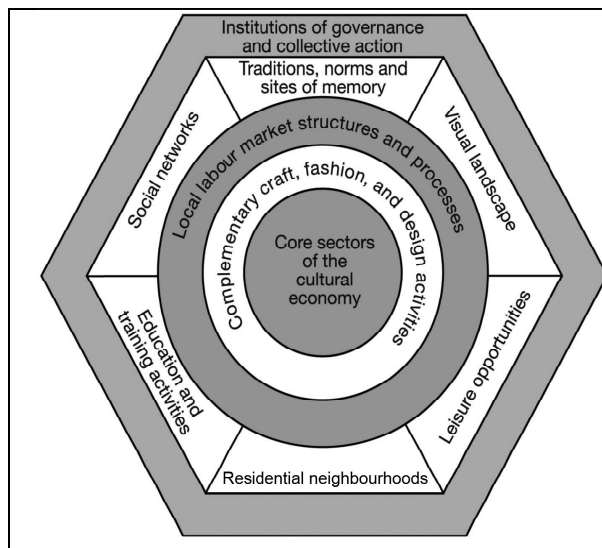


Figure 2-6 The creative field of the city (from Scott, 2010).

The (ideal) conditions towards which some of the most advanced creative cities with dynamic cultural economies seem to approach in recent years, are schematized by Scott (2010) in Figure 2-6. This scheme, conceptually reminiscent of the value chains approach, constitutes a fairly successful attempt to represent the driving forces of the cultural economy and their potential interactions.

Given the complexity of factors involved in delineating creativity and its relationships with the urban *milieu* it is evident the difficulty of the passage from a conceptual analytical level to an empirical implementation level. How important are urbanisation and agglomeration economies in stimulating creativity? Which would be the appropriate variables to explain creative clusters?

We try to capture the effects on the dependent variable ‘Number of creative firms per census block’ of (i) the local production system, distinguishing between the high-tech and the traditional manufacturing sectors, (ii) the urban physical environment (iii) the socio-economic morphologies. The assumption is that the explanatory variables, observed in the years prior to the year of reference, may have influenced the location choices of creative firms.

In the first group we take into consideration the productive structure of the metropolitan region by using as proxies the average number and the difference of high tech firms in the census blocks in the period 2007-2009, as well as the average number and the difference of traditional manufacturing firms in the census blocks in the period 2007-2009. We expect the number of creative industries to be strongly related to the presence of firms operating in the high tech sector and sensible to their eventual oscillations at census block level. We expect as well the presence of relationships with the traditional manufacturing sector, considering that part of it might be involved directly or indirectly in the value chain generated by the core creative activities.

In the second group of explanatory variables we treat the physical environment, distinguishing between urban quality, social and cultural amenities and infrastructural facilities. Urban quality (architecture and streetscapes) plays an important role on the locational choices of creative people. This measure is approximated by the average real estate prices of offices and shops in the period 2006-2009 and by the average real estate prices of housing in the period 2006-2009. In the case of Rome, we have already observed a positive relationship between creative clustering and the urban quality, proven by the presence of creative pockets located in ‘rich’ neighbourhoods (see section 3.6). On the other hand, the average renting prices of offices in the period 2006-2009 and the average renting prices of houses in the period 2006-2009 may capture for affordable locations, a possible driver for locational preferences of small firms, in particular. In addition to these variables, we count the number of buildings per census block used as offices, commercial and industrial activities, considering it a possible driver of locational choices of large firms. As previously argued, creative people are attracted by social and cultural amenities. These are included in our analysis by counting the number of museums, art galleries, theatres, and entertainment facilities in the census blocks. Given the monocentric structure of the urban system, we include, in addition, the Euclidean distance from the city centre of the creative activities<sup>9</sup>, to capture for the accessibility to a larger number of urban services and infrastructures. Other spatial-specific characteristics include the Euclidean distance from the three main city airports, the Euclidean distance from nodes of the main road network, the Euclidean distance from rail and metro stations.

Finally, the human capital is taken into consideration. Cities function as magnetic fields of dense and highly multifaceted local labour markets that ramify through local residential areas exerting attraction on surrounding neighbourhoods. The local workforce usually embodies many different skills, aptitudes and sensibilities. We count for each census block unit the total resident population, the population holding a bachelor or a diploma and the foreign residents. We expect a strong relationship between the presence of creative firms and the presence of skilled people, here approximated by the presence of educated people.

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<sup>9</sup> Euclidean distance from the city centre was calculated for each firm location, and then the average distance was calculated for each census block.

The data employed in the estimation are the Asia UL data set discussed in Sections 3.2 - 3.6. The number of creative industries within the census blocks in the Metropolitan region of Rome in the year of observation (2009) is 32.958, and the number of census blocks is 19.635. Table 2-5 presents the summary statistics for the census blocks that are used in the preliminary OLS estimation. Note that we use the number of creative firms as the dependent variable.

**Table 2-5** Descriptive statistics of variables.

Variable	Mean	SD	Min	Max	Source
CREATIVE INDUSTRIES	1.62	3.22	0.00	71.00	ASIA
AVERAGE HT INDUSTRIES (07-09)	0.52	1.42	0.00	39.33	ASIA
AVERAGE TRADITIONAL MANUFACTURE (07-09)	0.51	1.41	0.00	53.67	ASIA
DIFF. HT INDUSTRIES (07-09)	0.01	0.59	-9.00	8.00	ASIA
DIFF. TRADITIONAL MANUFACTURE (07-09)	0.03	0.55	-6.00	14.00	ASIA
AVERAGE HOUSING PRICE (06-09)	3119.91	1632.25	0.00	10375.00	OMI
AVERAGE OFFICES PRICE (06-09)	2956.55	2142.92	0.00	11618.80	OMI
AVERAGE HOUSING RENT (06-09)	12.28	7.67	0.00	42.19	OMI
AVERAGE OFFICES RENT (06-09)	12.26	9.64	0.00	46.91	OMI
OFFICE BUILDINGS	0.74	2.56	0.00	139.00	CENS
CULTURAL FACILITIES	0.02	1.04	0.00	14.00	ASIA
DISTANCE FROM THE CITY CENTRE	17312.40	14872.30	50.00	66234.90	GIS
DISTANCE FROM AIRPORTS	13054.60	11196.90	180.28	58829.40	GIS
ROAD ACCESSIBILITY	6383.23	7449.16	50.00	40432.20	GIS
RAIL ACCESSIBILITY	2324.81	2749.18	50.00	25323.90	GIS
RESIDENT POPULATION	188.46	243.24	0.00	2594.00	CENS
RESIDENTS WITH HIGHER EDUCATION	21.89	35.96	0.00	364.00	CENS
FOREIGN RESIDENTS	6.59	17.08	0.00	1173.00	CENS

*Notes:*

ASIA UL: Database on local units of firms, ISTAT (Istituto Nazionale di Statistica); years 2007-2009.

OMI: Database "Osservatorio del Mercato Immobiliare", Agenzia del Territorio; years 2006-2009.

CENS: Population and housing Census 2001, ISTAT (Istituto Nazionale di Statistica).

### 2.4.3 Estimation results

Table 2-6 provides the OLS estimation results for Equation (2), followed by diagnostic tests based on OLS residuals (Table 2-7).

We first estimate an equation that includes the average number of industries in the high-tech sector and the average number of industries in the traditional manufacturing sector as proxies for the productive structure of the metropolitan region; the average prices for housing, offices and shops as proxies for the urban quality; the number of buildings per census block used as offices, commercial and industrial activities as a proxy for the availability of office space; the presence of social and cultural amenities; road and rail accessibility; and total residential population as a proxy of the local labour force. The regression results are in column (a) of Table 2-6. We find that creative industries locate in high quality neighbourhoods; close to social and cultural amenities and their presence is strongly related to the presence of other urban economic activities, indiscriminately. Road accessibility is weakly significant indicating a positive relationship with the distance. This can be explained by the fact that the major accessibility nodes to the national road system are distant from the consolidated city neighbourhoods. Rail accessibility has the expected sign but is insignificant. The number of buildings used as offices, commercial and industrial activities has a strong negative relationship, indicating that the availability of office space is not a requirement of creative industries.



At a second stage we add to the equation other variables related to accessibility conditions and to the human capital. The Euclidean distance from the three main city airports accounts for potential international networks, while the Euclidean distance from the city centre is a proxy for the access to a large number of urban services and infrastructures. As far as it concerns human resources, the presence of residents holding a bachelor or a diploma is a proxy of the availability of skilled workforce, while the presence of foreign residents is a proxy for cultural diversity. Regression results are in column (b) of Table 2-6. We observe that, likewise in the first model estimation, urban production system and urban quality measures remain highly significant. The size of resident population across the census blocks has a strong negative relationship with the number of creative activities. The reversal of sign occurs when we control for other aspects of the human capital rather than for the generic measure of labour force presented in the first estimation (column a). The three measures of human capital, taken together, indicate that creative activities locate in neighbourhoods characterized by the presence of skilled and diverse people, and which are moderately crowded. As expected, the location of creative activities has a strong negative relationship with the distance from the city centre. Distance from the main airports is highly significant and, similarly with the road accessibility, indicates a positive relationship with the distance. Rail accessibility remains insignificant but the sign of the coefficient changes. The adjusted  $R^2$  shows an improvement compared to the first definition of the model.

**Table 2-6** Ordinary least squares (OLS)

Variable	a)		b)		c)	
	Coef.	t-value	Coef.	t-value	Coef.	t-value
(INTERCEPT)	-9.53E-01***	-19.043	-4.20E-01***	-7.192	-3.8080E-01***	-6.400
AVERAGE HT INDUSTRIES (07-09)	1.29E+00***	104.663	1.10E+00***	91.196	1.0990E+00***	91.889
AVERAGE TRAD. MANUFACTURE (07-09)	8.04E-02***	6.026	1.74E-01***	13.845	1.6120E-01***	12.757
DIFF. HT INDUSTRIES (07-09)					2.2430E-01***	11.227
DIFF. TRAD. MANUFACTURE (07-09)					-1.6000E-01***	-7.155
AVERAGE HOUSING PRICE (06-09)	3.53E-04***	16.011	2.12E-04***	10.12	2.3800E-04***	9.948
AVERAGE OFFICES PRICE (06-09)	9.69E-05***	5.694	4.51E-05**	2.696	8.9800E-05***	3.441
AVERAGE HOUSING RENT (06-09)					-1.4520E-02*	-2.165
AVERAGE OFFICES RENT (06-09)					-4.7120E-03	-0.879
OFFICE BUILDINGS	-2.54E-02***	-3.676	-1.28E-02*	-1.991	-1.5630E-02*	-2.430
CULTURAL FACILITIES	8.61E-01***	9.169	7.55E-01***	8.65	7.3390E-01***	8.439
DISTANCE FROM THE CITY CENTRE			-1.41E-05***	-5.145	-1.4920E-05***	-5.043
DISTANCE FROM AIRPORTS			1.39E-05***	4.473	1.4440E-05***	4.384
ROAD ACCESSIBILITY	5.32E-06*	2.365	7.66E-06**	3.156	6.5380E-06**	2.648
RAIL ACCESSIBILITY	-1.95E-06	-0.301	7.58E-06	1.236	6.5840E-06	1.078
RESIDENT POPULATION	2.39E-03***	34.138	-1.01E-03***	-11.088	-1.0180E-03***	-11.143
RESIDENTS WITH HIGHER EDUCATION			3.37E-02***	53.47	3.3920E-02***	53.829
FOREIGN RESIDENTS			4.79E-03***	4.983	4.7240E-03***	4.934
Adj. $R^2$	0.5282		0.5918		0.5954	
Number of Obs.	19635		19635		19635	

Notes: Dependent variable is the number of creative firms.

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

To further evaluate the urban production system and urban quality measures, we estimate a third model, with the difference between high-tech firms and between traditional manufacturing firms in the census blocks in the period 2007-2009 and the average renting prices of offices and houses in the period 2006-2009 as adjunct variables. From column (c) of Table 2-6 we learn that oscillations in the number of industries operating in the high-tech sector are highly significant and positively related to the number of creative firms at census block level. The opposite holds for the traditional

manufacturing sector, whose coefficient is negative and highly significant. Coefficients of the variables average renting prices of houses and average renting prices offices have both, correctly, negative sign, the first one being weakly significant and the second one having no significance at all. This result is not surprising, if we consider also the weak significance of the number of buildings used exclusively as offices, commercial or industrial activities and the fact that more than 80% of creative firms are individual. Therefore, we can assert that creative activities are carried out mostly on residential neighbourhoods, in privately owned spaces. They appear to be more affected by the availability/density of urban functions and less affected by transportation infrastructures.

The ordinary least squares (OLS) method of estimation neglects the existence of spatial interdependence. This estimation method does not compensate for loss of information due to spatial correlation or for induced heteroskedasticity. To correct for these omissions spatial dependence must be incorporated in the model estimation. Diagnostic tests for spatial dependence are therefore necessary in order to evaluate the appropriateness of OLS method of estimation.

We apply different types of spatial weights matrices, as specified in section 5.1, and test for spatial autocorrelation on the OLS residuals using Moran's  $I$  statistics. The Moran's  $I$  statistics in Table 2-7, distributed as standard normal, reject the hypothesis of no spatial autocorrelation, regardless of the weights specifications. We find that spatial autocorrelation is robustly present. The Lagrange multiplier test statistics  $LM_\rho$  and  $LM_\rho^*$  have a Chi-squared distribution with one degree of freedom. All null hypotheses when the autoregressive parameter is zero are rejected, because the  $p$ -values are sufficiently small. These imply that the spatial lag term ( $\rho$ ) must be considered. Furthermore, the Lagrange multiplier test statistics  $LM_\lambda$  and  $LM_\lambda^*$ , which have a chi-squared distribution with one degree of freedom, reject the null hypothesis, in all the cases. Therefore, model Equation (4) is estimated.

**Table 2-7** Diagnostics test for spatial autocorrelation

Weights and test	Value	$p$ -value
W1		
Moran's $I$	16.10910	0.00000
LM (lag)	159.18000	0.00000
LM (error)	255.11680	0.00000
LM* (lag)	6.80310	0.00910
LM* (error)	102.74000	0.00000
W2		
Moran's $I$	22.19620	0.00000
LM (lag)	240.61810	0.00000
LM (error)	481.03770	0.00000
LM* (lag)	12.37720	0.00043
LM* (error)	252.79680	0.00000
W3		
Moran's $I$	18.76990	0.00000
LM (lag)	206.00240	0.00000
LM (error)	342.85490	0.00000
LM* (lag)	12.34410	0.00044
LM* (error)	149.19660	0.00000
W4		
Moran's $I$	20.67030	0.00000
LM (lag)	170.39070	0.00000
LM (error)	403.06680	0.00000
LM* (lag)	15.89230	0.00007
LM* (error)	248.56840	0.00000

Note: Moran's  $I \sim N[0, 1]$ .  $LM \sim \chi^2 [1]$ .

Table 2-8 shows the estimated results of Equation (4) by means of GS2SLS. We use the spatial weight matrix based on first order contiguity ( $W_1$ ). The hypothesis that the spatial autoregressive error is not present ( $\lambda = 0$ ) is rejected at the 0.1 per cent significance level. The spatial lag term ( $\rho$ ) reflects the spatial dependence inherent in the sample data, measuring the average influence on observations by their neighbouring observations. It has a positive effect and it is highly significant. This has clear implications for the geographic concentration of creative firms by census unit.

**Table 2-8** Model estimation (GS2SLS).

Variable	Coef.	t-value
(INTERCEPT)	-4.0694E-01***	-5.977
AVERAGE HT INDUSTRIES (07-09)	1.1025E+00***	23.068
AVERAGE TRADITIONAL MANUFACTURE (07-09)	1.6144E-01***	5.134
DIFF. HT INDUSTRIES (07-09)	2.2305E-01***	4.568
DIFF. TRADITIONAL MANUFACTURE (07-09)	-1.5854E-01**	-2.964
AVERAGE HOUSING PRICE(06-09)	2.1016E-04***	9.674
AVERAGE OFFICES PRICE (06-09)	7.8910E-05**	3.047
AVERAGE HOUSING RENT (06-09)	-1.2546E-02**	-2.781
AVERAGE OFFICES RENT (06-09)	-3.6452E-03	-0.846
OFFICE BUILDINGS	-1.8007E-02	-0.857
CULTURAL FACILITIES	6.9362E-01*	2.317
DISTANCE FROM THE CITY CENTRE	-1.1915E-05***	-3.942
DISTANCE FROM AIRPORTS	1.1911E-05***	3.863
ROAD ACCESSIBILITY	6.5200E-06***	4.579
RAIL ACCESSIBILITY	7.0244E-06	1.768
RESIDENT POPULATION	-8.8034E-04***	-4.975
RESIDENTS WITH HIGHER EDUCATION	3.2037E-02***	18.885
FOREIGN RESIDENTS	4.3215E-03	1.359
$\lambda$	4.7975E-02**	2.912
$\rho$	1.0650E-01***	4.914
Number of Obs.	19635	

Notes: Dependent variable is the number of creative firms.

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

The signs of the control variables did not changed with respect to the OLS model. However, when we control for spatial correlation on both the dependent variable and the error term, we observe some striking differences in the significance levels of some variables.

First of all, the difference of firms in the manufacturing sector appears to be less significant if compared to the OLS estimation. As expected, albeit the strong influence of the entire economic structure of the region, creative industry appears to be more influenced by the existence of firms operating in high-tech sector.

The average real estate prices for offices and shops become less significant, while the number of buildings dedicated exclusively to offices and shops becomes insignificant. These results further validate the hypothesis that creative firms in the Metropolitan region of Rome do not require office space. Conversely, the average housing rents gains significance.

It is interesting to notice that cultural and social facilities appear to be considerably less significant than the initial OLS estimation, thus contradicting to some extent the assumption that creative activities are attracted by cultural amenities. Both road and rail accessibility variables gain importance in the GS2SLS estimation, but the positive sign of the coefficient indicates that proximity to transportation infrastructures remains trivial.

The other substantial difference between the two estimations concern the number of foreign residents, which become insignificant, showing that cultural diversity is not (yet) a determinant for creative clustering in the study area.

Our empirical results do not disappoint the expectations in relation to the influence of the urbanization economies, of the skilled work force and of the urban quality in the phenomenon of concentration of creative firms in the Metropolitan region of Rome. The incidence in the ownership structure of the creative sector of single employee firms, explains the minor importance of office space and of some accessibility criteria.

#### 2.4.4 Single employee creative firms

Given the peculiar ownership structure of the creative industry in general and of that of the Metropolitan region of Rome in particular, where more than 80% of the creative sector is composed by single employee firms, it is reasonable to think that there will be significant differences in the location criteria between the above mentioned category and companies that employ people.

To investigate these differences, it would be interesting to analyse the behavioural differences between these two categories of creative industries. Regrettably, the subset of firms with more than one employee is not large enough to allow for analysis at this level of spatial detail and extension.

Therefore, in this section we estimate our model using the largest subset of the original database. We study the behaviour of the explanatory variables on the number single employee creative firms, to check if there are substantial differences if compared to results obtained by estimation performed on the complete data set.

**Table 2-9** Model estimation (GS2SLS) for single employee firms.

Variable	Coef.	t-value
(INTERCEPT)	-2.6072E-01***	-4.75
AVERAGE HT INDUSTRIES (07-09)	6.8387E-01***	14.685
AVERAGE TRADITIONAL MANUFACTURE (07-09)	1.4595E-01***	5.631
DIFF. HT INDUSTRIES (07-09)	1.3117E-01**	3.053
DIFF. TRADITIONAL MANUFACTURE (07-09)	-1.4271E-01**	-3.100
AVERAGE HOUSING PRICE(06-09)	1.5236E-04***	8.401
AVERAGE OFFICES PRICE (06-09)	5.8626E-05**	2.899
AVERAGE HOUSING RENT (06-09)	-9.3842E-03*	-2.460
AVERAGE OFFICES RENT (06-09)	-4.9461E-03	-1.370
OFFICE BUILDINGS	-3.3679E-02	-2.252
CULTURAL FACILITIES	4.3261E-01*	2.110
DISTANCE FROM THE CITY CENTRE	-1.0434E-05***	-4.000
DISTANCE FROM AIRPORTS	9.2144E-06***	3.448
ROAD ACCESSIBILITY	6.1855E-06***	5.184
RAIL ACCESSIBILITY	5.3288E-06	1.618
RESIDENT POPULATION	-3.0917E-04*	-2.220
RESIDENTS WITH HIGHER EDUCATION	2.8562E-02***	19.423
FOREIGN RESIDENTS	2.9136E-03	1.128
$\lambda$	6.4576E-02**	3.251
$\rho$	6.6324E-02**	2.660
Number of Obs.	19635	

Notes: Dependent variable is the number of single employee creative firms.

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Tests for spatial autocorrelation on the OLS residuals using Moran's *I* statistics rejected the hypothesis of no spatial autocorrelation. Therefore, we estimated Equation (4) on the single employee firms' subset. Results are shown in Table 2-9. We observe that significance levels of the explanatory variables for this subset are similar to those of the overall dataset. The difference of

firms in the high-tech sector becomes less significant if compared to the model estimated in Table 2-8. This is an indication that the number of self-employed people in the creative sector across the census blocks, is less sensible to the increase in the number of industries operating in the high tech sector, if compared to the whole data set of the creative industries. Average housing rents are also less significant in the sub set estimation. This can be explained by the fact that self-employed creative people mostly work on residential neighbourhoods, in privately owned spaces. As far as it concerns the human capital, the coefficient of variable 'resident population' remains negative but is less significant than in the previous estimation, showing a minor sensibility towards crowding.

To reassume, the hypothesis that the spatial autoregressive error is not present ( $\lambda = 0$ ) is rejected at the 0.1 per cent significance level. The spatial lag term ( $\rho$ ) has a positive effect and is significant at 0.1 per cent. Thus, the impact of the geographic concentration of self-employed creative people by census unit is slightly lower if compared to that of the entire dataset, but still significant enough to support the thesis of spatial interaction amongst creative activities.

Proximity reveals crucial also in relation to other components of the urban system: human capital, economic activities, urban quality and functions, thus confirming the importance of urbanisation and agglomeration economies in stimulating creativity.

## 2.5 Conclusions

Creative industries represent one of the most important growth and employment sectors in advanced post-industrial economies and have played a major role in the economic regeneration of previously deindustrialised local economies. These industries include the media, fashionable consumer goods sectors, services, a wide range of creative professions and collective cultural consumption facilities. Understanding the mechanisms through which creative industries interact with the urban context represents an important challenge, in the light of the fact that scientific literature does not provide sufficient empirical evidence to this research topic.

The purpose of this paper is to analyse the geographic distribution of creative industries in the Metropolitan region of Rome and the variables that account for this concentration. We use the 2009 data on economic activities from ASIA-UL database, integrated by a rich dataset describing the urban production system, the physical environment and the socio-economic morphologies. The data are aggregated at census block.

We estimate a spatial autoregressive model with autoregressive disturbances that provides significant inputs to understanding the geographic distribution of creative industries and the variables that account for this concentration. From an econometric point of view, testing a null hypothesis of no spatial dependence on both the dependent variable and the error term is necessary when we estimate the spatial regression model (Kelejian and Prucha 1998). We show that the null hypothesis of no spatial correlation on both the dependent variable and the error term is rejected. As we know, the OLS estimator is biased when a spatial lagged dependent term is significant. Therefore, we applied a spatial autoregressive model with autoregressive disturbances.

Our empirical results document the importance of spatial factors in influencing creativity in the Metropolitan region of Rome. From the point of view of the creative clustering, this model enables us to prove the existence of spatial interactions between creative activities across census blocks. We find that the number creative firms in a census block is significantly influenced by the number creative firms in neighbouring census blocks, because the spatial lagged dependent term is significantly positive. Spatial concentration also means coexistence amongst different categories of creative clusters, which is an indirect indication of spillover effects occurring in well-defined neighbourhoods of the consolidated city.

The local production system, in particular industries operating in the high-tech sector, as well as the distribution of skilled labour force, strongly influence the geographic distribution of creative

industries. Instead, accessibility to transportation infrastructures appears less relevant if compared to the initial assumptions. This is due to the high incidence on the total number of creative industries of self-employed people. The presence of neighbourhoods characterized by the high quality of architecture and streetscape and a high density of urban functions and services attracts creative activities. To conclude, there is evidence that creative industry in the Metropolitan region of Rome benefit from the innovative urban *milieu*.

There are two considerations about our empirical model. The first one is that the spatial econometric model presented in this paper cannot be constructed at more disaggregated level than a census block. We cannot capture the impact of the distribution of creative activities within the census block. This problem becomes particularly striking in peripheral and less urbanised areas, where census units are larger. To overcome this problem, we need better explanatory variables in the census block that directly measure spatial distribution effects. The second concern is that our model does not allow us to investigate the types of creative clustering. We hope to be able to treat these issues in future research.

## 2.6 References

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### 3 Analysing the detailed location patterns of creative industries in the metropolitan area of Rome

#### Abstract

The purpose of this paper is to analyse the detailed location patterns of creative industries in the Metropolitan region of Rome. The spatial distribution of economic activities is studied by utilising spatially referenced point data as input to a statistical model based on Ripley's  $K$ -function. Pairwise differences between  $K$ -functions of observed point patterns are computed and compared with simulated confidence bands. A null hypothesis of random labelling is tested upon three conditions: by analysing the spatial distribution of different creative sectors with respect to the rest of creative activities; by comparing pairs of creative subcategories for the purpose of identifying those revealing mutual attraction; by comparing, for each creative subcategory, localization patterns of creative firms with respect to the localization of respective service functions.

The empirical analysis showed that the core creative sectors have the tendency to cluster in space at small distances (up to 20 – 40 kilometres) while the respective service sectors are dispersed internally and disposed around the core. In particular this holds true for the pattern displayed by Architecture, Antiquities, Publishing, Music and performing arts, Video, Film and photography, Radio and television. Pairwise point pattern analysis revealed the existence of urban clusters characterised by the co-existence of different creative activities.

**Key words:** creative industries, spatial patterns,  $K$ -function, spatial statistics.

#### 3.1 Introduction

The interest towards the spatial analysis of economic issues has grown since the publication in 1991 of *Geography and Trade*, by Paul Krugman. By proving the incentive to migrate towards urban areas, both for firms and individuals, the core-periphery model proposed by Krugman, launched the so-called 'new economic geography', contributing to its integration with mainstream economics (Fujita and Krugman, 1995; Fujita, Krugman and Venables, 1999; Fujita, Krugman and Mori, 1999).

In this context, it has become clear that the study of spatial concentration of economic activities can shed light on economic theoretic hypotheses concerning the nature of increasing returns and the determinants of agglomeration (Glaeser and Maré, 2001; Eaton and Eckstein, 1997; Peri, 1998; Black and Henderson, 1999; Charlot and Duranton, 2004; Rosenthal and Strange, 2008). There is extensive evidence in literature about the fact that spatial concentration of firms in urban areas determines their access to a more extensive and specialised labour pool. Moreover, firms gain access to a greater range and quality of shared inputs and supporting services, and take advantage from the 'knowledge spillovers' that help to disseminate good practice and facilitate new products

and processes (Lash and Urry, 1994; Scott, 2001; Duranton and Puga, 2005; Van Widen et al., 2007).

Statistical techniques for modelling geographic concentration of economic activities both on a discrete space and on a continuous space are relatively recent. According to Anselin (2006), it is possible to distinguish between two empirical approaches to spatial analysis: spatial econometrics and spatial statistics: the first approach is concerned with the introduction of spatial effects in regression analysis (Anselin, 1988); the second one refers to statistical models enabling for the analysis of spatially referenced data (Ripley, 1981). This latest research branch focuses on characterizing the spatial distribution of economic activities with respect to a set of hypotheses.

Different measures of spatial concentration have been developed in literature. A first group derives from the Gini coefficient that introduced distribution inequalities (Gini, 1912). Space played no role in these measures, in the sense that they do not rely on any discretization scheme (e.g. Kurgman, 1991). Space is taken into account in aggregated indexes of spatial concentration, such as the Hirschman-Herfindhal index (HHI), or the Ellison and Glaeser index (EG); the latest is a measure that takes into account space and controls for the underlying industrial concentration (Ellison and Glaeser, 1997). The most widely used measure for spatial concentration of economic activities is perhaps the location quotient (LQ) coined by Porter in 1990. LQ was the expedient for introducing the concept of industrial clusters at the basis of economic development policies, both in international and national levels.

Drawbacks of spatial concentration measures have been widely discussed in scientific literature. For example, Martin and Sunley (2003) argued that, when using location quotients, we look at measures of regional specialization, not at clusters. Feser (2000) found that in applied work the EG index is sensitive to the level of spatial aggregation.

Spatial aggregation is indeed a bone of content amongst spatial statisticians. The above-mentioned measures of spatial concentration use data aggregated according to pre-defined spatial units: space, which is naturally continuous, is thus subjected to representation models, which rely substantially on administrative subdivisions at various geographical scales. This problem is known in the statistical literature as the Modifiable Areal Unit Problem (Gehlke and Biehl, 1934; Yule and Kendall, 1950; Openshaw, 1984; Arbia, 1989; Cressie, 1993). The modifiable areal unit problem (MAUP) is a source of statistical bias that can radically affect the results of statistical hypothesis tests, since subdividing a continuous space in a set of discrete spatial units leads to spurious correlations across aggregated variables (Duranton and Overman, 2005; Combes et al., 2008; Briant et al., 2010).

These effects can be overcome by using a continuous approach to space, where data are collected at the maximum level of spatial disaggregation, i.e. each industry is identified by its geographic coordinate ( $x, y$ ), and spatial concentration is detected by referring to the distribution of distances amongst observations. Theoretical aspects of distance-based spatial concentration measures are discussed in detail in many publications (Ripley, 1976; 1977; Diggle, 1983; Cressie, 1993; Stoyan and Stoyan, 1995; Upton and Fingleton, 1985; Baddeley et al., 2000).

Unlike other fields, such as ecology or epidemiology, distance-based methods are rather new in economics (Barff, 1987; Sweeney and Feser, 1998). Duranton and Overman (2005) provide exhaustive account of the advantages deriving from the use of these methods in economic studies. The localization processes of industries can be analysed in terms of different forms of spatial association (Arbia et al., 2008) or relative concentration (Duranton and Overman, 2005; Marcon and Puech, 2010; Espa et al., 2010a; Jacobs et al., 2013), by means of univariate, bivariate or multivariate generalizations used to describe relationships between point patterns.

Creative industries are considered a propulsive force in the context of knowledge-based global economy (Pratt, 2012). They represent one of the most important growth and employment sectors in advanced economies and have played a major role in economic regeneration of previously deindustrialised local economies. Creative industries include: the media (e.g. films, television,

music recording, publishing); fashionable consumer goods sectors (e.g. clothing, furniture, jewellery); services (e.g. advertising, tourism, entertainment); a wide range of creative professions (e.g. architecture, graphic arts, web-page design); and collective cultural consumption facilities (e.g. museums, art galleries, concert halls). They are characterised by the blurring of the symbolic and utilitarian functions of the products and by the strong tendency to cluster in large and dense urban areas (Scott, 2010).

The influence of creative industries in economic development is generally studied according to two main research lines: spatial aggregation of creative firms and their determinants (Scott, 2006; Lazzarotti et al., 2012; Marrocu and Paci, 2012; De Miguel Molina et al., 2012); influence of creative people in employment growth (Florida, 2002; 2004; Scott, 2010). The analysis of localization of creative firms is very recent (Boix et al., 2012), as studies of this kind so far have privileged the manufacturing sector.

The scarcity of detailed studies on location patterns of creative industries is, to a certain extent, arguable in the light of the difficulties to provide a clear definition of the creative sector (Garnham, 2005; Evans, 2009; Scott, 2010; Flew, 2010) and of fact that creative activities are in part invisible to data collection (Girard, 1982). If we consider also the difficulty to produce (and to obtain) disaggregated data on economic activities in general and on the creative sectors in particular, we can figure out why point-pattern analysis has not yet been applied to this economic sector.

The use of distance-based statistical methods to analyse the location patterns of creative industries appears however a promising research field. Indeed, a closer look on the creative clusters, their physical extension and their components, would facilitate interpretation and give precious insights of the types of relationships that take place within these complex spatial arrangements.

Geographic concentration of creative firms increases the opportunities for them to interrelate, to employ suitable labour, to benefit from common infrastructure and to reduce market uncertainties. Spatial extension and density of economic activities determine the significance of these benefits. In the context of creative industries, a major challenge would be to test for co-localization between firms in the different subcategories. Much it has been written about economic activities that should or should not be part of the creative domain (software; advertising; heritage): the study of spatial interactions between creative categories within specific geographical areas, would be a good exercise for identifying and interpreting mutual relationships, and a way of compensating for the arbitrary nature of many definitions. Moreover, testing for co-localization of creative subcategories, would offer indirect evidence of the impact of urbanization economies in clustering of creative industries.

It has been widely argued that production chains affect industrial clustering (Turok, 2003). Firms within production chains tend to locate close together to minimize the costs of communication. Good internal and external transport infrastructure and logistics systems are important for the competitiveness of industrial complexes. In the case of creative industries, testing for co-localization between content-creation creative activities and 'support' activities, such as the production and distribution of complementary outputs, would offer direct evidence on the spatial relationships that creative industries hold with the rest of the creative value chain.

We study the spatial distribution of creative industries in the Metropolitan region of Rome utilising spatially referenced point data as input to a statistical model based on Ripley's  $K$ -function. We compute pairwise differences between  $K$ -functions of observed point patterns and compare them with simulated confidence bands. We test a null hypothesis of random labelling upon three conditions: by analysing the spatial distribution of different creative sectors with respect to the rest of creative activities; by comparing pairs of creative subcategories for the purpose of identifying those revealing mutual attraction; by comparing, for each creative subcategory, localization patterns of creative firms with respect to the localization of respective service functions. The analysis aims to answer at the following research questions:

Are creative categories spatially concentrated?

Are creative categories co-located?

Which are the spatial relationships between the creative activities and the ‘support’ activities?

The rest of the paper is organized as follows. Section 2 provides a literature review on spatial clusters and creative industries. Section 3 gives some insight on point pattern analysis and spatial cluster modelling. Section 4 provides a descriptive analysis of the creative industries in the study area. Section 5 presents the results of the empirical analysis. Section 6 summarizes the main findings and conclusions.

## 3.2 Literature review

### 3.2.1 Clusters

The cluster concept has proven to be attractive so that literature on cluster definitions and cluster benefits has proliferated over the last decades (Scott, 1988; Becattini, 1990; Camagni, 1991; Jacobs and De Jong, 1992; Doeringer and Terkla, 1995; Jacobs and De Man, 1996; Powell, 1996; Feser, 1998; Steiner, 1998; Bergman and Feser, 2000; Maskell and Mamberg, 1999; Bellandi, 2006; Gordon and McCann, 2000; Bathélet et al., 2004; Iammarino and McCann, 2006; Jacobs et al., 2013; Molina-Morales, 2013).

Clusters became an economic development paradigm in regional economic policy, thanks to the work of Porter (1990; 1996; 1998) that promoted the role of industrial clusters in raising regional productivity and innovative capacity. Porter’s research, mostly derived by case studies, pointed out the fact that clusters can act as a centripetal force, able to contrast the centrifugal forces of contemporary globalization processes (dispersion of firm activity through outsourcing and offshoring). Thus, clusters encourage local competition and new business formation, contributing to the integration of firms in the local economy (Woodward and Guimaraes, 2009).

Despite broad success of the cluster concept in various policy-making levels, the cluster approach is frequently criticised in academic literature. A general ‘disturbing’ aspect is related to the confusion/lack of clarity in the basic terminology of clusters, but criticism embraces also methodological aspects. Martin and Sunley (2003) remark that the vagueness/fuzziness of Porter’s ‘neo-Marshallian’ cluster concept does not lend to easy or precise delineation, with the consequence that ‘...there is no agreed method for identifying and mapping clusters, either in terms of the key variables that should be measured or the procedures by which the geographical boundaries of clusters should be determined’. Woodward and Guimaraes (2009) admit that, on Porter’s definition, clusters are hard to identify and track over time. Malmberg and Power (2005), point at the fact that there is little evidence of the effects of clustering and ‘...the evidence that does exist does not seem to show what we want them to show...’. Glasmeier (2000) argues that the benefits realized from geographical clustering appear to be specific to certain industries at certain stages of development in certain places, and are only realized under particular conditions. Writing about regional advantage and platform policies, Asheim, Boschma and Cooke (2011), bring evidence about the cluster perspective looking (already) an ‘old fashioned’ policy model for platform technologies such as software, displaying pervasive characteristics and complex interactions that are beyond conventional sectorial-spatial notions such as clusters.

Conceptual and methodological issues on cluster definition are further affected by the long-running controversy between supporters of ‘Marshall’ and ‘Jacobs’ economies that is far from being resolved (Beaudry and Schiffauerova, 2009). The debate is on whether agglomeration economies or urbanization economies are more important and beneficial (Glaeser et al., 1992; Henderson et al., 1995; Feldman, 2000; Audrechst and Feldman, 1996). Recently, a new stream of research presents

a more nuanced view of the benefits brought by ‘specialisation’ and ‘diversity’. Proponents of the ‘related variety’ concept have argued that beneficial externalities are more important in geographical areas where diverse sectors are able to develop intense relationships. Variety is a source of competitive advantage for the firms located in a place, but only if the diverse sectors that are located together have complementary capabilities and resources. In these cases, ‘knowledge spillovers’ take place around a ‘theme’, rather than around a sector (Asheim et al., 2011; Boschma and Iammarino, 2009).

Indeed, cluster definition is a complex task, strongly related to the identification of the causes of concentration. Gordon and McCann (2000) distinguish three stylized forms of spatial clustering, depending on the dominant or characteristic process occurring in the cluster: pure agglomeration, based on geographical proximity and agglomeration economies; industrial complex, based on input-output linkages and co-location in order to minimize transactions costs; and social-network, based on high levels of embeddedness and social integration.

There seems to be a gap between theoretical teachings (and controversies) and mapping clusters exercises: most of the studies on cluster mappings have focused on a particular industry, or involved methodologies in which an industry has been selected as representative of a place (e.g. Becattini et al. 2009), while issues such as the spatial patterns of location and co-location of clusters sharing the same geographical space, are some of the most neglected aspects in cluster literature.

This is probably due to the fact that ‘cluster is a spatial concept in which a-spatial processes play a prominent role’ (Boschma and Klosterman, 2005). Simplifications highlight the true difficulty of dealing with the geographical/functional complexity of cluster components, widely recognized by cluster theorists.

Another striking problem is scale. Many studies choose to deal with large-scale geographical units, such as states or regions, making the assumption that sectorial employment values for these units provide a direct measure of the strength of cluster development. Martin and Sunley (2003) explain that ‘... *extensive methodologies of top-down mapping exercises can at best only suggest the existence and location of possible clusters: they provide a shallow, indirect view of clusters. They can not provide much about the nature and strength of local inter-firm linkages, knowledge spillovers, social networks and institutional support structures, argued to be the defining and distinctive features of clusters*’.

As cluster analysis is rooted in regional studies, urban clusters are an isolated and rather scarce branch of research. At present, the feasibility of work with detailed data on single firm location and activity, offers interesting research opportunities in this field.

### 3.2.2 Creative clusters

Despite criticisms and controversies characterizing the cluster concept, it is widely accepted that creative industries show a clear tendency to concentrate in dense urban environments, typically, metropolitan areas. In distinction from manufacturing clusters, the relevant factors for explaining the clustering of creative industries (i.e. services with a symbolic knowledge base) are not only the benefits of localization (and specialization) economies, but also, in great part, the effects of old and new types of urbanization economies (Mommaas, 2004; Cooke and Lazzeretti, 2008; De Propris et al., 2009; Lazzeretti et al., 2012). Urbanization economies typically produce location patterns of cluster overlapping. Co-location provides cross-fertilization urbanization economies (Jacobs, 1969; 1984; Lorenzen and Frederiksen, 2008), opportunities for the co-presence of related variety (Boschma and Frenken, 2011), buzz (Storper and Venables, 2004), and access to collective learning and shared knowledge resources (Keeble and Nachum, 2002).

Localization patterns can be monocentric or polycentric, according to the city size and functional characteristics. Typically, large cities, with sensible land rents variation are characterized by polycentric distribution of activities and functions. In these conditions clusters of the same activity can be found in different parts of the city, partially overlapping with clusters of other activities and

taking the form of clouds of clusters. Such patterns cannot be observed through a macro-scale perspective, for this reason, the micro-scale analysis becomes indispensable to capture specific cluster characteristics (Boix et al., 2012).

De Propriis and Hypponen (2008) defines a creative cluster as a place that brings together: a) a community of 'creative people' who share an interest in novelty but not necessarily in the same subject; b) a catalysing place where people, relationships, ideas and talents can spark each other; c) an environment that offers diversity, stimuli and freedom of expression; and finally d) a thick, open and ever changing network of inter-personal exchanges that nurture individuals' uniqueness and identity.

Britain's Department of Culture Media and Sports (DCMS), following its seminal (and highly discussed) approach on creative industries, defines creative clusters as '*groups of competing and co-operating businesses that enhance demand for specialist labour and supply networks in a particular location. Such infrastructure depends not only upon the vitality of the creative sector itself, it is also underpinned by public policy and significant public investment*' (DCMS, 2006).

There is a consistent number of studies on creative places, highlighting the different aspects of geographical concentration of creative activities and creative people, and the mechanisms through creative industries generate externalities (agglomeration and urbanisation economies) and improve the creative potential of the places where they are located (Roodhouse, 2006; Florida, 2002; 2004; Momaas, 2004; O'Connor, 2004; Pratt, 2004; 2007; 2011; Scott, 2010). These studies support the existence of specificities and complementarities between creative sectors that influence their clustering patterns.

The majority of studies on creative clusters have looked inside the structure of sector-specific creative activities, analysing the relationships between firms, the drivers of new firm start-ups and the role of government intervention. For example, Kebir and Crevoisier (2008) argue that the Swiss watch-making cluster defines the cultural identity of the place and its community and is an economic resource for the regional economic development. Belussi and Sedita (2008) analysing the performing music cluster of Verona, maintain that opera performances are collective cultural goods whose production requires the integration of complementary resources in form of 'networks of activities' that require geographical proximity to support 'the creativity of artistic performers'. Wenting (2008) studied the development of the fashion designer cluster in Paris, finding that it was driven by the emergence of start-ups and knowledge spillovers between firms. In their analysis of five creative sectors in New York and Los Angeles, Currid and Williams (2006) showed that the tendency of certain creative firms to locate close to each other is a function of specific infrastructural requirements in infrastructures. Studies on Hollywood film cluster (Scott, 2002; Coe, 2001; De Propriis and Hypponen, 2008) have described a hybrid cluster with strong local agglomeration economies and powerful global connections.

Research on creative clusters includes, in addition, case studies on the Scottish film cluster (Turok, 2003), the film industry cluster in Potsdam (Kratke, 2002), the Cologne media cluster (Mossig, 2004), the Leipzig media cluster (Bathelt, 2002), the Montreal multimedia cluster (Tremblay and Rousseau, 2006), the clustering of the media industries in London (Pratt, 2012). There are also studies that have looked into the international dimensions of creative places in the music industry (Power and Hallencreutz, 2007) and in the media industry (Nachum and Keeble, 2003), showing how urban creative clusters balance their local relationships with wider links that go beyond geographical limits.

The richness in case-specific studies does not compensate for the lack of solid analytical bases on confronting creative cluster issues (Boix et al. 2012), as well as for the little influence of micro-oriented analytical approach (Fagerberg, 2006).

Creativity and its specific forms of expression in urban areas can be effectively analysed at the maximum level of spatial disaggregation, identifying each industry by its geographic coordinate, and by and detecting spatial relationships through statistical models that refer to distance-based concentration measures.



### 3.3 Point-patterns and spatial cluster modelling

Measures that treat space as continuous can overcome discretization problems (Feser and Sweeney, 2002; Duranton and Overman, 2005; 2008; Marcon and Puech, 2010), provided that detailed information on localization patterns of phenomena exists.

Point pattern analysis is a group of statistical techniques that aim to identify patterns in spatial data. Spatial point patterns are formalized as: univariate, bivariate, inhomogeneous, marked or space-time patterns. Paradigmatic examples of spatial point patterns are: a) aggregated pattern, b) regular pattern, c) random pattern (Schabenberger and Gotway, 2005).

In the spatial domain, it is possible to view an aggregated pattern in different ways depending on the focus of the analysis. Generally aggregations are considered as originated by random effects, which are governed by global model parameters, controlling for the scale and frequency of aggregations. This is similar to the geostatistical view of random processes, where the intensity or local density of events is defined by some type of spatial process. The peaks of this process would correspond with local aggregations. Examples of this approach can be found in Cressie (1993) and Diggle et al. (1983).

Point processes based in inferential methods involve comparisons between empirical summary measures and theoretical summary measures of an underlying point process. The basic probabilistic assumptions are stationarity and isotropy: stationarity implies that all properties of the process are invariant under translation; isotropy implies that all properties of the process are invariant under rotation.

The null hypothesis to be tested is the one of Complete Spatial Randomness (CSR) that implies (i) constant propensity to host points (uniformity) and (ii) absence of spatial interactions amongst points; i.e. each point's location is independent from the other points' locations (independence).

The homogeneous Poisson process represents an idealized standard of the hypothesis of CSR: (i) for any constant point intensity  $\lambda$ , the number of points located in an area  $A$ , follows a Poisson distribution with mean  $\lambda|A|$ ; (ii) the  $n$  points in  $A$  constitute an independent random sample from the uniform distribution on  $A$ . Observed pattern distributions that deviate from complete spatial randomness hypothesis include aggregated patterns or inhibitory patterns.

Under the null hypothesis of CSR, second order properties can be described by the function introduced by Ripley (1976; 1977), and named Ripley's  $K$ -function.

$$\lambda K(d) = E[\text{\#of points with distance } \leq d | \text{at } x] \quad (1)$$

where:

$\lambda$  is the intensity of the point process;

$K(\ )$  is an interpoint distance distribution function:  $K(d) \rightarrow \infty$  as  $d \rightarrow \infty$ .

Ripley (1988) suggests a simple estimator for  $K(\ )$  in (1), that accounts for edge effects correction:

$$\hat{K}_o(d) = \frac{1}{\lambda n} \sum_1^n \# (\text{other points within distance } d \text{ of } x_i) \quad (2)$$

where  $n$  is the number of points in the area with radius  $d$ .

Bivariate  $K$  functions are based on the Ripley's  $K$ -function, but refer to two different sets of points (for instance, type  $i$  and Type  $j$ ). Thus, a bivariate  $K$  function is defined as the expected number of type  $i$  points falling at a distance  $\leq d$  from an arbitrary type  $j$  point.

The most widely used estimator for bivariate  $K$  function is by Lotwick and Silverman (1982), which is also implemented in SPlanCS package in R.

The application of statistical methods based on bivariate point patterns for the study of economic activities allows unveiling co-agglomeration and/or repulsion tendencies amongst pairs of industrial activities. Null hypothesis specification for bivariate patterns in economic applications is rather complex. This is due to the fact that localization processes of two different industries may be influenced by exogenous factors, as well as by mutual relationships between firms. Arbia et al. (2008) suggest two possible definitions of null hypothesis, depending on the study object and characteristics: a null hypothesis of *independence* and a null hypothesis of *random labelling*.

Under the hypothesis of *independence* it is assumed that type  $i$  and type  $j$  point patterns are generated, respectively, by two different and independent univariate point processes. The absence of interaction between them is to be interpreted as lack of interaction between the two generating fields (Lotwick and Silverman, 1982). Under this hypothesis,  $H_0: K_{ij}(d) = \pi d^2$ . Agglomeration is observed when inside a circle with radius  $d$  centred on an arbitrary type  $i$  point, the number of type  $j$  points is higher than expected under the  $H_0$ , then,  $K_{ij}(d) > \pi d^2$ . On the contrary, inhibition takes place when  $K_{ij}(d) < \pi d^2$ . To verify whether observed distribution of firms differs from random distribution, confidence intervals are generated by simulating a large number of independent distributions generated by Monte Carlo simulations (Besag and Diggle, 1977).

Under the hypothesis of *random labelling* a firm can belong randomly to type  $i$  or type  $j$ . In the case of economic activities, this can be interpreted as the existence of conditions that encourage location of one industry rather than the other. Under this hypothesis:  $H_0: K_{ij}(d) = K_{ji}(d) = K(d)$  (Diggle and Chetwynd, 1991).

The null hypothesis of *random labelling* is evaluated by computing the pairwise differences between the various  $K$  functions and by comparing them with simulated confidence bands (Diggle and Chetwynd, 1991; Gatrell et al., 1996; Kulldorff, 1998; Dixon, 2002; Haining, 2003). Agglomeration is observed when  $K_{ij}(d) = K_i(d) - K_j(d) > K(d)$ , inhibition is observed when  $K_{ij}(d) = K_i(d) - K_j(d) < K(d)$ . Confidence intervals are generated using Monte Carlo simulations, by keeping firm's location unchanged and by randomly assigning the labels that characterize each sector.

Over the last decade exhaustive account it was given about the advantages deriving from the use of distance-based methods in economic studies. Notwithstanding, empirical applications are still limited (Arbia and Espa, 1996; Duranton and Overman, 2005; 2008; Marcon and Puech, 2003; 2010; Quah and Simpson, 2003; Arbia et al., 2008; Espa et al., 2010a; Jacobs et al., 2013). Bivariate  $K$ -function is the most widely used method amongst the economic applications of point-pattern analysis, because it enables for rather straightforward testing procedure for spatial association between pairs of sectors. There are also other empirical examples of the application of  $K$ -functions for mark-weighted patterns (Espa et al., 2010b) and space-time patterns (Arbia et al., 2010).

### 3.4 Creative industries in the metropolitan region of Rome: descriptive analysis

The Province of Rome<sup>10</sup>, located in central Italy, covers an area of 5352 km<sup>2</sup> and has 121 *comuni* (municipalities). The area is dominated by the presence of the city of Rome and its strongly concentric metropolitan system that accounts for almost 7% of the total Italian population. According to the last census, the provincial population amounts at 3.997.465 inhabitants, of whom 65% live in the municipality of Rome, 25% in first belt municipalities and 10% in peripheral ones.

The data used to analyse the creative industry in the study area are from The Statistical Archive of Local Units of Active Enterprises (Archivio Statistico delle Unità Locali delle Imprese Attive:

<sup>10</sup> Territorial limits of the Province of Rome formally coincide with those of the Metropolitan City of Rome, established as an administrative body since January 1st 2014.

ASIA-UL), provided by the National Institute of Statistics. This is a business register annually updated through a process of integration of administrative and statistical sources. ASIA-UL is constituted by economic units exercising trades and professions in industrial commercial and services activities. It provides identification information (name and address) and information about the structure (economic activity, dependent and independent workers, legal form, turnover) of such units. The data concern the accurate location in space of each firm (firm coordinates), the economic activity (5 digit ATECO code) and the number of employees of local units dependent on the main enterprise, being active for at least six months during the reference year. The data utilized refer to the study area in the year 2007. Principal problems when using the ASIA-UL dataset concern the varying localization accuracy (about 1.5% of the firms is located on the centroid of the municipality of reference; about 0.6% is located on the centroid of the postal code area), and the absence of firm demography.

The definition of creative categories is the one proposed in the ‘Geography the creative industries’ by DCMS, that uses 5 digit SIC codes (De Propris et al., 2009), adapted for the Italian ATECO categories. According to this definition, for every creative sector activities are classified in ‘layers’, which can be interpreted as stages in a creative value chain. Content creation is located at the ‘core’ and other functions such as distribution and production of complementary outputs lay in the ‘periphery’ of the classification system. Layer one includes more intrinsically creative activities at the top of each supply chain (for example, composition for the music industry, programming for the computer games industry and writing for the publishing industry). Layer two includes those activities that directly support layer one activities in the supply chain (for example, casting for the performing arts). Layer three includes the manufacture of the hardware that directly supports the creative process (for example, the manufacture of television cameras and other hardware directly used in creating television programmes). Layer four includes the manufacture and wholesale of raw materials and the manufacture of hardware used in the consumption of creative industry products (for example, arcade machines for computer games). Layer five includes the sales of creative products (for example the sale of games consoles for the computer games industry).

The number of firms and employees for each core creative category (Layer1 and Layer 2) in the year of observation 2007 and their respective weight in each value chain are reported in Table 3-1. Figure 3-1 illustrates the distribution of firms (a) and employees (b), according to the different position they hold within the value chain of each creative category. Detailed distribution of firms and employees in each layer is reported in Appendix 1.

**Table 3-1** Core creative industries (layer 1 and layer 2) in year 2007, according to the DCMS classification.

	N. firms	N. employees	% firms	% employees
Advertising	2052	4897.29	100	100
Architecture	11562	17371.05	22	12
Arts, antiques and crafts activities	4108	7926.79	76	75
Design	1522	2024.02	9	5
Music and performing arts	4921	6296.89	80	72
Publishing	2789	8592.59	46	40
Radio e TV	322	10703.75	45	87
Software and computer games	5781	39143.74	75	80
Video, film and photography	2340	14609.99	56	71

Source: ASIA-UL 2007.

As it can be noticed from the simple statistics reported above, creative categories proposed by the DCMS definition bring together groups of economic activities that reveal remarkable differences both in terms of specific weight of the various sectors, and in terms of layer composition. The number of firms is dominated in the core activities by two creative categories:

Architecture and Software and computer games. ‘Traditional’ cultural industries are represented to a large extent by Music and performing arts, and Video, film and photography. Amongst support activities it is worth to mention the weight of construction firms (L4) in the value chain of Architecture and that of retail of fashion products (L5) in the value chain of Design.

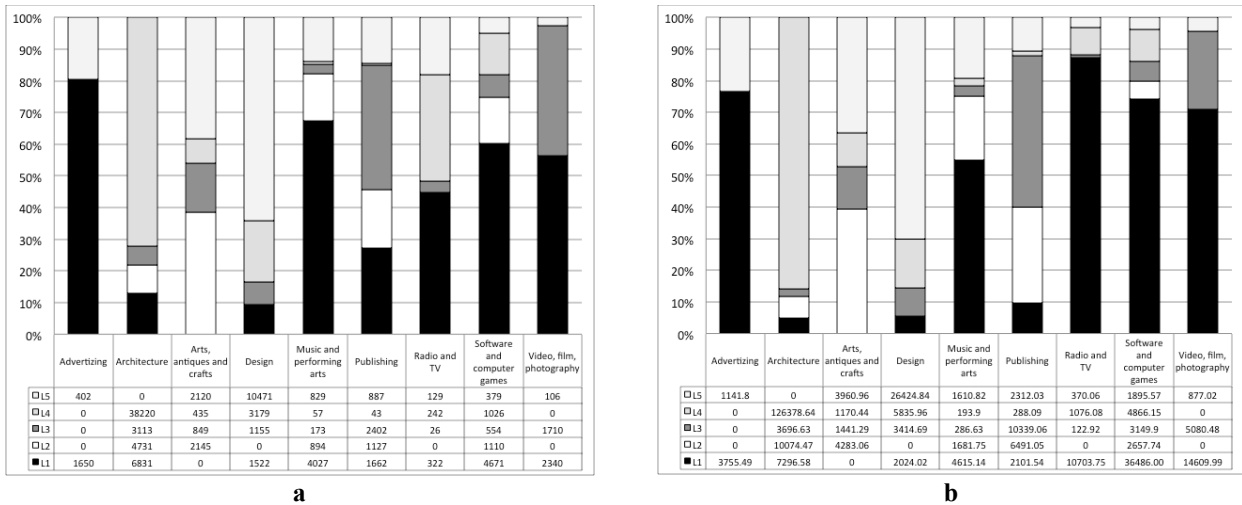


Figure 3-1 Distribution of firms (a) and employees (b) in the creative categories, by layer, in 2007. Source: ASIA-UL.

Employment in the creative sector is dominated by Software and computer games and by the audio-visuals: Video, film and photography as well as Radio and television. In analogy with the number of firms, employment in the support activities is dominated by the construction firms (L4) in the value chain of Architecture and by the retail of fashion products (L5) in the value chain of Design.

Problems and ambiguities greatly affect the clear delimitation different creative sectors. These are due to unclear definition criteria in the allocation of single activities, as well as to the presence of ATECO codes not being able to appropriately distinguish amongst the various components of creative activities. These problems will be addresses more in detail further on.

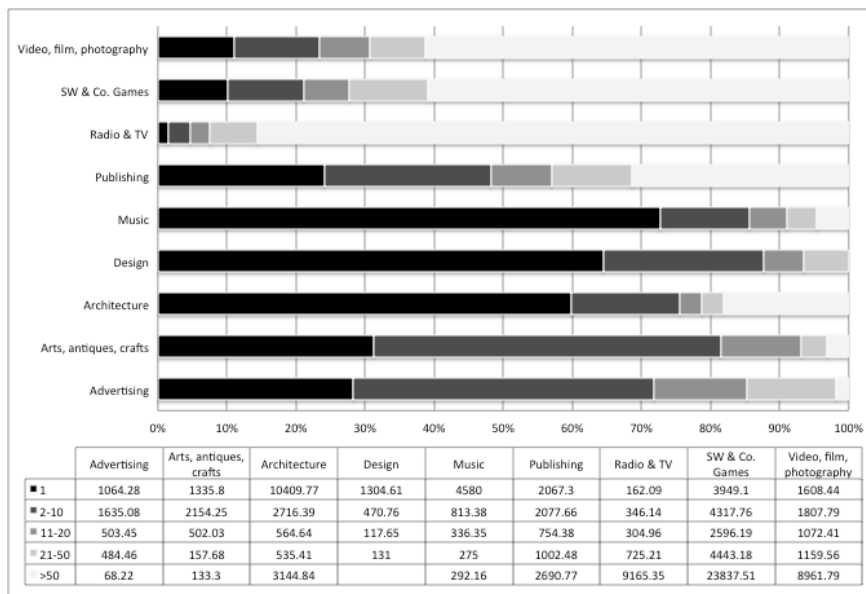


Figure 3-2 Distribution of employees in creative categories, by class, in 2007. Source: ASIA-UL.

Creative categories greatly differ in terms of firm size. We look closely at this feature for the core activities in Figure 3-2, noticing that: Architecture, Design, Arts, antiques and Crafts,

Advertising, are dominated by the presence of single employee firms and micro firms (up to 10 employees). The audio-visuals: Video, film, photography and, in particular, Radio and television are strongly dominated by the presence of large firms (more than 50 employees). The same holds true for Software and computer games.

It is therefore predictable that different creative categories, although rooted in the urban structure, would establish with it different relationships, resulting in different spatial distributions. We first look at the spatial distribution of the creative sector taken as a whole, afterwards we describe some relevant characteristics of single creative subcategories and comment the differences between them. Findings will support the empirical analysis interpretation presented in the following chapter.

Figure 3-3 shows the location quotients (LQ) of creative industries in the Metropolitan area of Rome. Standard LQ (De Propriis et al., 2009) is an aggregated measure utilized for mapping the specialisation level of spatial units<sup>11</sup>. It is calculated by computing the ratio between the local (municipal/district) share of the creative industry and the industry's share at metropolitan level. LQ values above one indicate that the local unit has a higher share of creative industry than the metropolitan area as a whole. With respect to the previously described definition of creative industries, the activities considered are those intrinsically creative, located at the top of each supply chain (Layer 1) and those, which directly support layer one activities in the supply chain (Layer 2).

We observe that territorial units with higher share of creative industries are located in form of a cluster with an elongated shape disposed north-south. This spatial arrangement involves most of the consolidated city, part of the southern regions towards the See, and some northern regions along the Via Cassia, in first instance, and then along the motorway A1.

Being not sensitive to absolute values, the LQ index cannot offer a real picture of clusters. Conversely, the mapping of each point location would give a correct perception about the spatial extension of clusters, but not about their intensity. Kernel density mapping accounts for both intensity and spatial extension of the observed phenomena. Distance-based statistical tools used in point-pattern analysis are rooted in the kernel concept.

Figure 3-4 represents the Kernel density estimation depicting the cumulative incidence of creative firms over a gridded surface of the study area. Conceptually, a smoothly curved surface is fitted over each point. The surface value is highest at the location of the point and diminishes with increasing distance from the point, reaching zero at the maximum search radius distance from the point<sup>12</sup>. The perception of cluster in Figure 3-4 is different from the one in Figure 3-3. The spatial extension covers the entire consolidated city and extends beyond the municipal limits in territories that correspond to some of the first-belt municipalities. Spatial concentrations of creative industries are almost absent in peripheral regions of the Metropolitan area. Intensity peaks are clearly visible in Rome's city centre (Prati and Parioli neighbourhoods), in the northern quartier of Fidene, in the southern quartier of EUR, as well as along the motorway that conducts to the Fiumicino airport.

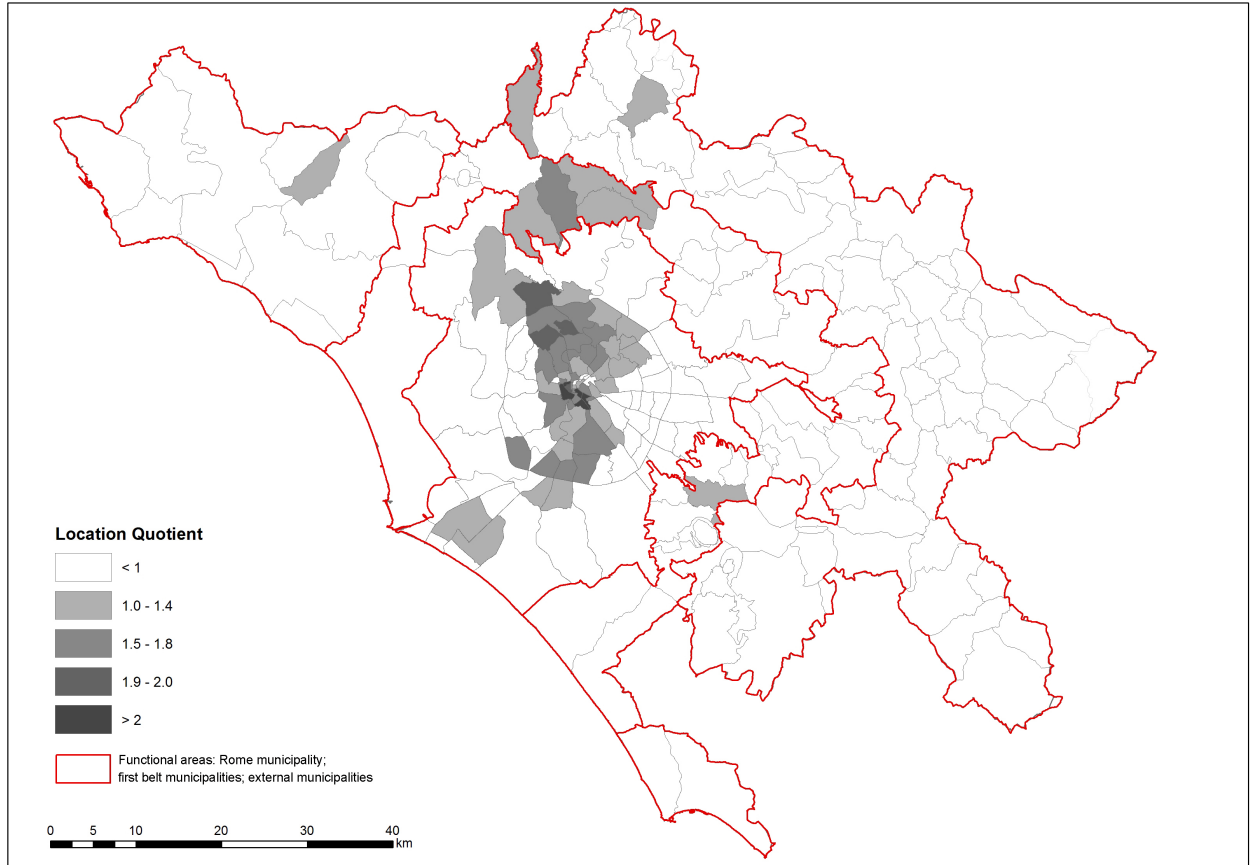
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<sup>11</sup> Due to its large extension, if compared to the rest of the municipalities in the study area, the Municipality of Rome has been further subdivided in urban districts, according to the census nomenclature.

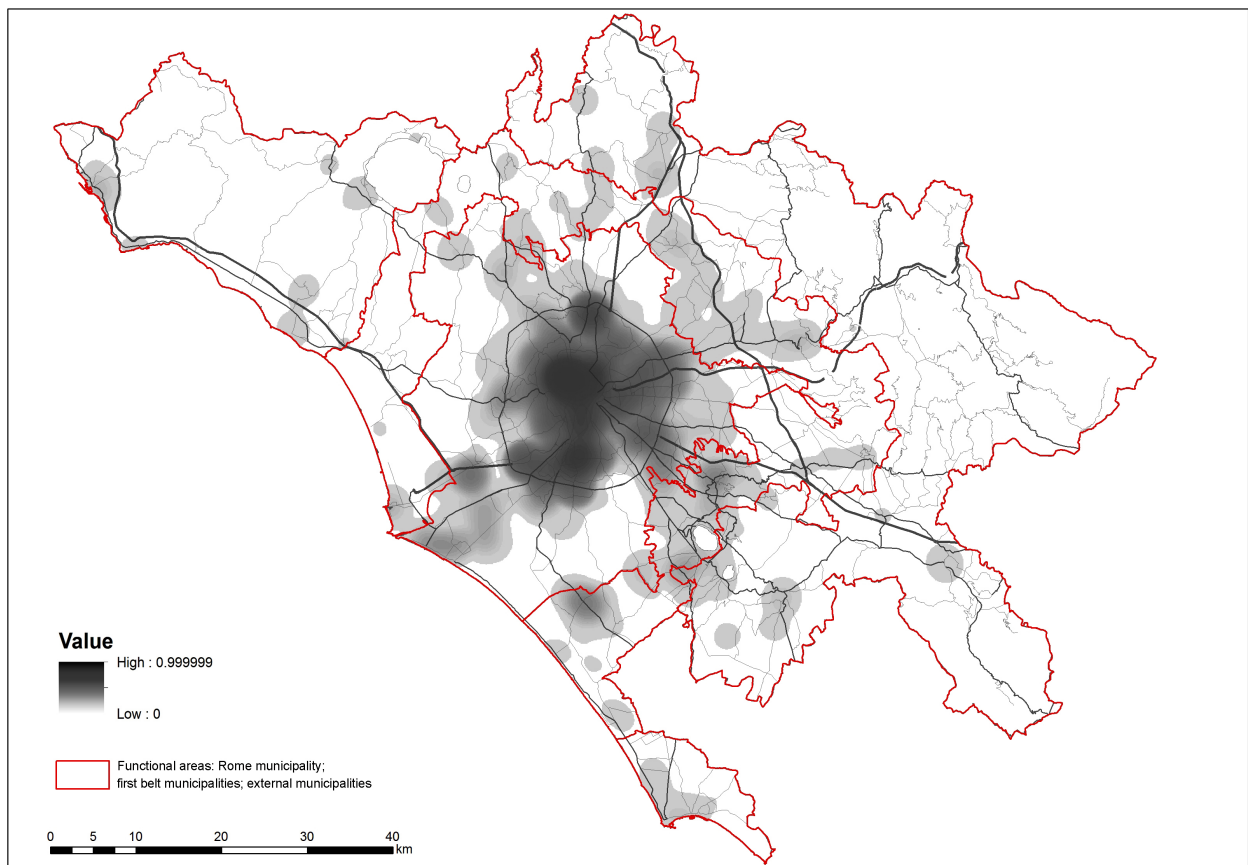
<sup>12</sup> Kernel density estimation was performed with the Spatial Analyst Extension for ArcGIS 10. ArcGIS employs the quadratic kernel function described in Silverman (1986):

$$f(x) = \frac{1}{nh} \sum_{i=1}^n H\left(\frac{x - x_i}{h}\right)$$

Where  $h$  is the bandwidth,  $x_i$  is the Euclidean distance between type  $i$  firms.  $K$  is the quadratic kernel function, which is defined as:  $H(x) = -\frac{3}{4}(1 - x^2)$ ,  $|x| \leq 1$ ;  $K(x) = 0$ ,  $x > 1$ . We chose a bandwidth (kernel) of 40 km with an output cell size of 100x100m.



**Figure 3-3** LQ of creative firms in 2007. Source: ASIA-UL.



**Figure 3-4** Kernel function for the creative firms in 2007. Source: ASIA-UL.

For the single creative sectors, whose Kernel functions are reported in Appendix 2, we can summarise the following: Advertising, Architecture, Design, Music and performing arts, are spatially distributed in accordance to the urban form and extension. Architecture has three different intensity peaks, while the rest of the sectors only one, centrally located, peak. Publishing as well as Arts, antiques and crafts show a similar monocentric distribution pattern, similar to the above-described activities, but their spatial extension is far more reduced. Software and computer games barycentre is in the southern quarter of EUR, in discordance with the rest of the creative sectors. This sector also displays a significant offshoot along the motorway that conducts to the Fiumicino airport. Radio and television and Video, film and photography are both highly concentrated in the city centre, both revealing multiple intensity peaks.

The mapping exercise has highlighted the fact that Rome's city centre hosts the largest number of creative activities. Areas of influence of different creative categories have different spatial form and behaviour, but they overlap.

Cartographic representation of spatially distributed phenomena is useful in discovering relationships amongst distributions. These relationships can be further developed through specific statistical techniques that aim at identifying patterns in spatial data.

### 3.5 Empirical analysis

The empirical part of this paper is devoted to the study of the location patterns of different creative sub-sectors. We identify and interpret mutual relationships amongst these groups of activities, as well as their interactions with the respective service sectors. Thus, analysis focuses on bivariate spatial point patterns.

The selected method to test for industry localization depends on the hypothesis made over the nature of the spatial relationships. Bivariate spatial patterns may be interpreted in terms of exogenous factors influencing both types of economic activities, which lead to joint-localization, or in terms of attraction-repulsion amongst them, which leads to co-localization.

According to Duranton and Overman (2005), tests of industry localization should rely on a measure which: (i) is comparable across the firm types; (ii) controls for the overall agglomeration of firms; (iii) controls for individual concentration; (iv) is unbiased respect to the scale of agglomeration; (v) gives an indication of the significance of the results.

In the context of analysing the localization characteristics of two different types of industries, distance-based methods have the significant advantage of detecting spatial structure at every scale: geographic concentration or dispersion of firms in space is reported independently from the scale of phenomenon (property [iv]). Marcon and Puech (2010) identify two principal groups of distance-based methods used in the economic literature:

- i. The *probability density function* utilised by Duranton and Overman (2005). This measure is based on the average number of neighbours at each distance, smoothed and normalized so that it sums up to 1.
- ii. The *cumulative distance-based methods* based on Ripley's  $K$ -function (1976, 1977), Besag's  $L$  function (1977) and their extensions based on the second-order property of point patterns (Barff, 1987; Arbia, 1989; Espa et. al., 2010a; Espa et. al., 2010b). These functions describe geographic concentration by counting the average number of neighbours on every possible circle with a given radius.

Despite some limitations, cumulative distance-based methods based on Ripley's  $K$ -function are the most widely used in empirical economic applications. A principal drawback of these methods is related to the fact that they are generally applied to relative concentrations (i.e. detect whether each industry is overrepresented or underrepresented with respect to a baseline distribution), but they

refer literally to absolute concentrations, being based on the null hypothesis of completely random spatial distribution of establishments (i.e. plants are distributed uniformly and independently). Property [iii] defined by Duranton and Overman (2005) is usually fulfilled by comparing a sector's distribution with the overall location pattern of industries, yet, Marcon and Puech (2003) maintain that these statistical tools effectively measure the existence of specialized areas only. Another issue is related to the fact that distance-based methods most often do not consider the size of industries (property [ii]), although adaptations of Ripley's  $K$ -function to include marked point-patterns that account for industry size, have been proposed in order to overcome this problem (Espa et al., 2010b).

One of the most important concerns about the application of distance-based functions to point-patterns of economic activities is the fact that economic space is heterogeneous. The presence of geographic features such as water bodies or protected areas, where firms cannot locate, is a clear contraindication for the use of statistical methods, which are based on the null hypothesis of completely random spatial distribution of establishments. This aspect is even more enhanced when working with point-patterns at urban/neighbourhood scale. In these cases we should account for the fact that firm localization is subject to precise spatial constraints, related to the physical composition of built-up units.

It is possible to account for space heterogeneity by assuming a null hypothesis of *random labelling* (Diggle and Chetwynd, 1991; Marcon and Puech, 2003; Espa et al., 2010a). This hypothesis implies that the location of firms is fixed, while their sector of activity is distributed randomly. The reference framework is the marked point process (Diggle, 1983) that, besides of the point location, accounts for point characteristics (e.g. type  $i$ ; type  $j$ ).

### 3.5.1 Analysing the aggregative properties of creative sectors

We first look at the characteristics of the spatial distribution of different creative sub-sectors with respect to the rest of creative activities in the study area. The null hypothesis is the one of random labelling, as proposed by Diggle and Chetwynd (1991), i.e. a firm can belong randomly to one creative sector or to the rest of the creative activities. Under this hypothesis, at any distance  $d$ ,  $K_s(d) = K_C(d)$ , where  $K_s(d)$  and  $K_C(d)$  are Ripley's  $K$ -functions for the single creative sector and for the rest of creative economy respectively. The distance-based function is defined as:

$$D_s(d) = K_s(d) - K_C(d) \quad (3)$$

Such a difference can help in identifying creative sectors that are over-concentrated (over-dispersed) conditionally upon the spatial pattern displayed by the rest of the creative economy in the study area.  $D$  detects the occurrence of statistically significant concentration or dispersion of each creative subsector with the increasing of distance.

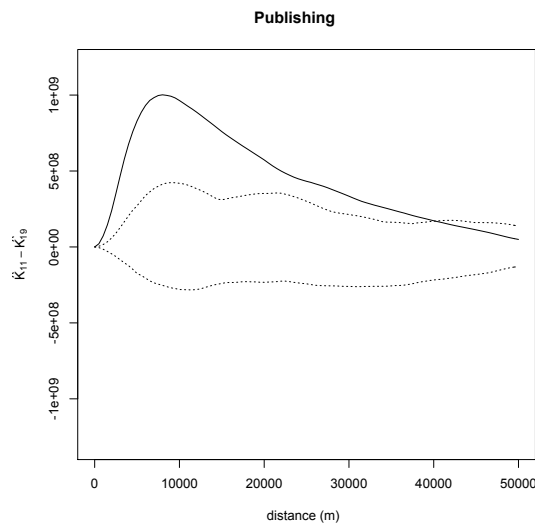
Confidence intervals, at a significance level  $\alpha = 0.05$ , are generated using Monte Carlo simulations, by keeping firm's location unchanged and by randomly assigning the labels that characterize each sector.

We apply  $D$  function in a study area of 100x150 km that comprises the Metropolitan region of Rome. The distance  $d$  is considered 50 km (ibid.). Behaviours of the estimated  $D$  functions for each creative sub-sector compared to the rest of creative economy are reported in Appendix 3. Figures 3-5 to 3-7 represent three clearly distinguishable distribution patterns of creative sub-sectors observed in the study area. The continuous line is the estimated  $D$  function, namely the difference between the estimated  $K$  function for one creative sub-sector and the estimated  $K$  function for the rest of creative activities. The dotted lines are the simulated confidence bands. They represent the maximum and minimum values  $D$  function assumes, after a sequence of 999 random labelling of the two point data sets (Rowlingson and Diggle, 1993).

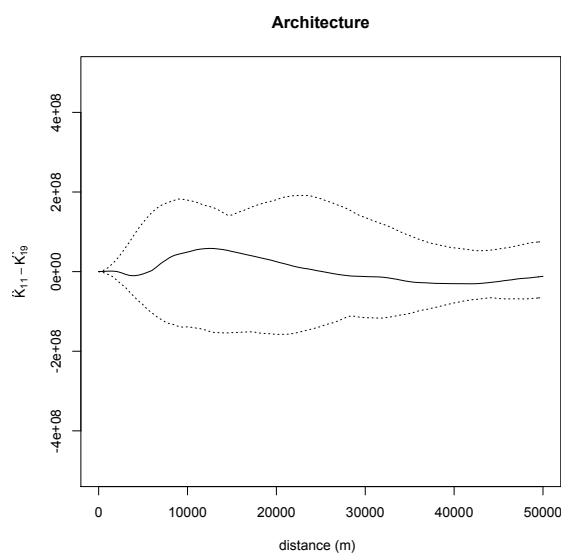


Figure 3-5 illustrates a case of over-concentration of one creative sub sector when compared to the rest of the creative sectors. In this case the estimated D curve lies above the maximum envelope curve. Figure 3-6 illustrates a case of random labelling of one creative sub sector when compared to the rest of the creative sectors. In this case the estimated D curve lies in-between the maximum and minimum envelope curves. Figure 3-7 illustrates a case of over-dispersion of one creative sub sector when compared to the rest of the creative sectors. In this case the estimated D curve lies below the minimum envelope curve.

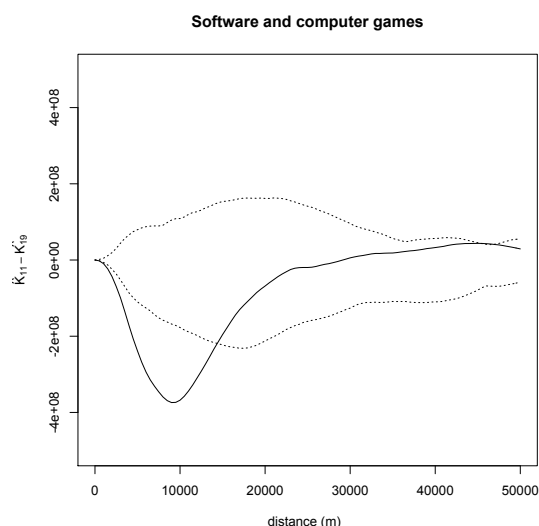
Table 3-2 reassumes the observed spatial behaviours for all the creative sub-sectors. The third and fourth columns indicate the existence of concentration and dispersion patterns, respectively, and the distance at which these phenomenon occur. The fifth column evidences the distance at which intensity peaks are observed. The lack of reference values both for concentration and for dispersion patterns evidences random labelling of one subsector when compared to the spatial distribution of rest of creative activities.



**Figure 3-5** Agglomeration pattern for the “Publishing” sector in the Metropolitan area of Rome.



**Figure 3-6** Random labelling for the “Architecture” sector in the Metropolitan area of Rome.



**Figure 3-7** Dispersion pattern for the “Software and computer games” sector in the Metropolitan area of Rome.

**Table 3-2** Concentration-dispersion characteristics for each creative sector in the Metropolitan area of Rome.

	N. firms	Concentration	Dispersion	Peak
Advertising	2052	0-7.5 km	--	6.5 km
Architecture	11562	--	--	--
Arts, antiques and crafts	4108	0-11 km	--	5 km
Design	1522	--	--	--
Music and performing arts	4921	0-48 km	--	10 km
Publishing	2789	0-40 km	--	8 km
Radio and TV	322	0-12 km	--	8 km
Software and computer games	5781	--	0-15 km	9 km
Video, film and photography	2340	0-33 km	--	8 km

From Table 3-2 we learn that: Advertising; Arts, antiques and crafts; Music and performing arts; Publishing; Radio and television; Video, film and photography, display a pattern of *significant concentration* when compared to the spatial distribution of rest of creative activities; Software and computer games has a spatial pattern of *significant dispersion*; Architecture and Design are *randomly labelled*. The distance at which there is significant concentration differs greatly between the various creative sectors. A common characteristic is the existence of only one concentration peak for all non-randomly labelled categories. This feature derives from the strong monocentric pattern of Rome’s Metropolitan area.

The localization characteristics displayed by the different creative sectors are interesting to comment in the light of the strong differences between the components. The arts and the media, which are the ‘traditional’ categories of the ‘cultural’ economy, have a clear tendency to agglomerate if compared to the totality of the creative activities of the city. Creative sectors such as the Architecture and Design, which are dominated by the micro firms (see Figure 3-2), are randomly labelled. Software and computer games is the only sector showing a dispersive pattern relative to the rest of the creative components. As we will discuss further on, when it comes to definition issues, this is the most controversial sector.

### 3.5.2 Mutual relationships between creative sectors

Geographic concentration of creative firms increases the opportunities for them to interrelate, to employ suitable labour, to benefit from common infrastructure and to reduce market uncertainties. In this section we analyse the mutual relationships between specific creative sectors, in order to identify possible co-agglomeration patterns. We test a null hypothesis of random labelling by comparing pairs of creative subcategories.

In the presence of a bivariate point process (with points marked as type  $i$  and type  $j$ ), at any distance  $d$ , we have two typologies of events and two distinct types of  $K$ -functions: the univariate Ripley's  $K$ -functions for each marked point subset  $K_i(d)$  and  $K_j(d)$ , and the bivariate functions  $K_{ij}(d)$  and  $K_{ji}(d)$ .

Under the null hypothesis of random labelling we have  $K_{ij}(d) = K_{ji}(d) = K_i(d) = K_j(d) = K(d)$ , meaning that all the bivariate and univariate  $K$ -functions of marked point subsets coincide with the univariate  $K$ -function obtained by the whole point-pattern.

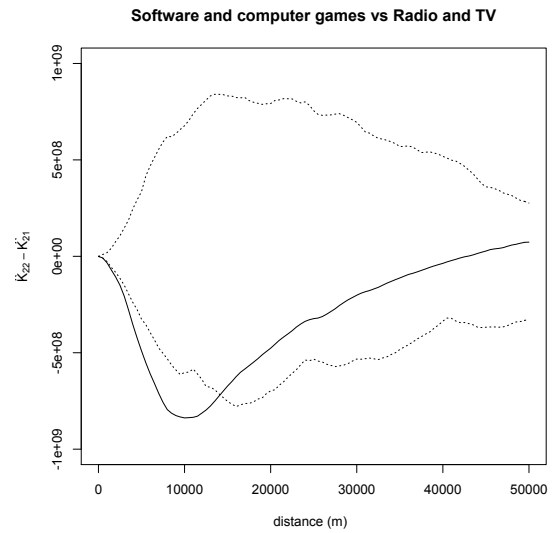
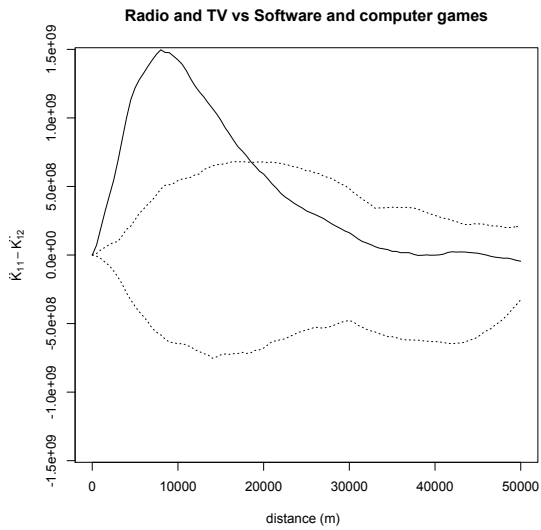
The null hypothesis is tested by performing the differences between estimators:  $\hat{K}_i(d) - \hat{K}_{ij}(d)$  and  $\hat{K}_i(d) - \hat{K}_{ji}(d)$ . Arbia et al. (2007) argue that these differences are more informative than the simple difference  $\hat{K}_i(d) - \hat{K}_j(d)$ , suggested by Diggle and Chetwynd (1991), because they allow for a better characterisation of the mutual spatial relationships between the two marked point patterns. For example, when  $\hat{K}_i(d) > \hat{K}_{ij}(d)$  and  $\hat{K}_i(d) > \hat{K}_{ji}(d)$  both type  $i$  and type  $j$  industries show a tendency of segregation within mono-type clusters.

Confidence intervals, at a significance level  $\alpha = 0.05$ , are generated using Monte Carlo simulations, by keeping firm's location unchanged and by randomly assigning the labels that characterize each sector. The results obtained from the testing of the null hypothesis on all pairs of creative categories are shown in Appendix 4.

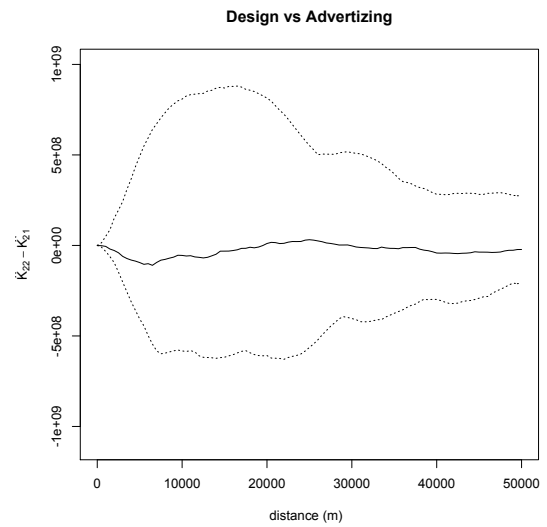
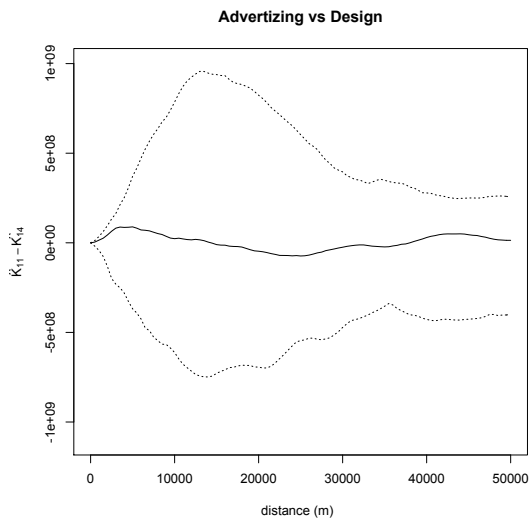
Under the hypothesis of random labelling a firm can belong randomly to type  $i$  or type  $j$ . In the case of economic activities, this can be interpreted as the existence of conditions that encourage location of one industry rather than the other. To facilitate the interpretation of such a large amount of information, we pinpoint and comment three dominant typologies of attraction-repulsion patterns. We will further comment some significant relationships amongst creative categories, in the light of the literature and by considering the specific characteristic of the study area.

A first, frequent, typology of relationship involves clusters of points of one sector co-existing with points of the second sector that are internally over-dispersed (Figure 3-8). This pattern is observed in the relationship that creative categories in general hold with the Advertising sector and with the Software and computer games sector. In most of the cases clustering distance of the dominant sector is small - between 0 and 15 kilometres, as in the cases of: [Arts, antiquities and crafts; Publishing; Music and performing; Video, film and photography] *versus* Advertising; [Arts, antiquities and crafts; Radio and TV] *versus* Architecture; [Arts, antiquities and crafts; Architecture] *versus* Software; Publishing *versus* Design -, or very small - between 0 and 5 kilometres, as in the cases of [Architecture; Radio and TV] *versus* Advertising; [Arts, antiquities and crafts; Music and performing; Radio and TV; Video, film and photography] *versus* Design. At higher distances points become randomly labelled. It is, however, important to keep in mind the fact that the number of points on which the estimation is based decreases with the increasing of distance, thus the estimates become less reliable. Clustering distance of the dominating sector is much larger - from 0 up to 30-50 kilometres, for [Music and performing; Publishing; Video, Film and Photography] *versus* Architecture; [Music and performing; Publishing; Radio and TV; Video, Film and Photography] *versus* Software.

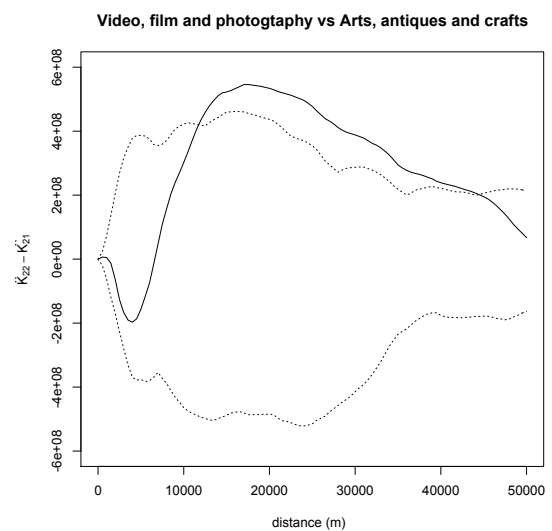
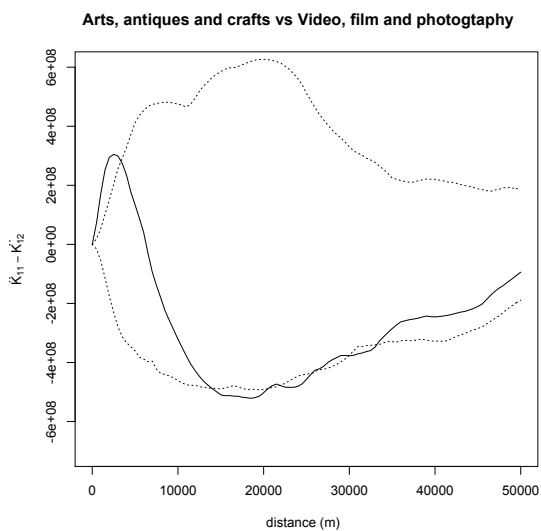
The second typology of relationship is that of the random labelling at all distances (Figure 3-9). This holds true for: Architecture *versus* Design; Publishing *versus* Video, Film and Photography; Radio and TV *versus* Video, Film and Photography.



**Figure 3-8** Pairwise comparison for “Radio and television” and “Software and computer games”.



**Figure 3-9** Pairwise comparison for “Advertising” and “Design”.



**Figure 3-10** Pairwise comparison for “Arts, antiques and crafts” and “Video, film and photography”.

The last typology of attraction–repulsion is displayed by the pairs of sectors displaying a clustering pattern of one sector at small distances (less than 20 kilometres) attracting a second sector, which is also self-clustered but at higher distances (Figure 3-10). This type of relationship involves the Arts, antiques and crafts sector *versus* Publishing; Music and performing arts; Video, film and Photography.

Within the complexity of the urban structure, each creative sector exhibits a proper locational pattern as well as its relationships with other creative sectors. These ties are spatially legible in different contexts and for different types of creative activities.

The advertising industry represents an interesting case to look at. Advertising holds cross-industry links with most of the economic activities, hence with the rest of creative sectors. Advertising is a space-specific industry because, although dominated by international groups, it strongly depends in national markets of regulation and of audience taste (Pratt, 2012). At the local scale this industry is generally characterised by a strong presence of small and micro firms, who have a relatively short life. In this context, physical proximity becomes crucial because enables fluxes of specialized labour.

In the case of Rome we observe the presence of micro firms (up to 10 employees) in the advertising sector that account for more than 70% of the total (Figure 3-2), and a spatial distribution that follows that of the urban imprint in its full extension (Appendix 2: Figure 1).

Advertising displays the same spatial behaviour in relation to the ‘traditional’ cultural industries (Arts, antiques and crafts activities; Music and performing arts; Publishing; Video, film and photography; Radio and TV). This behaviour can be reassumed as follows: cultural industries are concentrated at small distances, while Advertising is internally dispersed at small distances and randomly labelled after. This statistical evidence recalls a spatial arrangement where the ‘leading’ sector is highly clustered and the ‘follower’ sector is disposed around it. The ‘service’ role of Advertising fits well to this spatial arrangement (Appendix 4).

As far as it concerns the relationships with the creative professions, it is interesting to notice the fact that Advertising and Design are randomly labelled at all distances. Advertising shows a slight tendency to cluster at a distance of 0-5 kilometres with respect to the randomly labelled Architecture, and a strong tendency to cluster at a distance of 0-15 kilometres with respect to the internally dispersed Software and computer games (Appendix 4). It is possible to comment these results by looking at some evidences emerging from the analysis of the study area. Despite the fact that Architecture counts eight times more firms if compared to Design (Figure 3-2), these two economic activities have similar spatial behaviours. In analogy with Advertising, they are dominated by small and micro firms and are disposed accordingly to the spatial extension of the urban imprint, thus being less ‘site specific’. Random labelling appears well justifiable under these conditions.

This observation is also applicable when looking at the pairwise relationship between Architecture and Design: the un-expectable random labelling between these two sectors is explained by the fact that they are both highly influenced by spatially ‘pulverised’ activities of self-employed people, whose localization preferences depend more on urban amenities than on mutual relationships.

Design tends to be often within the hypothesis of random labelling when compared to the other creative sectors; the only exceptions being Arts, antiques and crafts activities and Publishing, with respect to which it is ‘correctly’ positioned as a ‘follower’.

Another unexpected result is the one of random labelling between Video, film and photography and Radio and TV (Appendix 4). Both sectors are dominated by the presence of medium and large firms (Figure 3-4) and have the tendency to concentrate in precise sectors of the city centre (see Appendix 2: Figures 7; 9). Random labelling maybe due to the reduced spatial extension, but maybe

also related to rather imprecise definition of the sectors, related to the fact that the Ateco codes (59.11.0 and 59.12.0) include activities that belong to both sectors (complete list of Ateco codes is in Appendix 1).

Software and computer games constitute one atypical case amongst the creative sectors within the study area. All the pairwise relationships with the other sectors reveal internal dispersion of Software at small distances followed by random labelling (Appendix 4). The behaviour of the functional statistics does not help the interpretation of relationships with other creative sectors. As it can be noticed from Figure 3-2, the sector is dominated by the presence of medium and large firms, it has the highest share in employment and a clear tendency to concentrate in precise sectors of the metropolitan area: in the city centre and in the area between Rome and the Sea (see Appendix 2: Figure 8).

The sector itself and its composition has been object of discussion amongst scholars dealing with creative industries definition criteria (Reeves 2002; Selwood 2002; 2004). It was argued that its inclusion amongst the creative industries was justified by its employment share rather than by its affinity with the creativity (Garnham, 2005). In the present case study we have used the 'inclusive' definition by DCMS, as reported by the NESTA Report (De Propris et al., 2009). The sector definition through the Ateco codes has revealed some difficulties related to codification problems, not allowing for correct discrimination between subsectors (see Appendix 1). This deficiency hinders from identifying those segments of software production that are clearly related to the creative sector. This question cannot be solved unless precise taxonomies are defined for some 'recent' businesses like the computer games or the new media.

### *3.5.3 Core-periphery relationships within the value chains*

Production chains affect industrial clustering. In the case of creative industries, testing for co-localization between content-creation creative activities and related support activities, such as the production and distribution of complementary outputs, would offer evidence about the spatial relationships that creative activities in the different creative economic sectors hold with the support activities in the value chain.

We test a null hypothesis of random labelling by comparing, for each creative category, localization patterns of creative firms (L1 and L2 layers) with those of the respective service functions (L3, L4 and L5 layers). Detailed distribution of firms and employees in each layer is reported in Appendix 1. Point data is organised according to the definition described in Section 4, adapted for the Italian 5 digit ATECO codes for the observation year 2007. Content creation activities (L1, L2) are marked as 'core' activities, while the rest of firms (L3, L4, L5) are marked as 'support' activities.

Table 3-3 summarises the concentration-dispersion characteristics derived from pairwise comparisons between the core creative industries and the service industries for each creative category. Detailed results are in Appendix 5. Note that Advertising sector is not included, since it is composed only by L1 and L2 type of economic activities.

Three distinguishable concentration-dispersion patterns can be observed between the core-creative and the service industries for each creative category in the study area:

- Concentration of core creative activities and contextual dispersion of support activities (Architecture; Arts, antiquities and crafts activities; Publishing; Music and performing arts; Video, Film and photography; Radio and TV);
- Concentration of support creative activities and contextual dispersion of core activities (Design);
- Random labelling of core and support activities (Software and computer games).

**Table 3-3** Concentration-dispersion characteristics between the core-creative and the service industries for each creative category in the Metropolitan area of Rome.

	N. firms	Core		Support	
		Concentration	Dispersion	Concentration	Dispersion
Architecture	11562	0-50 km	--	--	0-50 km
Arts, antiques and crafts	4108	0-29 km	--	--	0-23 km
Design	1522	--	--	0-2 km	--
Music and performing arts	4921	0-30 km	--	--	5-8 km 20-42 km
Publishing	2789	0-38 km	--	--	0-39 km
Radio and TV	322	0-14 km	--	--	8-16 km
Software and computer games	5781	--	--	--	--
Video, film and photography	2340	0-42 km	--	--	0-42 km

The most striking feature in Table 3-3 is the fact that the service sector of Design is clustered at small distances (0-3 kilometres) while the core sector is randomly labelled. This can be explained by the fact that, as already discussed, spatial distribution of Design activities shows no strong intensity peaks or excessive spatial concentration, being the sector dominated by micro firms. On the other hand, value chain includes retailing of fashion and design products, whose tendency to locate in central neighbourhoods is well known. However, interpretation of these results is by no means straightforward. The design sector in the classification scheme based on the DCMS mapping document appears ill assorted when adapted to the Italian case: the Ateco codes do not allow for distinction amongst fashion design and industrial design (these categories are merged in code 74.10.1) and identifiable activities in the value chain include the fashion sector only. Analogies with the Design sector were also noted in the above discussed problematic sector of Software and computer games, which results randomly labelled in relation to its service activities.

Architecture deserves perhaps a separate comment, considering the fact that its supporting sector gathers the largest number both of firms and employees (Figures 3-1 and 3-2). The leader-follower relationship between core and service activities emerges clearly at all distances. This statistical evidence is explained by the fact that service activities within the value chain of Architecture are mainly represented by small but numerous construction firms. In this case the hinterland region is representative in terms of hosting a significant number of economic activities if compared to the central urban agglomeration. In this case it is possible to describe a core creative sector clustered in space and a service sector dispersed internally and disposed around the core.

This observation holds true also for all the ‘traditional’ cultural sectors: Arts, antiquities and crafts activities; Publishing; Music and performing arts; Video, film and photography; Radio and television. Analysis results for these latest categories perhaps can be interpreted with greater conviction, in the light of the fact that sector boundaries are more consolidated and reliable.

### 3.6 Conclusions

This paper addressed the use of distance-based statistical methods to analyse the location patterns of creative industries. The spatial distribution of creative industries in the Metropolitan region of Rome is studied by utilising spatially referenced point data as input to a statistical model based on Ripley’s *K*-function. Pairwise differences between *K*-functions of observed point patterns are computed and compared with simulated confidence bands. A null hypothesis of random labelling is tested upon three conditions: by analysing the spatial distribution of different creative

sectors with respect to the rest of the creative industry; by comparing pairs of creative subcategories for the purpose of identifying those revealing mutual attraction; by comparing, for each creative subcategory, localization patterns of creative firms with respect to the localization of respective service functions. Exhaustive establishment level data from the Statistical Archive of Local Units of Active Enterprises (ASIA-UL) provided by the National Institute of Statistics is used in the analysis.

While looking at the spatial relationships that each creative category holds with the rest of the creative economy, we observe that six out of the nine creative sectors display a pattern of significant concentration. In detail, this holds true for: Advertising; Arts, antiques and crafts; Music and performing arts; Publishing; Radio and television; Video, film and photography. Instead, Software and computer games shows significant dispersion, while Architecture and Design are randomly labelled.

This statistical evidence highlights the fact that macro components of the creative industry, as defined by the DCMS (1998) classification, and similarly by many other national and international institutions, clearly reveal different spatial arrangements: the arts and the media, which are the 'traditional' categories of the 'cultural industry', show a higher tendency to agglomerate if compared to the totality of the creative activities of the city. Creative sectors such as Architecture and Design, which are dominated by the micro firms, are randomly labelled. Software and computer games is the only sector showing a dispersive pattern when compared to the rest of the creative components. These structural spatial characteristics are reflected also in the relationships between different creative sectors and between core-creative activities and their respective support activities.

Pairwise comparisons between creative categories revealed the existence of urban clusters characterised by the co-existence of different creative sectors. Most of the observed joint patterns display a situation of dominance of one sector on the other. This evidence can be interpreted in terms of the existence of a 'leader' sector, clustered in space at small distances, and a 'follower' sector, internally dispersed and spatially disposed around the leader. Typically the leaders are 'traditional' cultural sectors: Arts, antiques and crafts; Publishing; Music and performing arts; Video, film and photography; Radio and television, while followers are creative services such as Advertising and – to a lesser extent – Design.

The observed random labelling amongst Advertising and Design activities is explained by the fact that they both appear to be less 'site specific' if compared to other creative industries, especially if characterised by the presence of medium and large enterprises. Design, in particular, tends often to be within the hypothesis of random labelling when compared to other sectors of the creative economy.

When looking at the pairwise comparisons between the creative sectors and their respective service sectors, the following situation emerges: six out of eight possible pairs of point patterns display a situation of dominance of the creative sector on the service sector. The leader-follower type of relationship is displayed by: Architecture; Arts, antiques and crafts; Publishing; Music and performing arts; Video, Film and photography; Radio and television. This type of relationship between 'core' and 'peripheral' economic activities within the creative value chains can be interpreted in terms of mutual relationships that are influenced by the urban milieu. Generally creative firms tend to locate in central neighbourhoods characterized by the high quality of architecture and streetscape and a high density of urban functions. On the other hand, many service activities, despite the requisite for spatial proximity with the core creative sector, are more sensitive to urban real estate values and/or accessibility to transportation infrastructures.

The results obtained have shown the utility of empirical analysis based on spatial statistics in the analysis of detailed patterns of creative industries. Empirical evidence is provided about the



tendency to cluster shown by different creative sectors, about the spatial interaction amongst specific creative activities and about the co-localisation of industries within the value chains.

This site-specific type of analysis would gain much from the confrontation with empirical evidence obtained in other, different spatial contexts, both at national and international levels.

Another consideration to be made when introducing this approach to the study of the creative sector regards the existence of conceptual problems deriving from the lack of a clear-cut definition of what creativity is meant to entail from an economic perspective. This leads to confusing evidence about the weight of the creative sector and the relative significance of its components, but also to distorted visions on the relationships amongst creative activities and their spatial context. This latest aspect was evidenced also by the analytical results, showing how creative categories whose boundaries are not precisely drawn as a result of definition dilemma or problems with the (SIC) codes not being able to distinguish amongst the components return statistical evidence that is difficult to interpret.

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# 4 APPENDICES



#### 4.1 ATECO codes and description of creative industries per Category and Layer. Source: ISTAT – Business register 2007 – Province of Rome

##### ADVERTIZING

Ateco code	Layer	Description	N. firms	N. employees
73.11.0	L1	Agenzie pubblicitarie	1650	3755.49
73.12.0	L2	Attività delle concessionarie e degli altri intermediari di servizi pubblicitari	402	1141.8
<b>Grand total</b>			<b>2052</b>	<b>4897.29</b>

##### ARCHITECTURE

Ateco code	Layer	Description	N. firms	N. employees
71.11.0	L1	Attività degli studi di architettura	6831	7296.58
71.12.1	L2	Attività degli studi di ingegneria	3744	4653.4
71.12.2	L2	Servizi di progettazione di ingegneria integrata	987	5421.07
71.12.3	L3	Attività tecniche svolte da geometri	2810	3058.87
71.12.4	L3	Attività di cartografia e aerofotogrammetria	86	210.51
71.12.5	L3	Attività di studio geologico e di prospezione geognostica e mineraria	217	427.25
41.10.0	L4	Sviluppo di progetti immobiliari senza costruzione	639	1387.99
41.20.0	L4	Costruzione di edifici residenziali e non residenziali	11037	41307.62
42.11.0	L4	Costruzione di strade, autostrade e piste aeroportuali	264	2054.51
42.12.0	L4	Costruzione di linee ferroviarie e metropolitane	40	507.27
42.13.0	L4	Costruzione di ponti e gallerie	49	448.12
42.21.0	L4	Costruzione di opere di pubblica utilità per il trasporto di fluidi	17	759.33
42.22.0	L4	Costruzione di opere di pubblica utilità per l'energia elettrica e le telecomunicazioni	14	1241.64
42.91.0	L4	Costruzione di opere idrauliche	78	537.29
42.99.0	L4	Costruzione di altre opere di ingegneria civile n.c.a.	160	801.71
43.21.0	L4	Installazione di impianti elettrici ed elettronici (inclusa manutenzione e riparazione)	4396	16808.91
43.22.0	L4	Installazione di impianti idraulici, di riscaldamento e di condizionamento dell'aria	4117	12075.35
43.29.0	L4	Altri lavori di costruzione e installazione	1198	4351.64
43.31.0	L4	Intonacatura e stuccatura	602	1481.61
43.32.0	L4	Posa in opera di infissi, arredi, controsoffitti, pareti mobili e simili	1002	2222.68
43.33.0	L4	Rivestimento di pavimenti e di muri	1402	2611.91
43.34.0	L4	Tinteggiatura e posa in opera di vetri	1452	2614.42
43.39.0	L4	Altri lavori di completamento e di finitura degli edifici	8539	21854.32
43.91.0	L4	Realizzazione di coperture	169	620.64
43.99.0	L4	Altri lavori specializzati di costruzione n.c.a.	577	3081.23
46.13.0	L4	Intermediari del commercio di legname e materiali da costruzione	949	1269.02
46.73.1	L4	Commercio all'ingrosso di legname, semilavorati in legno e legno artificiale	168	615.68
46.73.2	L4	Commercio all'ingrosso di materiali da costruzione	613	2962.88
46.73.3	L4	Commercio all'ingrosso di vetro piano	7	27.66
46.73.4	L4	Commercio all'ingrosso di carta da parati, colori e	132	356.2

		vernici		
70.10.0	L4	Attività delle holding impegnate nelle attività gestionali (holding operative)	151	3147.49
71.20.1	L4	Collaudi ed analisi tecniche di prodotti	181	519.78
71.20.2	L4	Controllo di qualità e certificazione di prodotti, processi e sistemi	267	711.74
<i>Total core</i>			<i>11562</i>	<i>17371.05</i>
<i>Total support</i>			<i>41333</i>	<i>130075.27</i>
<b>Grand total</b>			<b>52895</b>	<b>147446.32</b>

#### ARTS, ANTIQUES AND CRAFTS ACTIVITIES

<b>Ateco code</b>	<b>Layer</b>	<b>Description</b>	<b>N. firms</b>	<b>N. employees</b>
47.78.3	L2	Commercio al dettaglio di oggetti d'arte di culto e di decorazione, chincaglieria e bigiotteria	1128	2102.71
47.79.2	L2	Commercio al dettaglio di mobili usati e oggetti di antiquariato	336	404.85
47.77.0	L2	<i>Commercio al dettaglio di orologi, articoli di gioielleria e argenteria</i>	<i>1963</i>	<i>3643.73</i>
82.30.0	L2	Organizzazione di convegni e fiere	681	1775.5
15.12.0	L3	Fabbricazione di articoli da viaggio, borse e simili, pelletteria e selleria	116	289.82
15.20.1	L3	Fabbricazione di calzature	31	60.19
15.20.2	L3	Fabbricazione di parti in cuoio per calzature	9	26.28
24.41.0	L3	Produzione di metalli preziosi e semilavorati	10	16.14
32.12.1	L3	Fabbricazione di oggetti di gioielleria ed oreficeria in metalli preziosi o rivestiti di metalli preziosi	487	800.86
32.12.2	L3	Lavorazione di pietre preziose e semipreziose per gioielleria e per uso industriale	33	48.49
32.13.0	L3	Fabbricazione di bigiotteria e articoli simili	149	182.17
32.20.0	L3	Fabbricazione di strumenti musicali (incluse parti e accessori)	14	17.34
13.93.0	L4	Fabbricazione di tappeti e moquette	6	28.83
23.31.0	L4	Fabbricazione di piastrelle in ceramica per pavimenti e rivestimenti	3	46.83
23.41.0	L4	Fabbricazione di prodotti in ceramica per usi domestici e ornamentali	59	102.77
23.70.2	L4	Lavorazione artistica del marmo e di altre pietre affini, lavori in mosaico	124	408.93
46.47.2	L4	Commercio all'ingrosso di tappeti	11	12.5
46.48.0	L4	Commercio all'ingrosso di orologi e di gioielleria	232	570.58
<i>Total core</i>			<i>4108</i>	<i>7926.79</i>
<i>Total support</i>			<i>1284</i>	<i>2611.73</i>
<b>Grand total</b>			<b>5392</b>	<b>10538.52</b>

#### DESIGN

<b>Ateco code</b>	<b>Layer</b>	<b>Description</b>	<b>N. firms</b>	<b>N. employees</b>
74.10.1	L1	Attività di design di moda e design industriale	362	491.15
74.10.2	L1	Attività dei disegnatori grafici	785	1082.05
74.10.3	L1	Attività dei disegnatori tecnici	244	249.38
74.10.9	L1	Altre attività di design	131	201.44
14.11.0	L3	Confezione di abbigliamento in pelle e similpelle	31	81.91
14.13.1	L3	Confezione in serie di abbigliamento esterno	341	1284.17

14.13.2	L3	Sartoria e confezione su misura di abbigliamento esterno	402	939.81
14.14.0	L3	Confezione di camicie, T-shirt, corsetteria e altra biancheria intima	83	462.16
14.19.1	L3	Confezioni varie e accessori per l'abbigliamento	128	258.39
14.19.2	L3	Confezioni di abbigliamento sportivo o indumenti particolari	104	296.24
14.20.0	L3	Confezione di articoli in pelliccia	66	92.01
13.10.0	L4	Preparazione e filatura di fibre tessili	4	4.33
13.20.0	L4	Tessitura	13	29.08
13.30.0	L4	Finissaggio dei tessili, degli articoli di vestiario e attività simili	8	16.69
15.11.0	L4	Preparazione e concia del cuoio e pelle; preparazione e tintura di pellicce	8	14
46.16.0	L4	Intermediari del commercio di prodotti tessili, abbigliamento, pellicce, calzature e articoli in pelle	1720	2213.5
46.24.2	L4	Commercio all'ingrosso di pelli gregge e lavorate per pellicceria	9	9
46.42.1	L4	Commercio all'ingrosso di abbigliamento e accessori	1116	2944.49
46.42.2	L4	Commercio all'ingrosso di articoli in pelliccia	10	26.32
46.42.3	L4	Commercio all'ingrosso di camicie, biancheria intima, maglieria e simili	84	163.64
46.42.4	L4	Commercio all'ingrosso di calzature e accessori	155	276.14
46.49.5	L4	Commercio all'ingrosso di profumi e cosmetici	52	138.77
47.51.1	L5	Commercio al dettaglio di tessuti per l'abbigliamento, l'arredamento e di biancheria per la casa	506	1062.38
47.71.1	L5	Commercio al dettaglio di confezioni per adulti	5819	15640.59
47.71.2	L5	Commercio al dettaglio di confezioni per bambini e neonati	773	1635.39
47.71.3	L5	Commercio al dettaglio di biancheria personale, maglieria, camicie	1465	2767.76
47.71.4	L5	Commercio al dettaglio di pellicce e di abbigliamento in pelle	65	386.45
47.71.5	L5	Commercio al dettaglio di cappelli, ombrelli, guanti e cravatte	71	261.81
47.72.1	L5	Commercio al dettaglio di calzature e accessori	1320	3489.11
47.72.2	L5	Commercio al dettaglio di articoli di pelletteria e da viaggio	452	1181.35
<i>Total core</i>			<i>1522</i>	<i>2024.02</i>
<i>Total support</i>			<i>14805</i>	<i>35675.49</i>
<b>Grand total</b>			<b>16327</b>	<b>37699.51</b>

#### MUSIC AND PERFORMING ARTS

<b>Ateco code</b>	<b>Layer</b>	<b>Description</b>	<b>N. firms</b>	<b>N. employees</b>
90.01.0	L1	Rappresentazioni artistiche	4027	4615.14
90.02.0	L2	Creazioni artistiche e letterarie	807	1118.1
90.04.0	L2	Gestione di teatri, sale da concerto e altre strutture artistiche	87	563.65
59.20.1	L3	Edizione di registrazioni sonore	161	270.47
59.20.3	L3	Edizione di musica stampata	12	16.16
46.43.2	L4	Commercio all'ingrosso di supporti registrati, audio, video (cd, dvd e altri supporti)	57	193.9

47.59.6	L5	Commercio al dettaglio di strumenti musicali e spartiti	72	167.66
47.63.0	L5	Commercio al dettaglio di registrazioni musicali e video in esercizi specializzati	157	317.23
93.29.9	L5	Altre attività di intrattenimento e di divertimento n.c.a.	757	1443.16
<i>Total core</i>			4921	6296.89
<i>Total support</i>			1216	2408.58
<b>Grand total</b>			<b>6137</b>	<b>8705.47</b>

#### PUBLISHING

<b>Ateco code</b>	<b>Layer</b>	<b>Description</b>	<b>N. firms</b>	<b>N. employees</b>
90.03.0	L1	Creazioni artistiche e letterarie	1662	2101.54
58.11.0	L2	Edizione di libri	390	1477.52
58.13.0	L2	Edizione di quotidiani	104	2402.85
58.14.0	L2	Edizione di riviste e periodici	553	2285.21
58.19.0	L2	Altre attività editoriali	80	325.47
18.11.0	L3	Stampa di giornali	16	203.31
18.12.0	L3	Altra stampa	1080	6766.6
18.13.0	L3	Lavorazioni preliminari alla stampa e ai media	280	816.12
18.14.0	L3	Legatoria e servizi connessi	148	693.23
63.91.0	L3	Attività delle agenzie di stampa	23	875.33
74.30.0	L3	Traduzione e interpretariato	855	984.47
17.12.0	L4	Fabbricazione di carta e cartone	10	117.73
20.30.0	L4	Fabbricazione di pitture, vernici e smalti, inchiostri da stampa e adesivi sintetici	33	170.36
47.61.0	L5	Commercio al dettaglio di libri nuovi in esercizi specializzati	425	1571.82
47.62.1	L5	Commercio al dettaglio di giornali, riviste e periodici	462	740.21
<i>Total core</i>			2789	8592.59
<i>Total support</i>			3332	12939.18
<b>Grand total</b>			<b>6121</b>	<b>21531.77</b>

#### RADIO AND TELEVISION

<b>Ateco code</b>	<b>Layer</b>	<b>Description</b>	<b>N. firms</b>	<b>N. employees</b>
60.10.0	L1	Trasmissioni radiofoniche	157	675.98
60.20.0	L1	Programmazione e trasmissioni televisive	165	10027.77
26.30.1	L3	Fabbricazione di apparecchi trasmettenti radiotelevisivi (incluse le telecamere)	26	122.92
26.40.0	L4	Fabbricazione di apparecchi per la riproduzione e registrazione del suono e delle immagini	13	63.01
46.52.0	L4	Commercio all'ingrosso apparecchiature elettroniche per telecomunicazioni e	229	1013.07
47.43.0	L5	Commercio al dettaglio di apparecchi audio e video in esercizi specializzati	129	370.06
<i>Total core</i>			322	10703.75
<i>Total support</i>			397	1569.06
<b>Grand total</b>			<b>719</b>	<b>12272.81</b>

#### SOFTWARE AND COMPUTER GAMES

<b>Ateco code</b>	<b>Layer</b>	<b>Description</b>	<b>N. firms</b>	<b>N. employees</b>
32.40.1	L1	Fabbricazione di giochi (inclusi i giochi elettronici)	15	29.36
32.40.2	L1	Fabbricazione di giocattoli (inclusi i tricicli e gli strumenti musicali giocattolo)	6	8
62.01.0	L1	Produzione di software non connesso all'edizione	2716	29352.43
62.02.0	L1	Consulenza nel settore delle tecnologie dell'informatica	1934	7096.21
62.09.0	L2	Altre attività dei servizi connessi alle tecnologie dell'informatica	1110	2657.74
58.21.0	L3	Edizione di giochi per computer	4	34.25
58.29.0	L3	Edizione di altri software	67	425.55
62.03.0	L3	Gestione di strutture e apparecchiature informatiche hardware - housing (esclusa la riparazione)	483	2690.1
26.20.0	L4	Fabbricazione di computer e unità periferiche	77	552.55
46.49.3	L4	Commercio all'ingrosso di giochi e giocattoli	39	211.11
46.51.0	L4	Commercio all'ingrosso di computer, apparecchiature informatiche	910	4102.49
47.19.2	L5	Commercio al dettaglio di computer, periferiche, telecomunicazioni, elettronica di consumo audio e video, elettrodomestici	38	1019.49
47.65.0	L5	Commercio al dettaglio di giochi e giocattoli (inclusi quelli elettronici)	341	876.08
<i>Total core</i>			<i>5781</i>	<i>39143.74</i>
<i>Total support</i>			<i>1959</i>	<i>9911.62</i>
<b>Grand total</b>			<b>7740</b>	<b>49055.36</b>

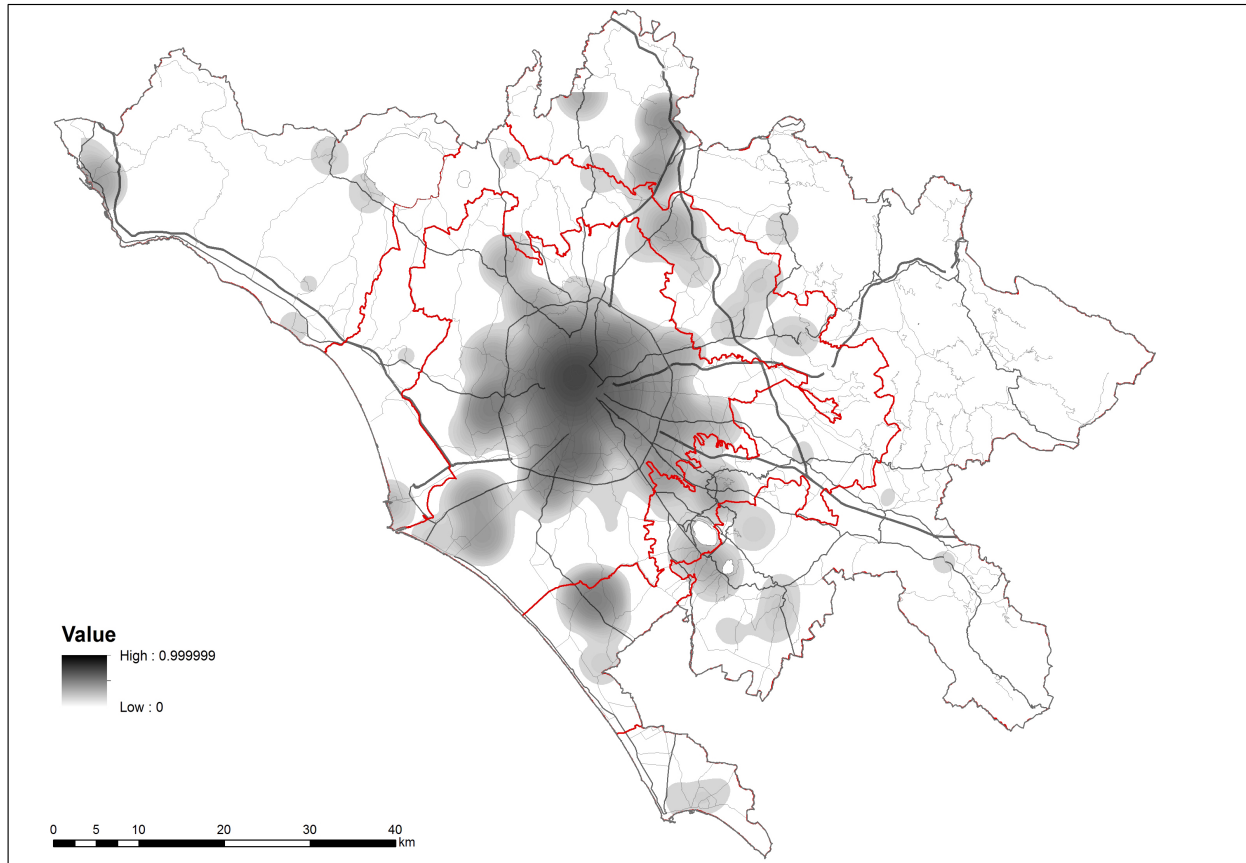
#### VIDEO, FILM AND PHOTOGRAPHY

<b>Ateco code</b>	<b>Layer</b>	<b>Description</b>	<b>N. firms</b>	<b>N. employees</b>
59.11.0	L1	Attività di produzione cinematografica, di video e di programmi televisivi	1374	12581.24
59.12.0	L1	Attività di post-produzione cinematografica, di video e di programmi televisivi	204	1125.28
74.20.1	L1	Attività di riprese fotografiche	762	903.47
18.20.0	L3	Riproduzione di supporti registrati	41	309.14
20.59.1	L3	Fabbricazione di prodotti chimici per uso fotografico	2	9.08
26.70.2	L3	Fabbricazione di apparecchiature fotografiche e cinematografiche	9	226.25
26.80.0	L3	Fabbricazione di supporti magnetici ed ottici	1	1
46.43.3	L3	Commercio all'ingrosso di articoli per fotografia, cinematografia e ottica	133	499.81
47.78.2	L3	Commercio al dettaglio di materiale per ottica e fotografia	1098	2106.66
59.13.0	L3	Attività di distribuzione cinematografica, di video e di programmi televisivi	194	1511.04
59.14.0	L5	Attività di proiezione cinematografica	106	877.02
<i>Total core</i>			<i>2340</i>	<i>14609.99</i>
<i>Total support</i>			<i>1584</i>	<i>5540</i>
<b>Grand total</b>			<b>4156</b>	<b>20567.49</b>

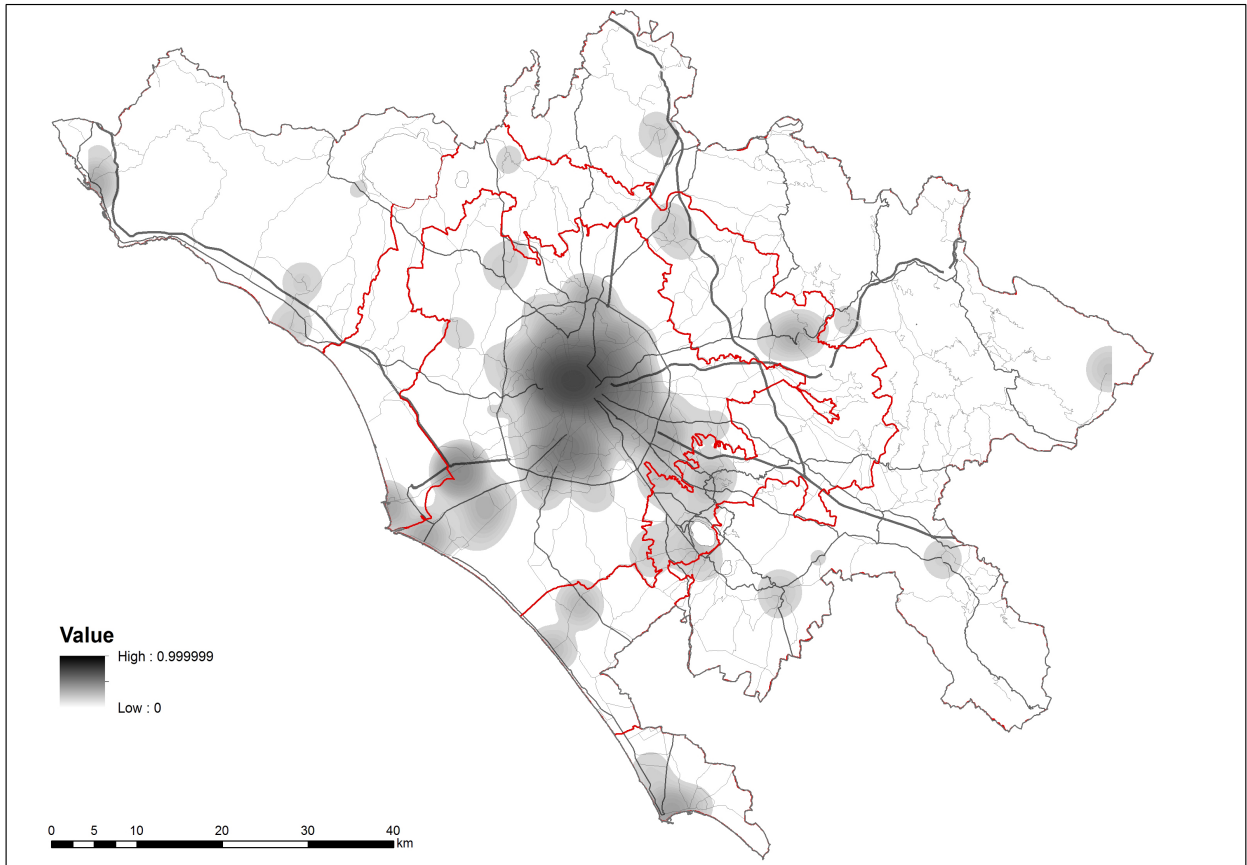
#### 4.2 Kernel density maps for the sub-sectors of creative industries, according to DCMS (2009) definition.

Only core-creative activities (layers L1 and L2) are mapped.

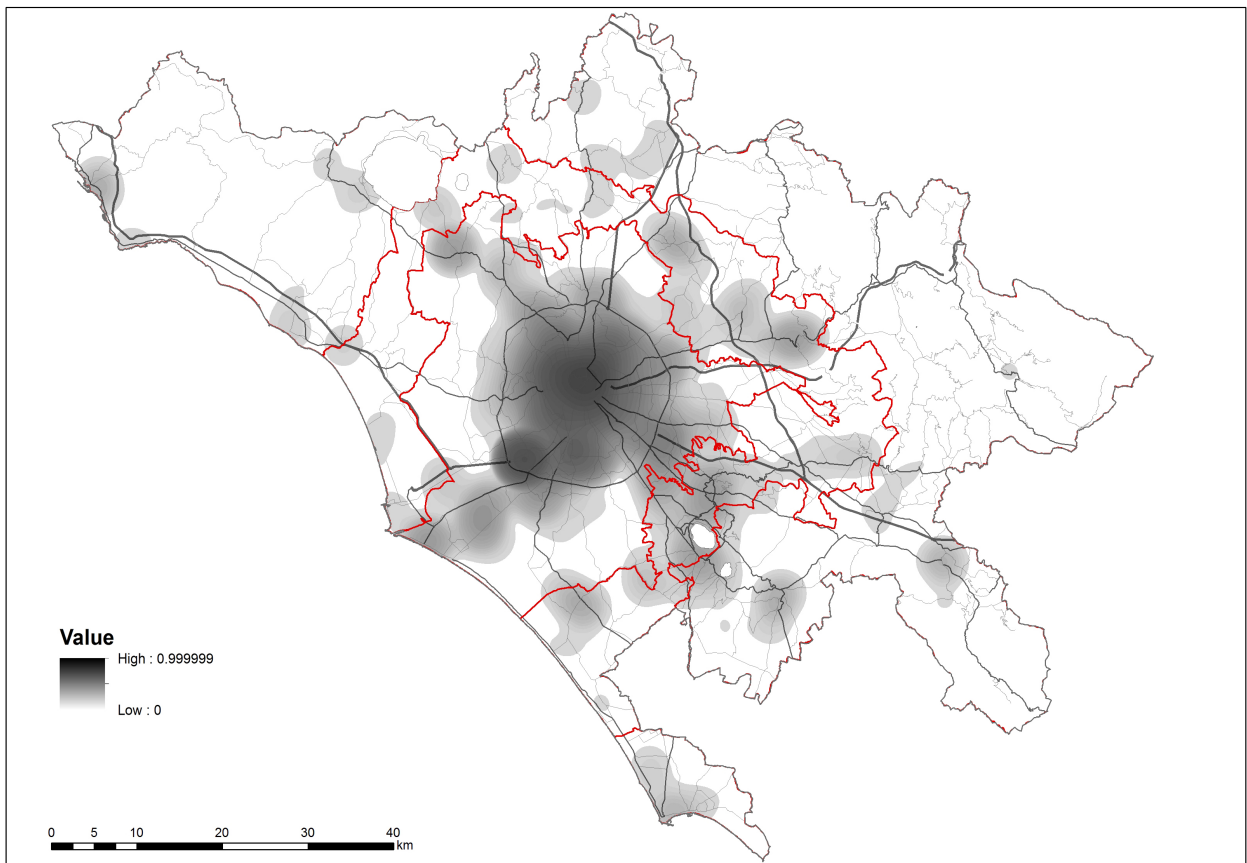
Source: ISTAT – Business register 2007 – Province of Rome



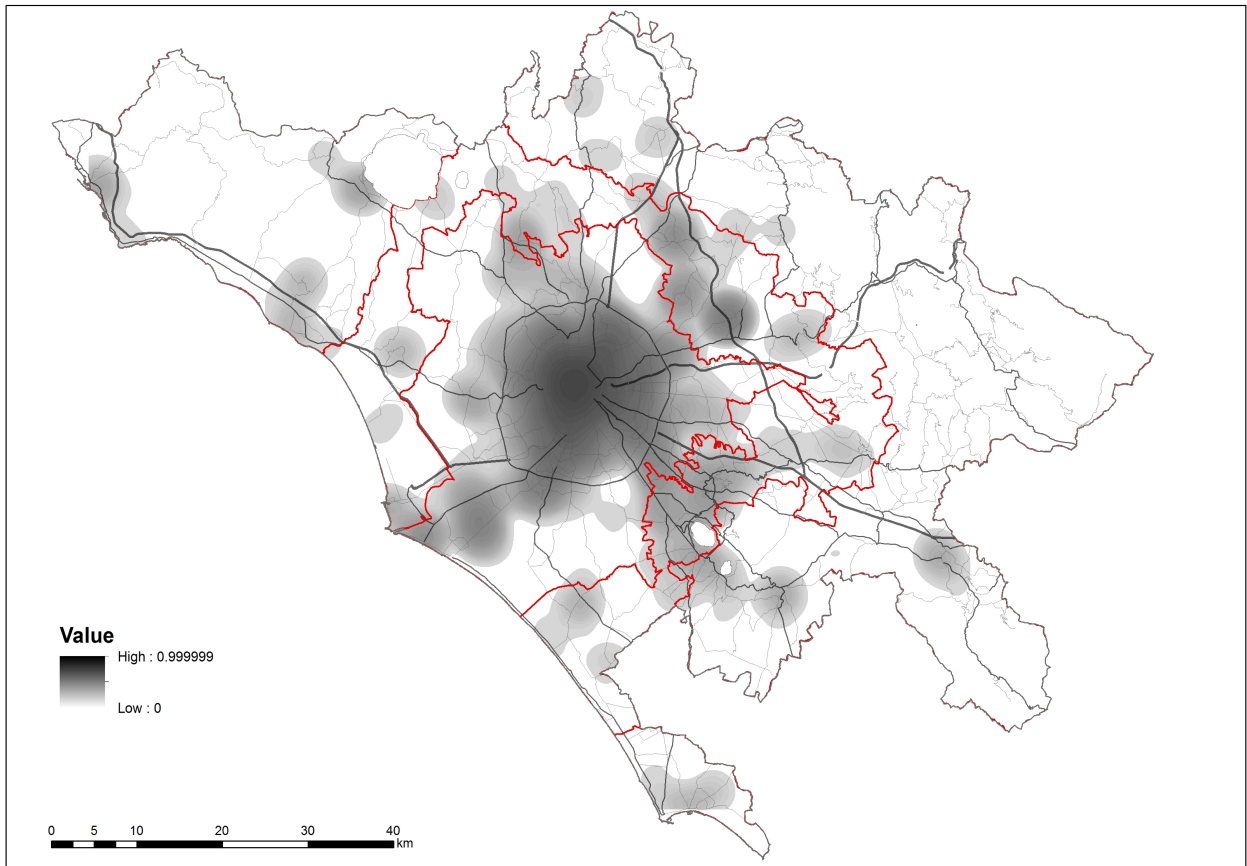
1. Advertising



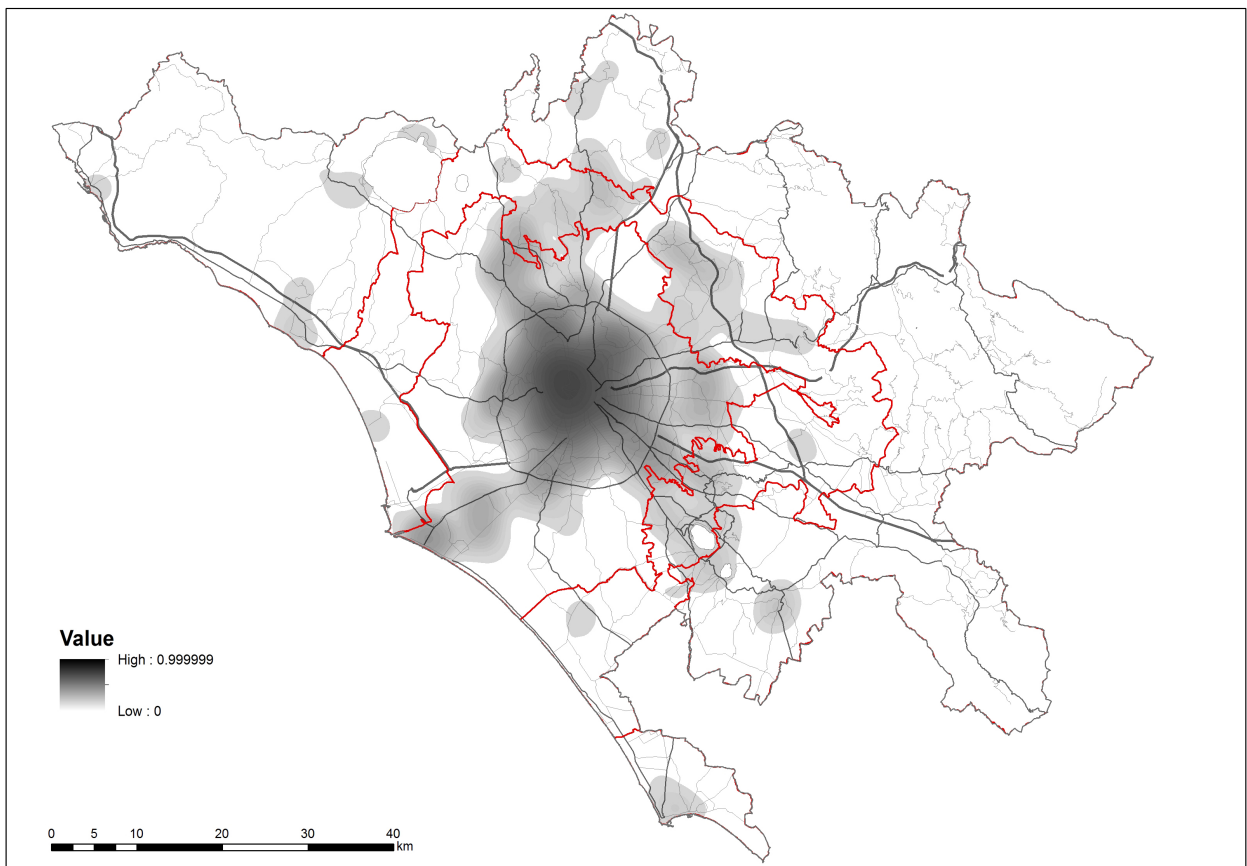
2. Arts, antiques and crafts activities.



3. Architecture.

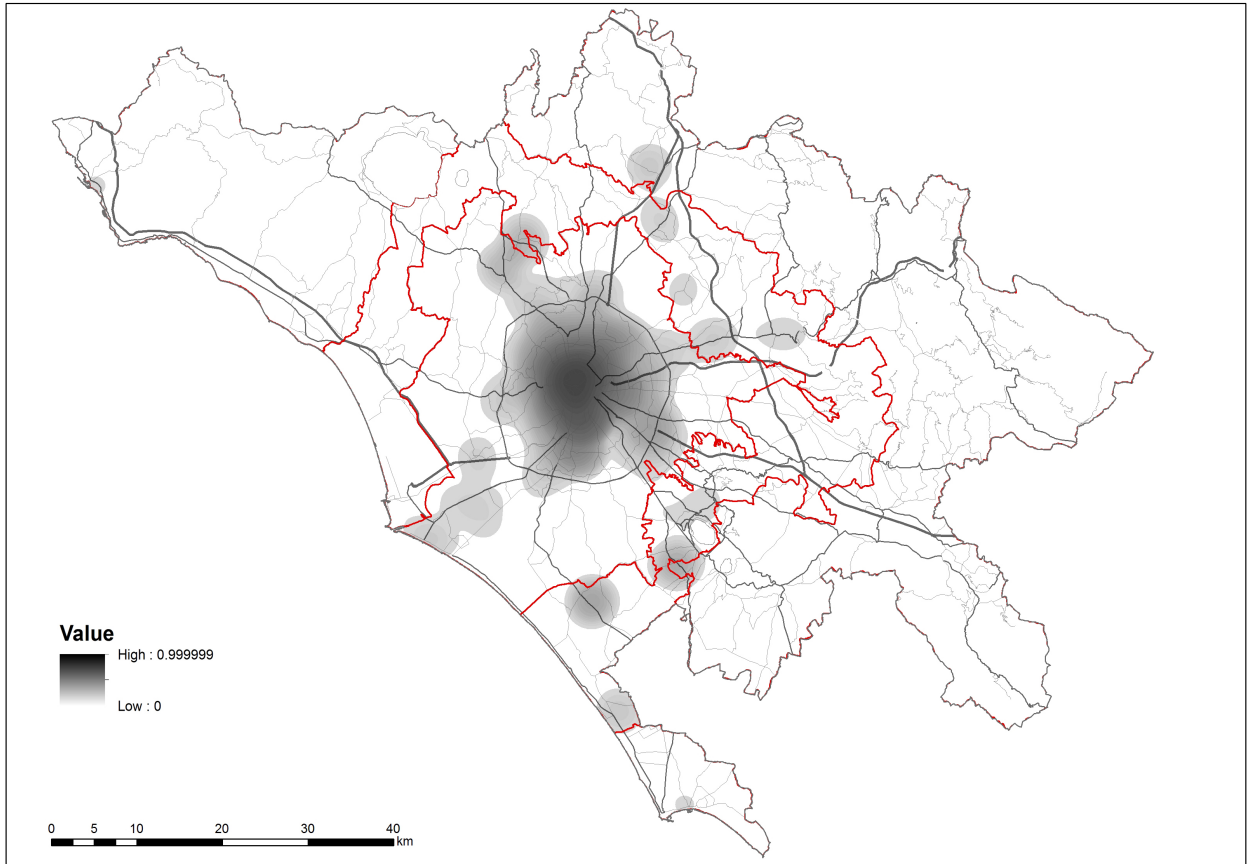


#### 4. Design.

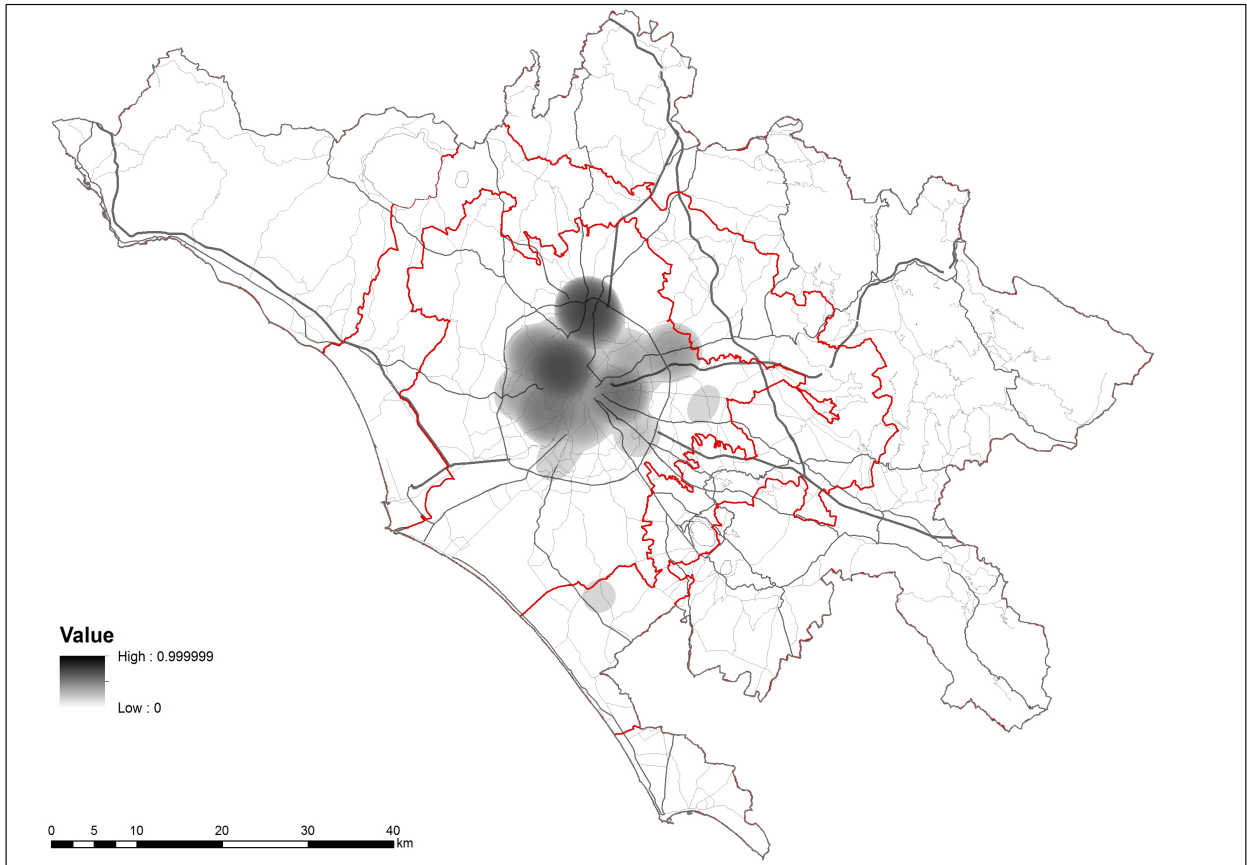




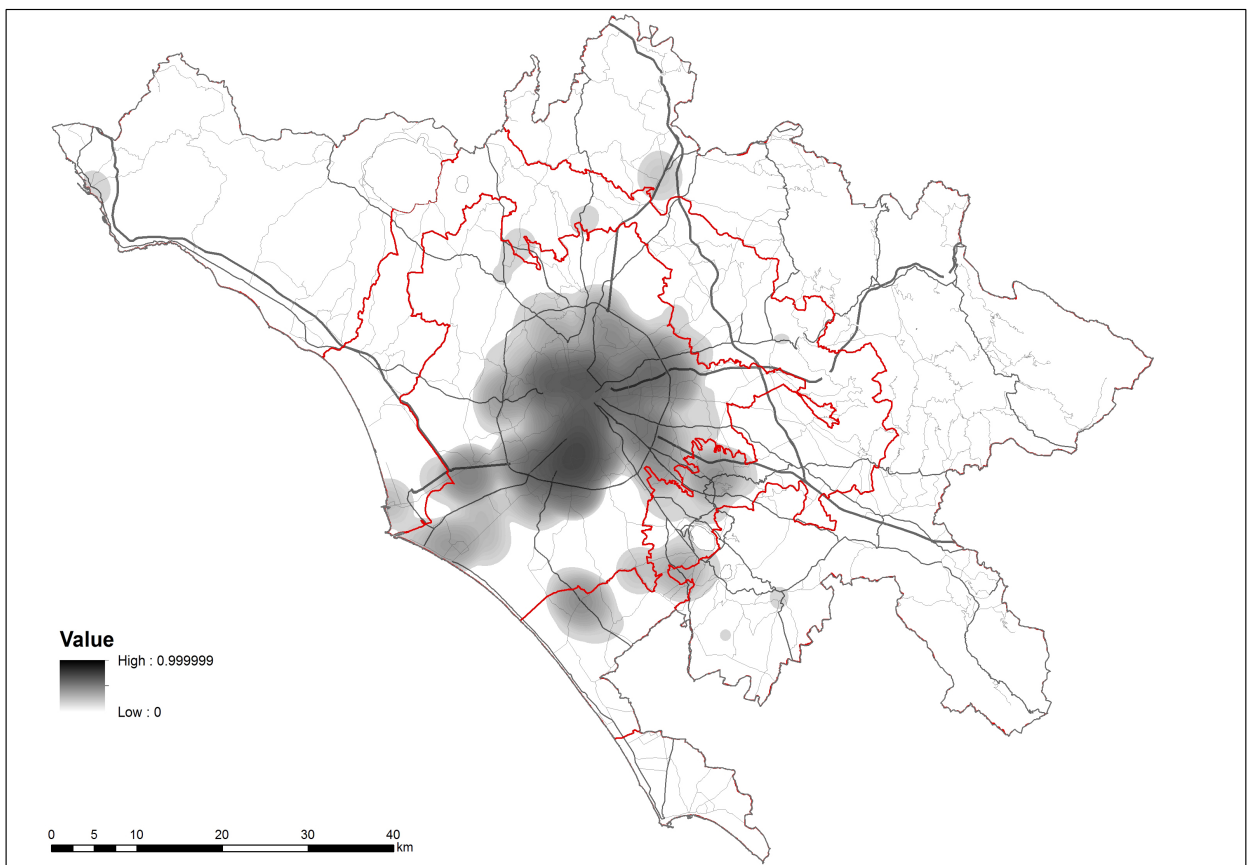
5. Music and performing arts.



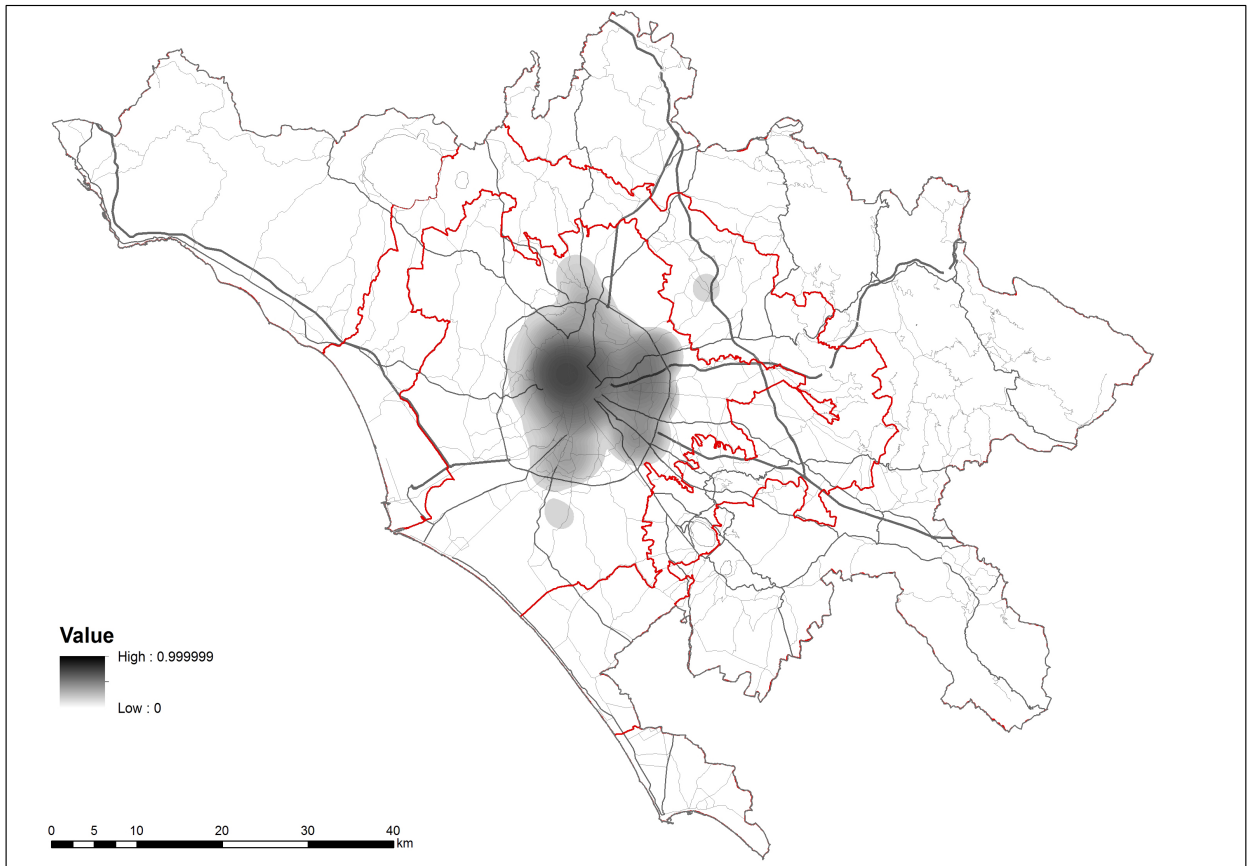
6. Publishing.



7. Radio and Television.

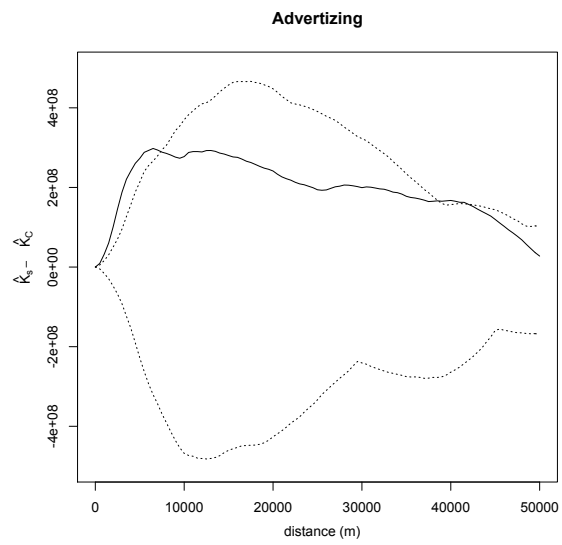


8. Software and computer games.

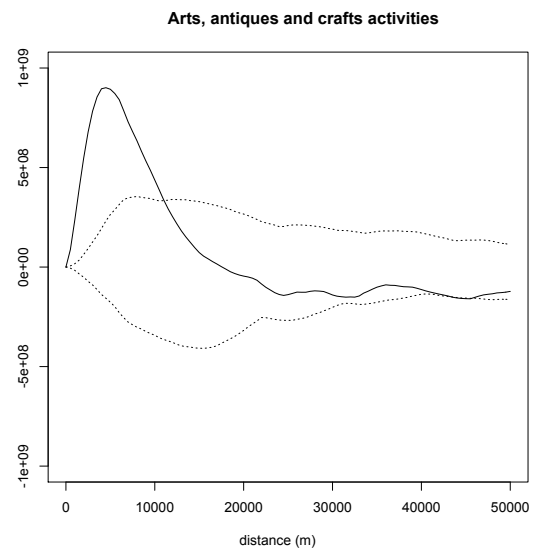


9. Video, film and photography.

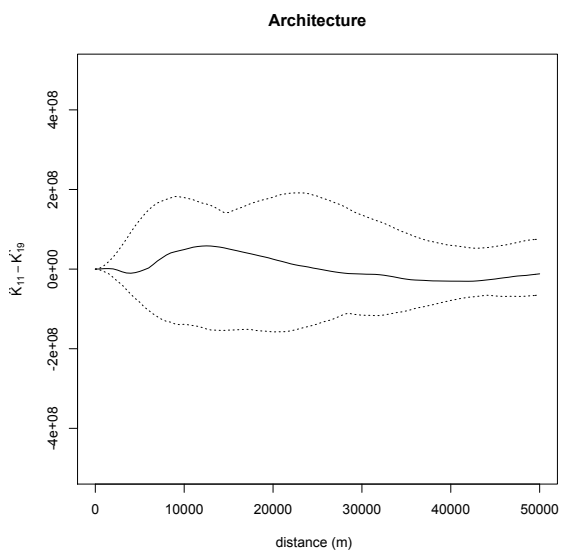
**4.3 Behaviour of the statistics  $\widehat{K}_s(d) - \widehat{K}_c(d)$  (solid line) and of the corresponding min and max envelopes (dashed lines) estimated on the bases of 999 random labelling.**



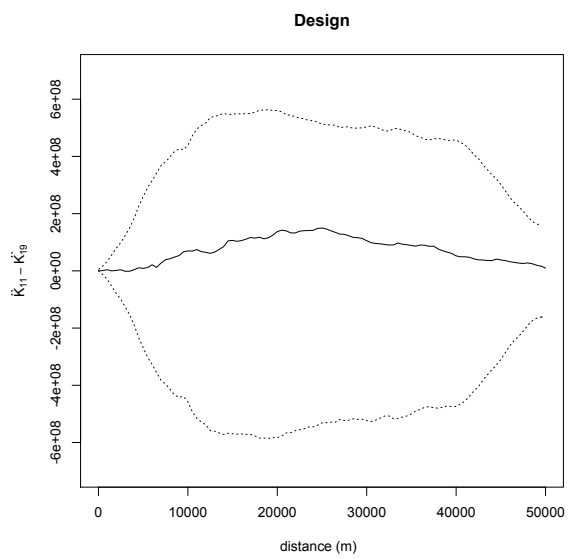
a



b

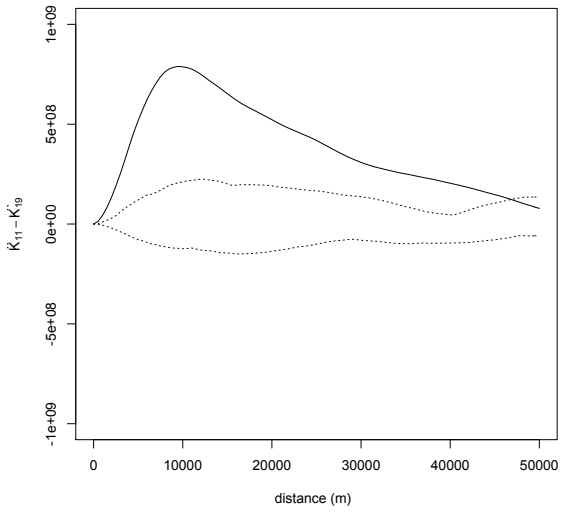


c



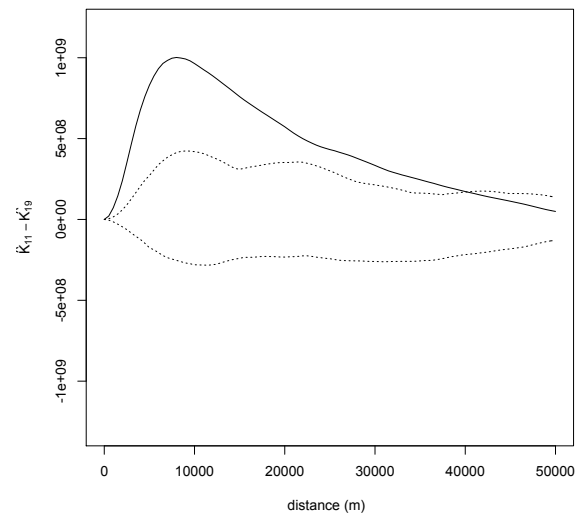
d

**Music and performing arts**



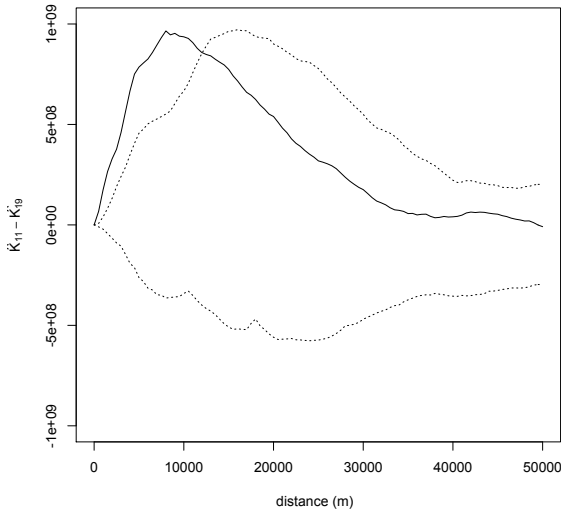
e

**Publishing**



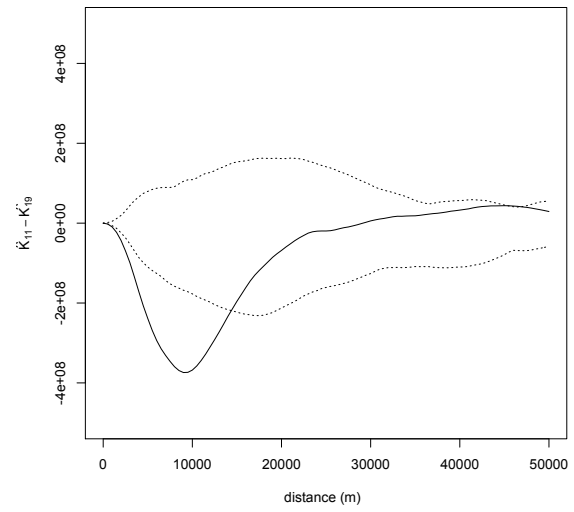
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**Radio and TV**



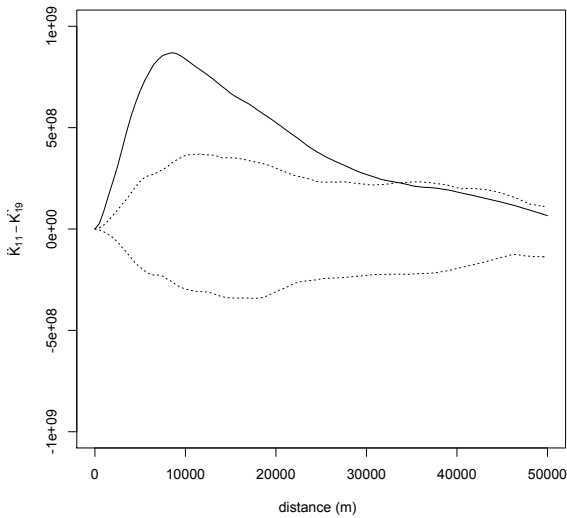
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**Software and computer games**



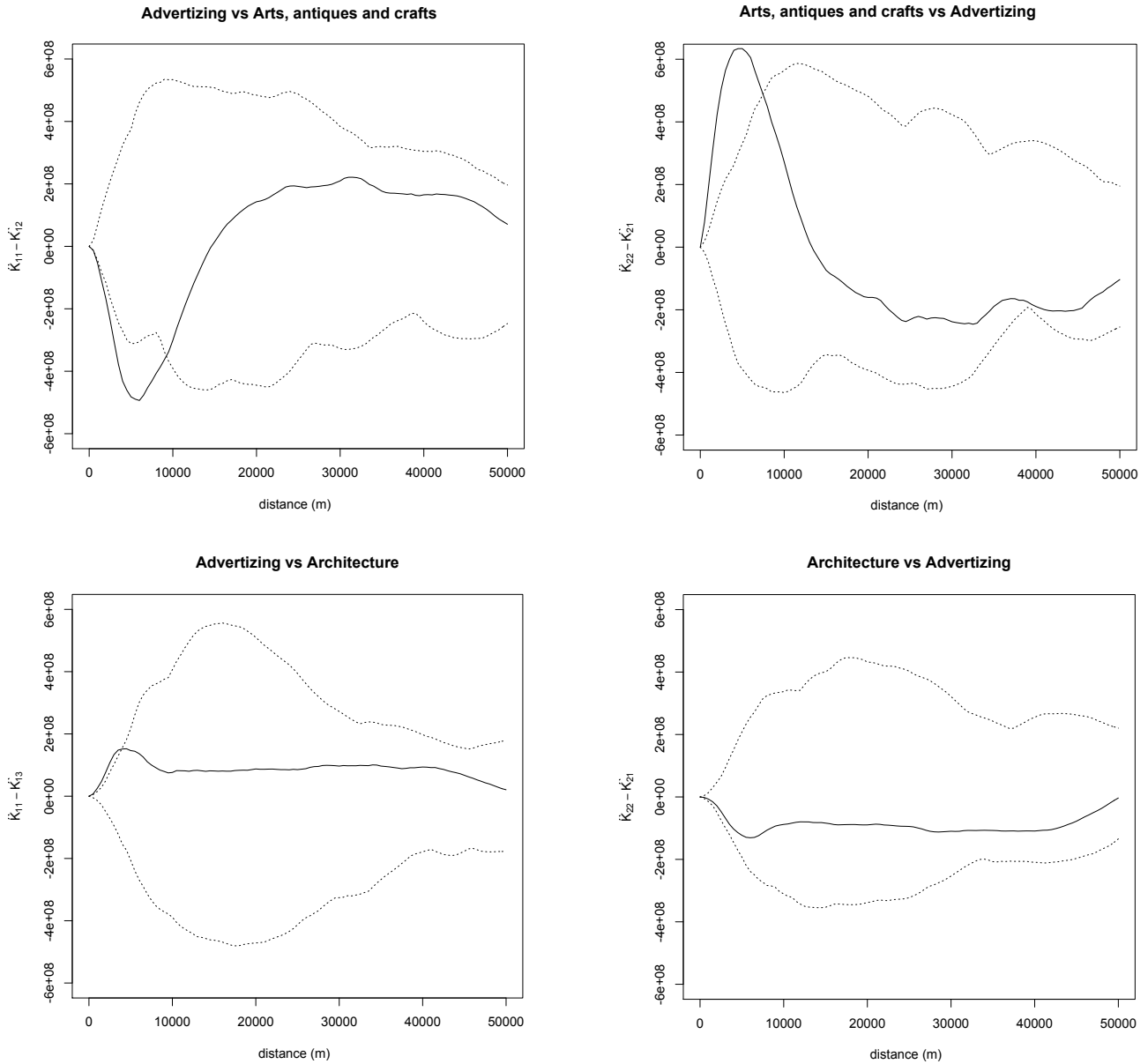
h

**Video, film and photography**

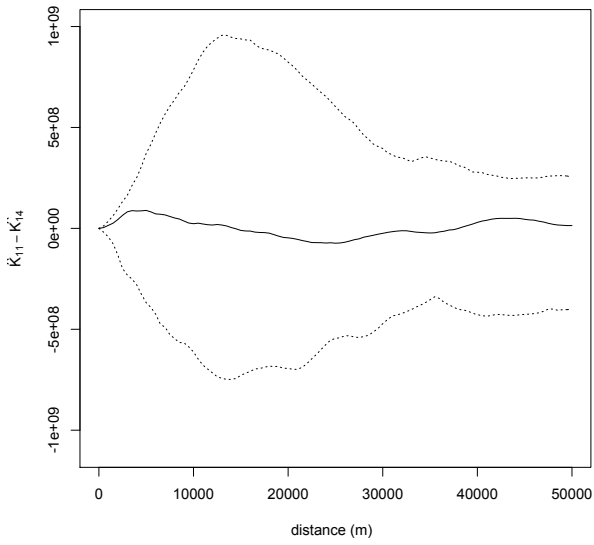


i

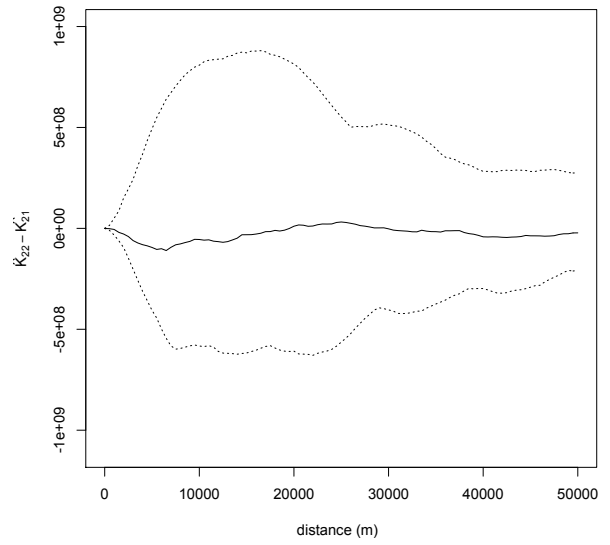
**4.4 Behaviour of the statistics  $\widehat{K}_{ii}(d) - \widehat{K}_{Cij}(d)$  and  $\widehat{K}_{jj}(d) - \widehat{K}_{ij}(d)$  (solid line) and of the corresponding min and max envelopes (dashed lines) estimated on the bases of 999 random labelling, for each pair of creative subsector.**



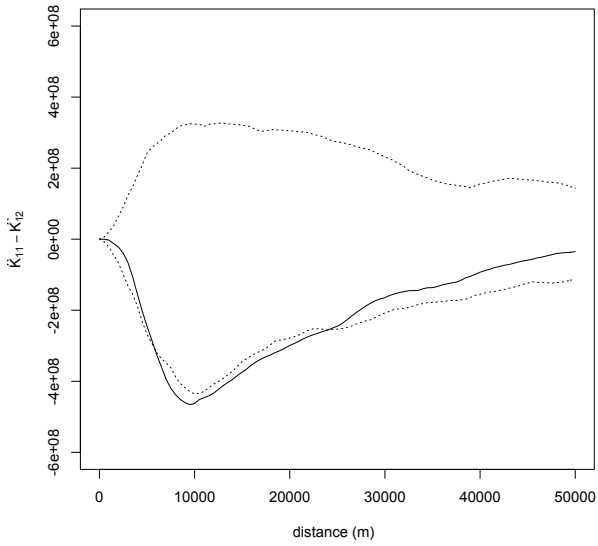
**Advertizing vs Design**



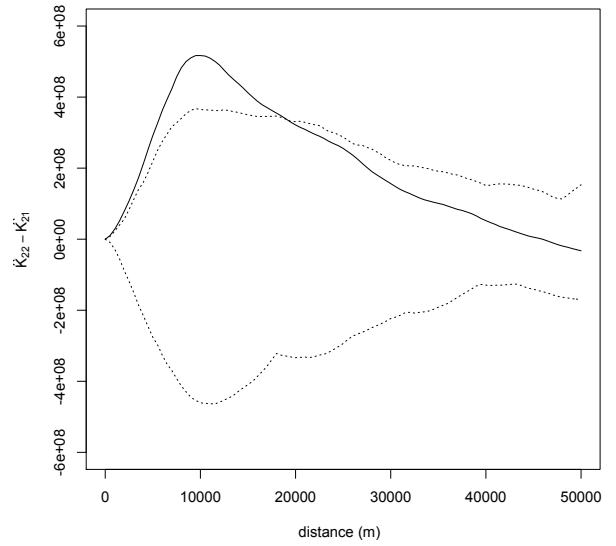
**Design vs Advertizing**



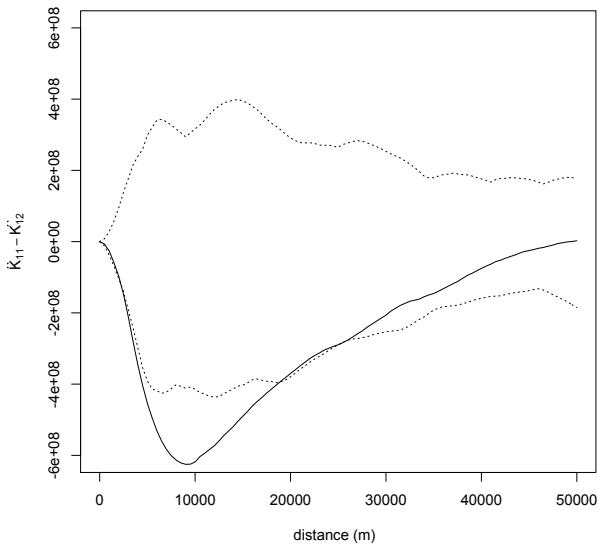
**Advertizing vs Music and performing arts**



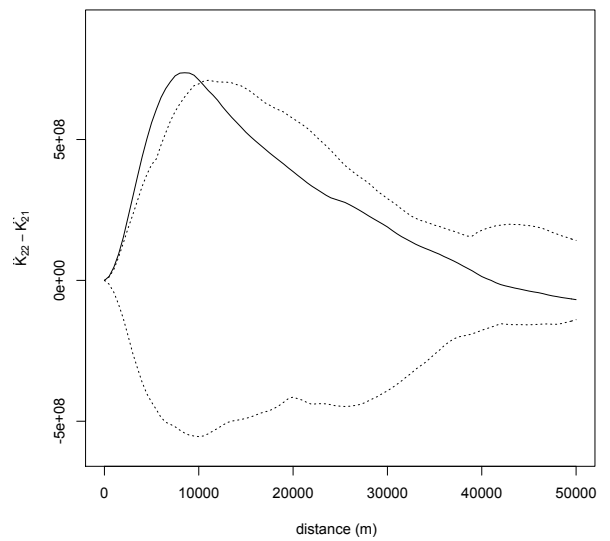
**Music and performing arts vs Advertizing**



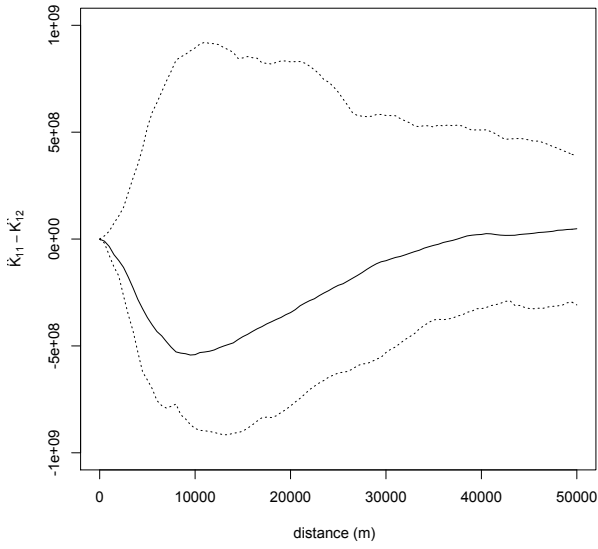
**Advertizing vs Publishing**



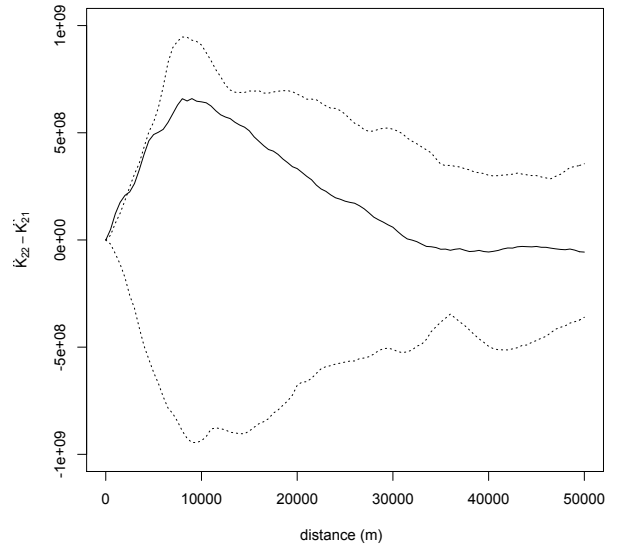
**Publishing vs Advertizing**



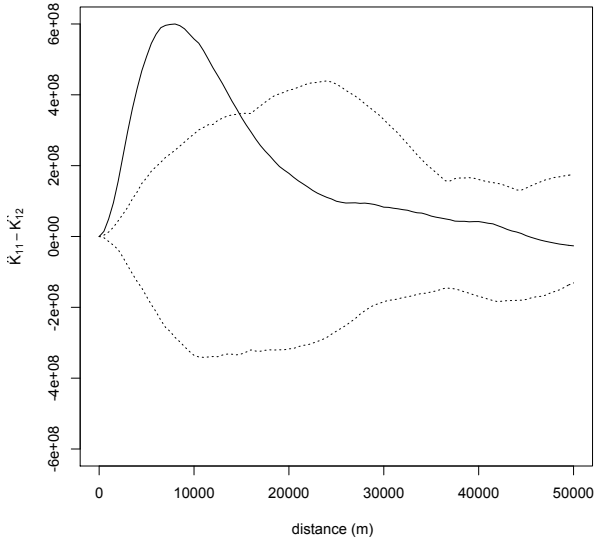
**Advertizing vs Radio and TV**



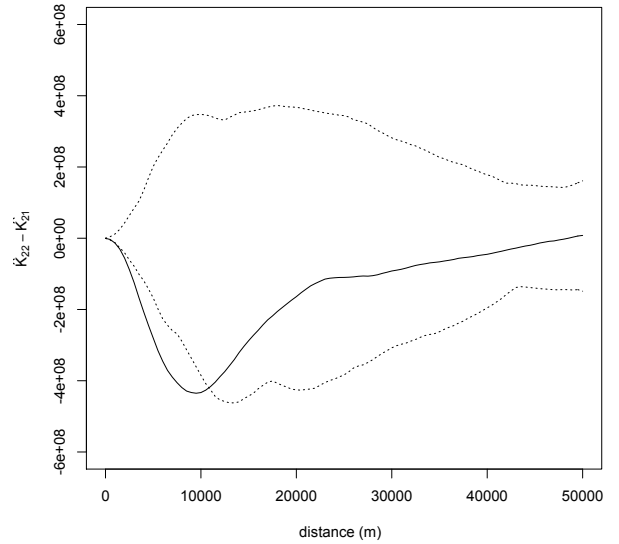
**Radio and TV vs Advertizing**



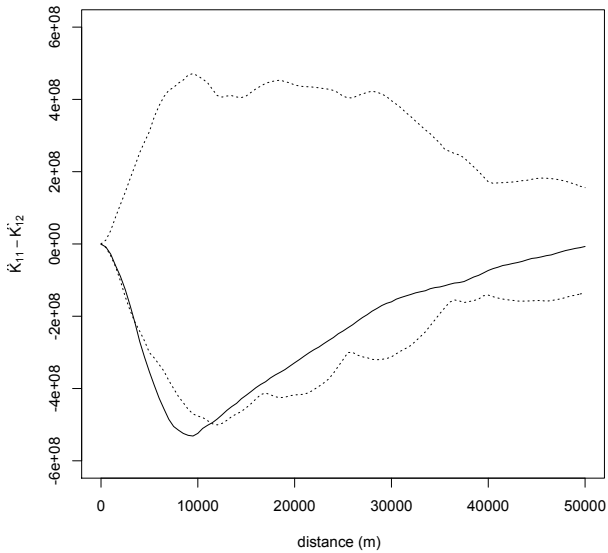
**Advertizing vs Software and Computer games**



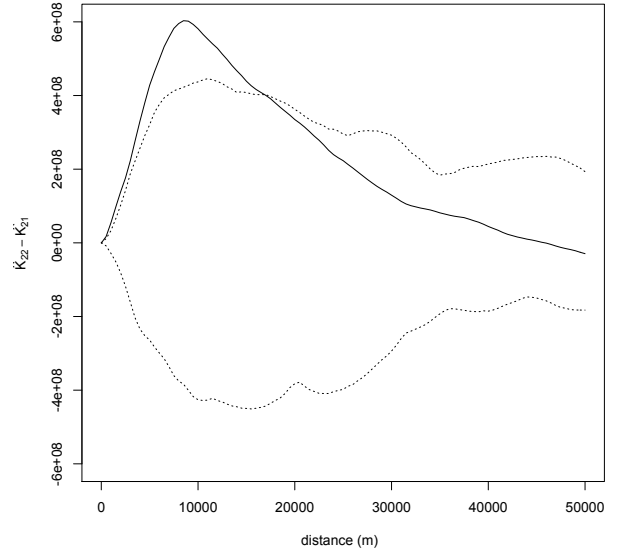
**Software and Computer games vs Advertizing**



**Advertizing vs Video, film and photography**

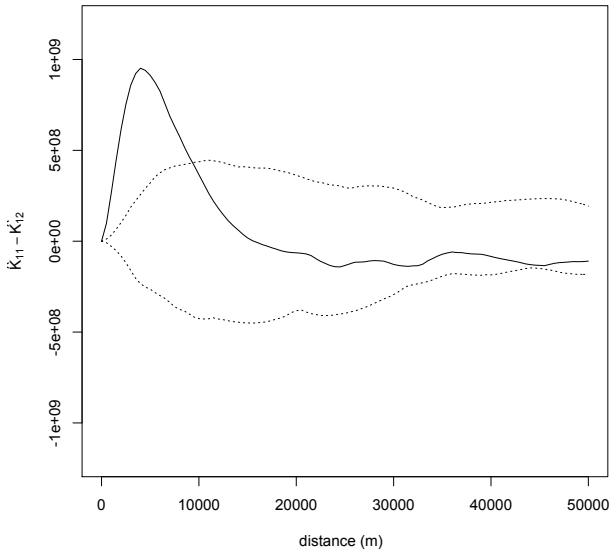


**Video, film and photography vs Advertizing**

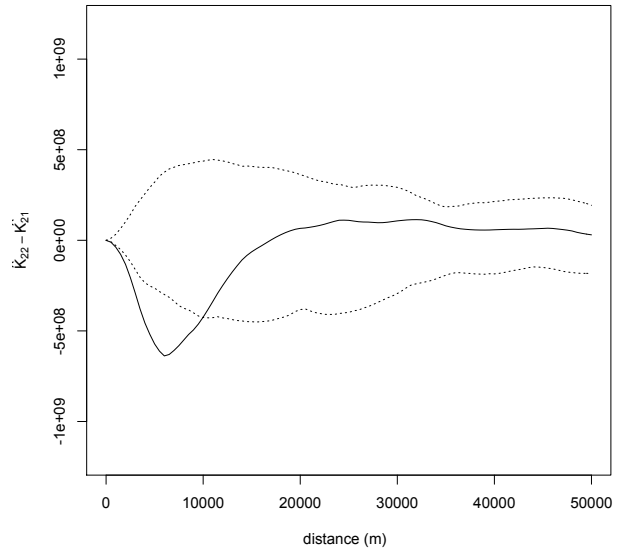




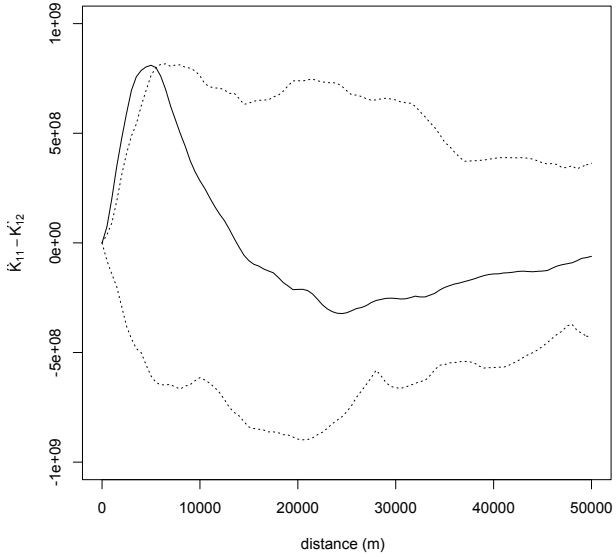
Arts, Antiques and crafts vs Architecture



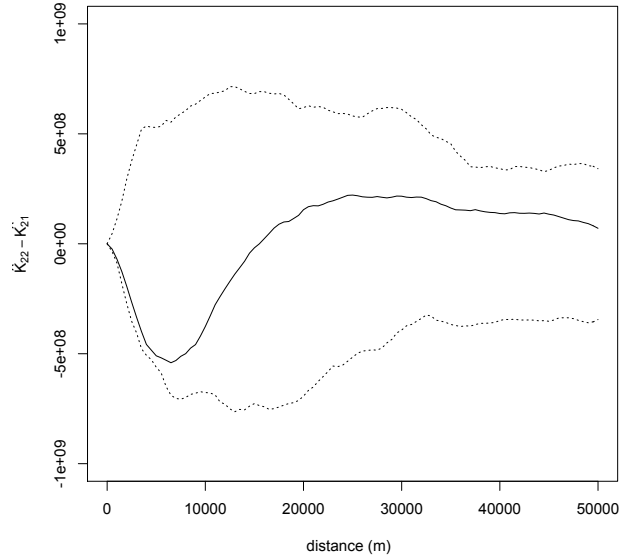
Architecture vs Arts, antiques and crafts



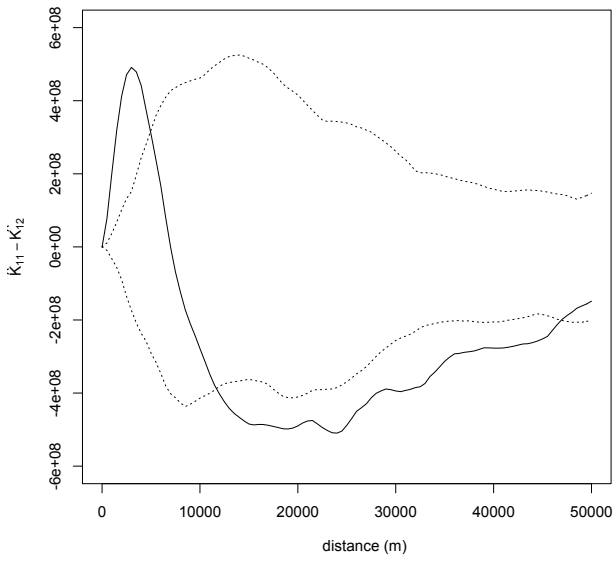
Arts, antiques and crafts vs Design



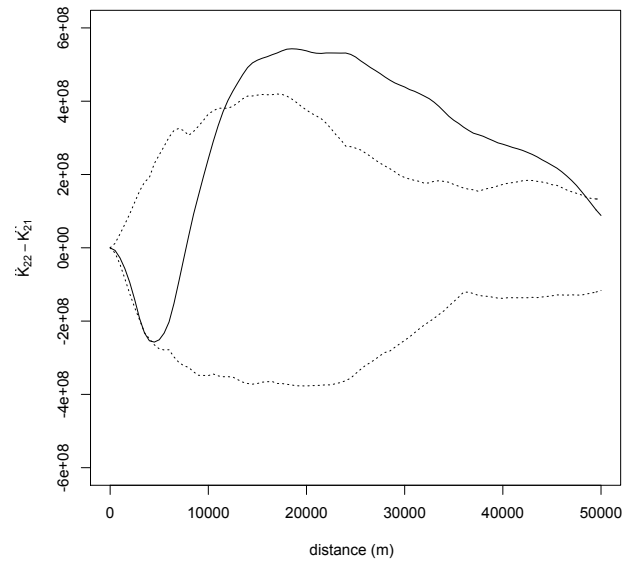
Design vs Arts, antiques and crafts



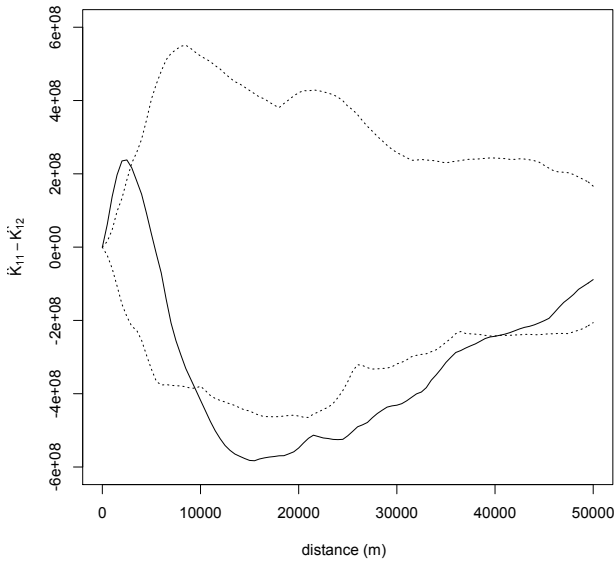
Arts, antiques and crafts vs Music and performing arts



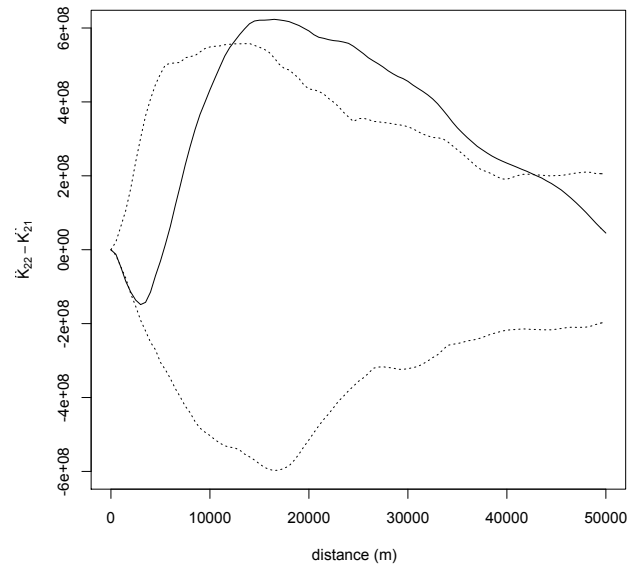
Music and performing arts vs Arts, antiques and crafts



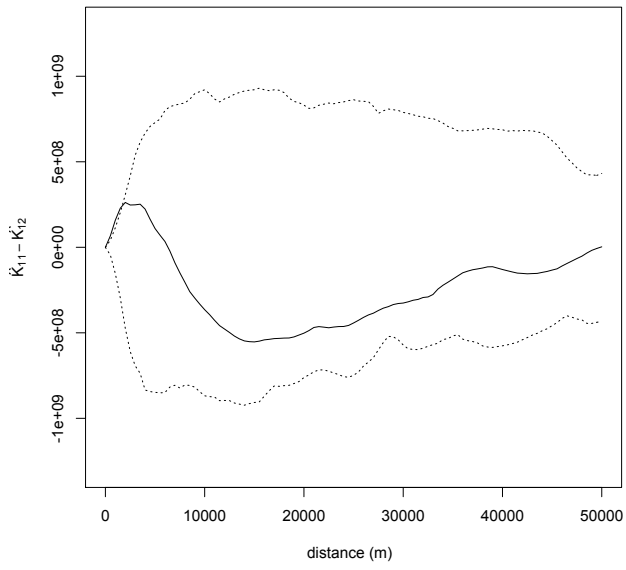
Arts, antiques and crafts vs Publishing



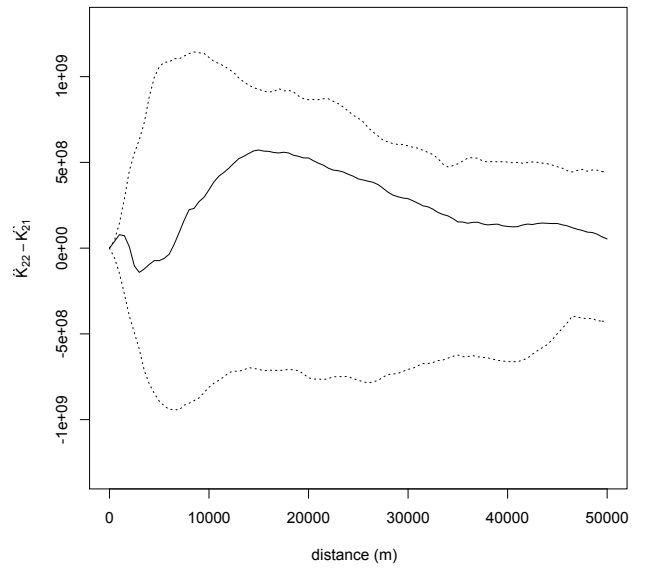
Publishing vs Arts, antiques and crafts



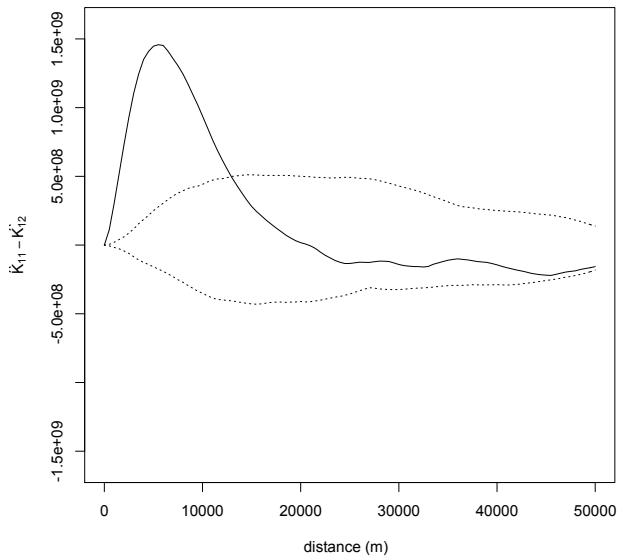
Arts, antiques and crafts vs Radio and TV



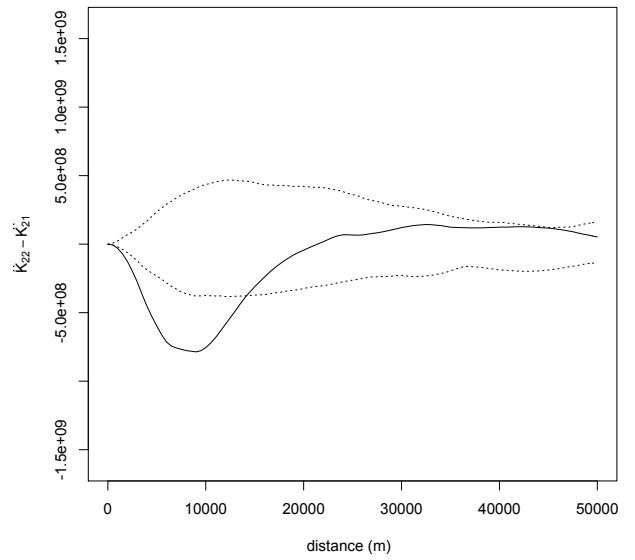
Radio and TV vs Antiques



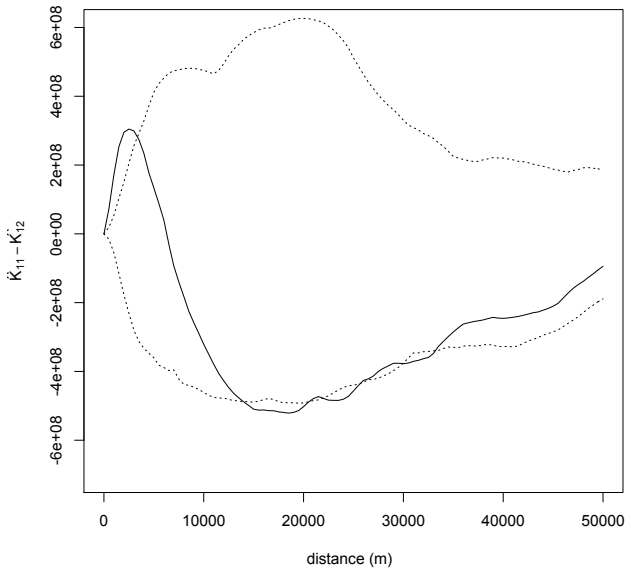
Arts, antiques and crafts vs Software and Computer games



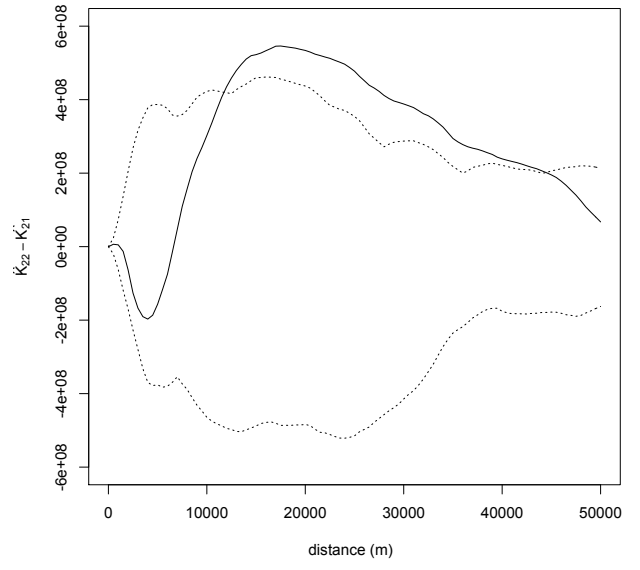
Software and Computer games vs Arts, antiques and crafts



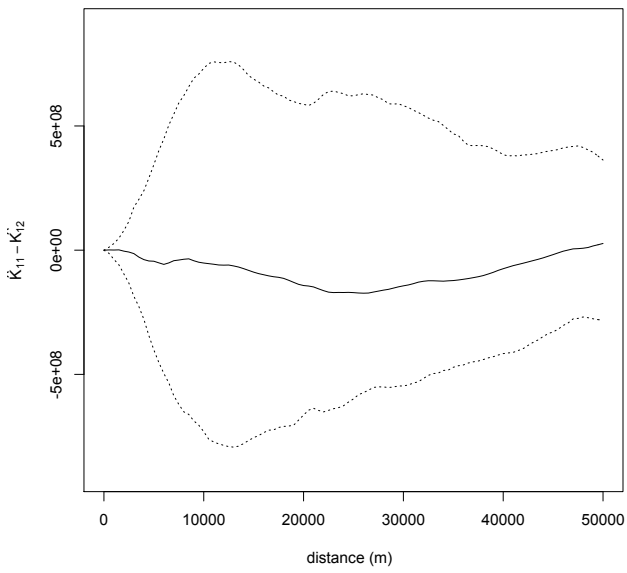
Arts, antiques and crafts vs Video, film and photography



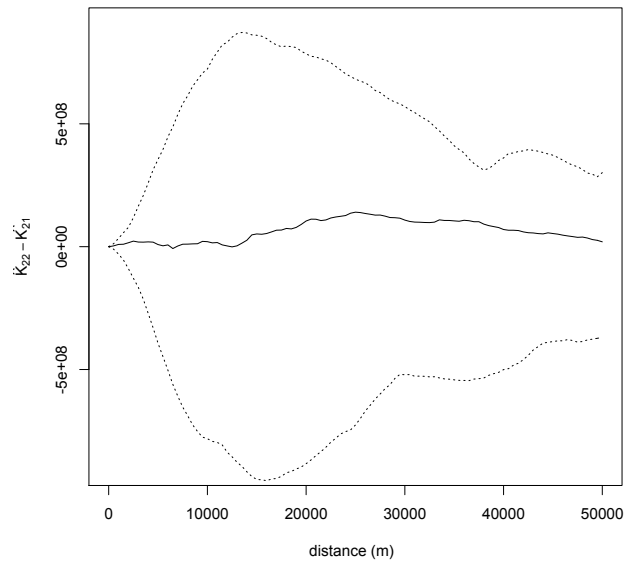
Video, film and photography vs Arts, antiques and crafts



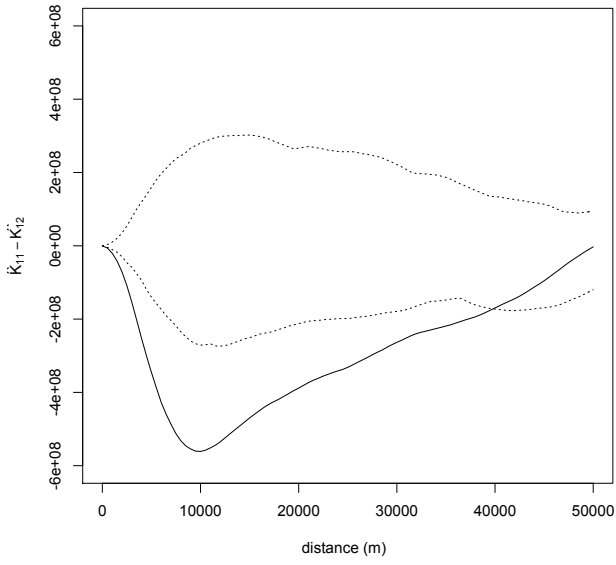
Architecture vs Design



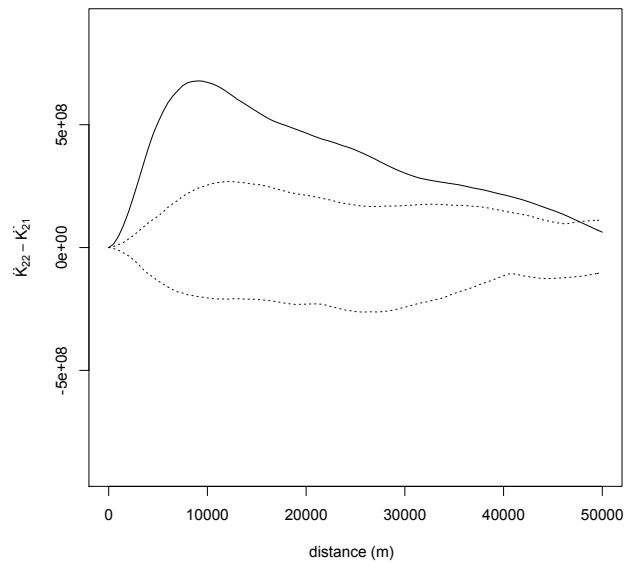
Design vs Architecture



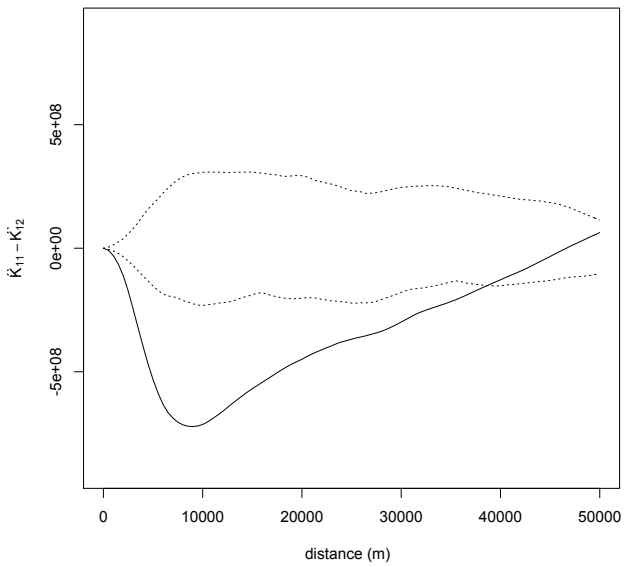
**Architecture vs Music and performing arts**



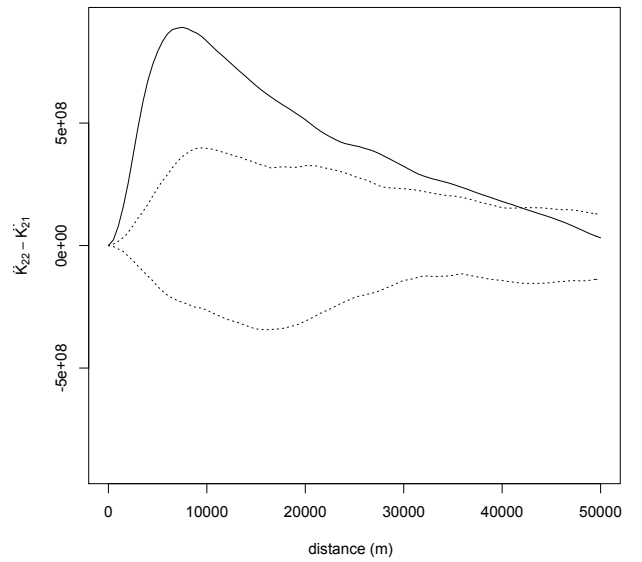
**Music and performing arts vs Architecture**



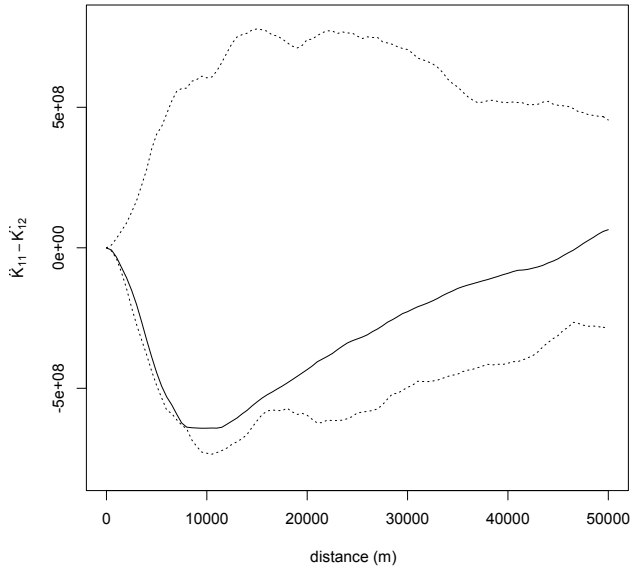
**Architecture vs Publishing**



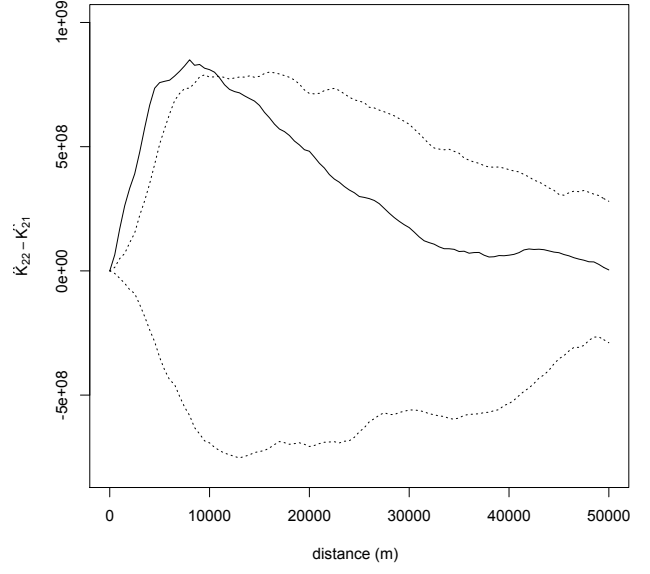
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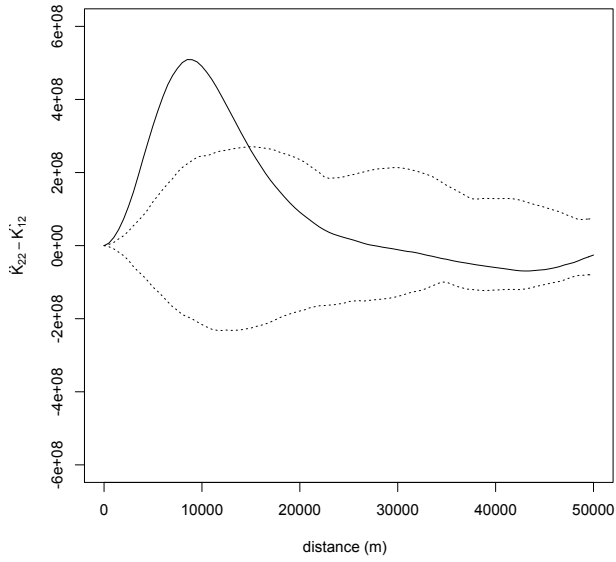
**Architecture vs Radio and TV**



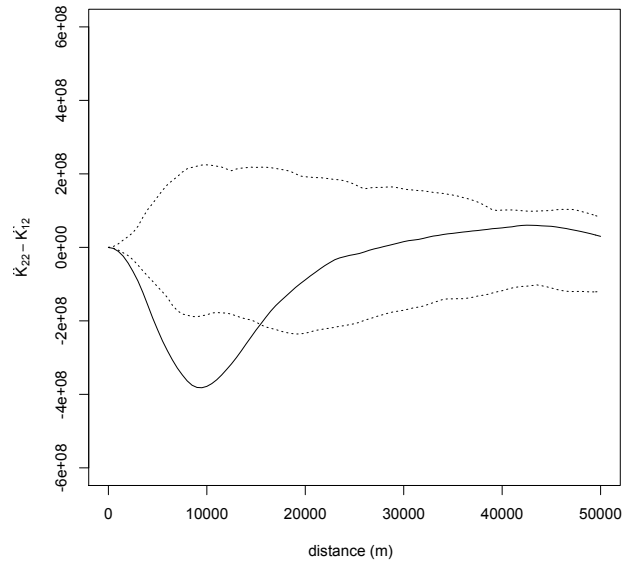
**Radio and TV vs Architecture**



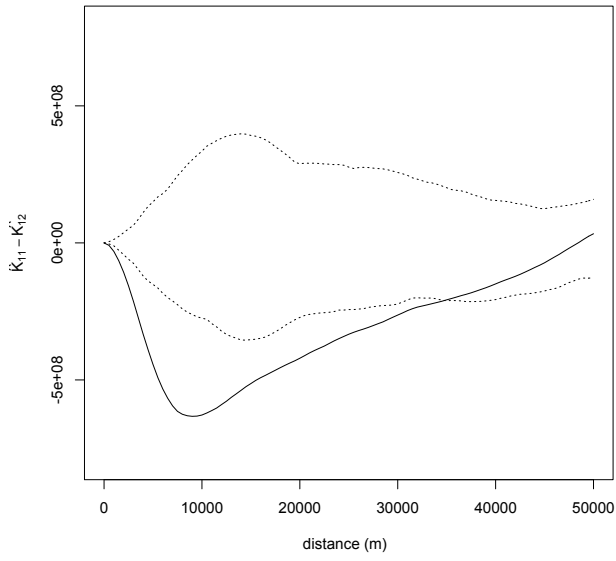
**Architecture vs Software and Computer games**



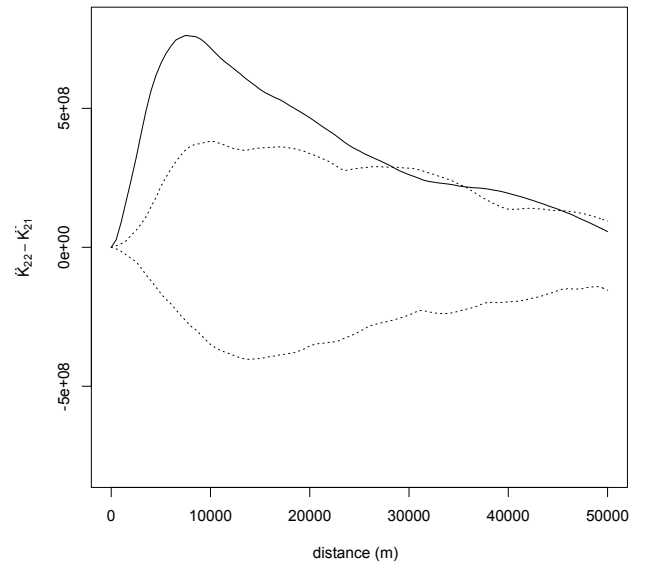
**Software and Computer games vs Architecture**



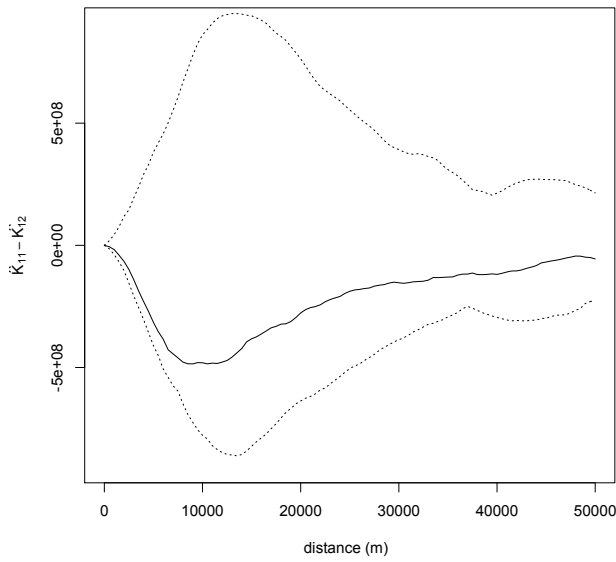
**Architecture vs Video, film and photography**



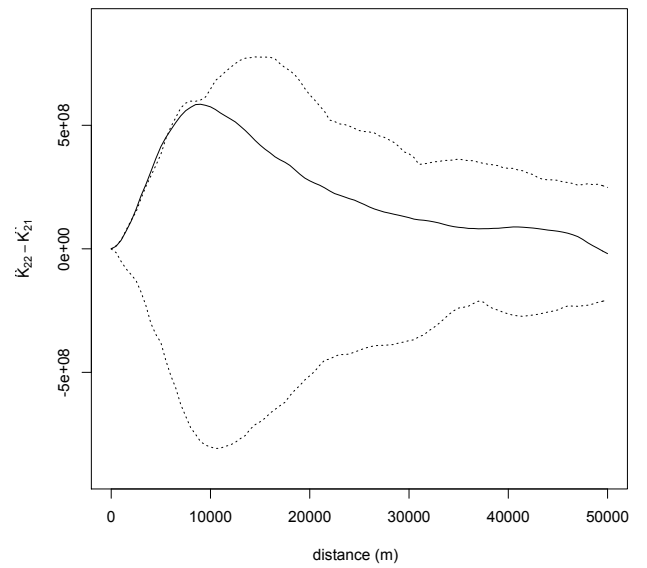
**Video, film and photography vs Architecture**



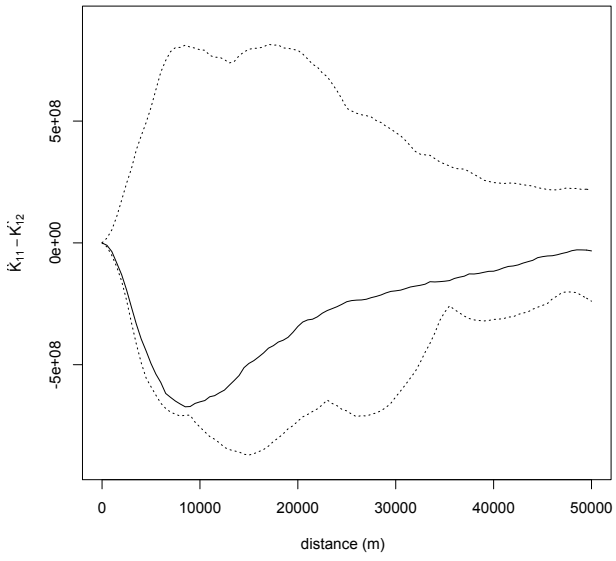
**Design vs Music and performing arts**



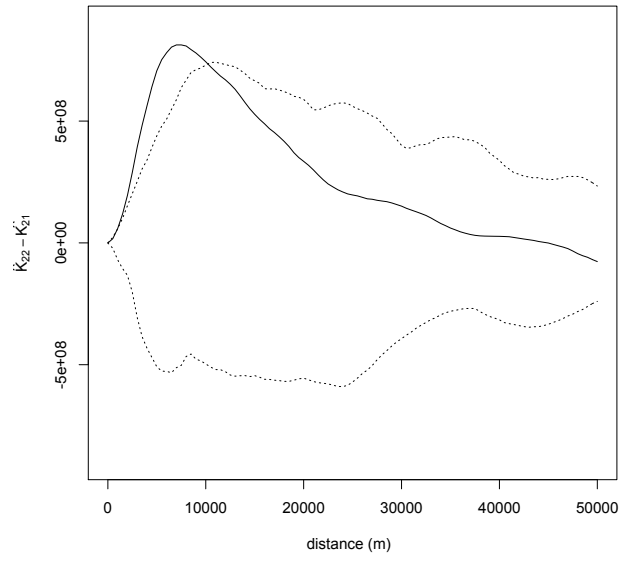
**Music and performing arts vs Design**



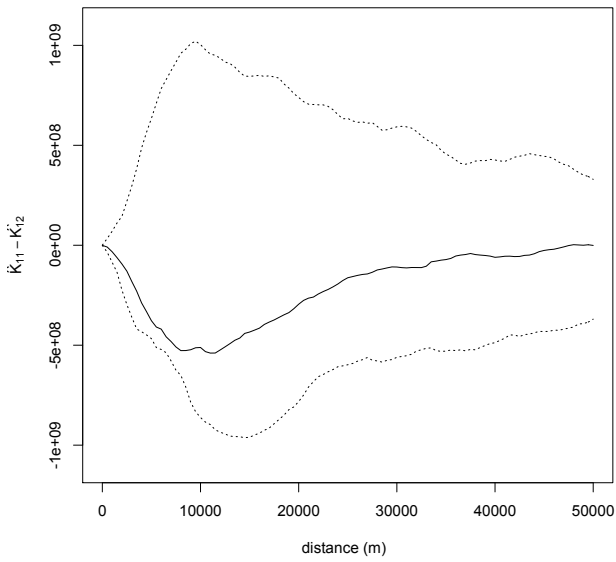
**Design vs Publishing**



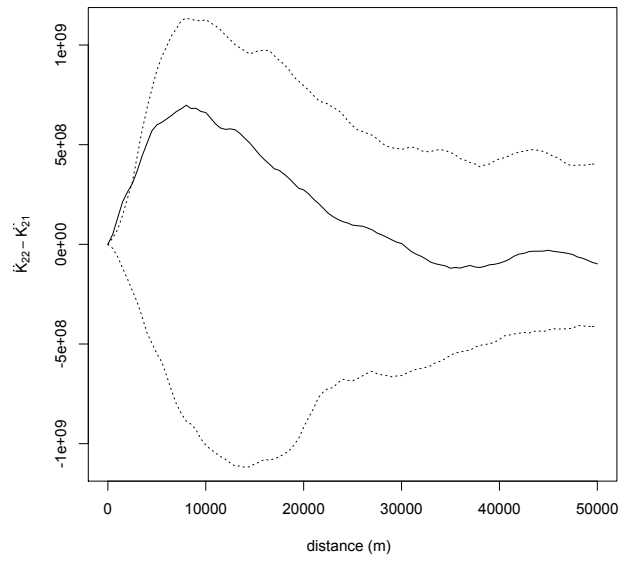
**Publishing vs Design**



**Design vs Radio and TV**

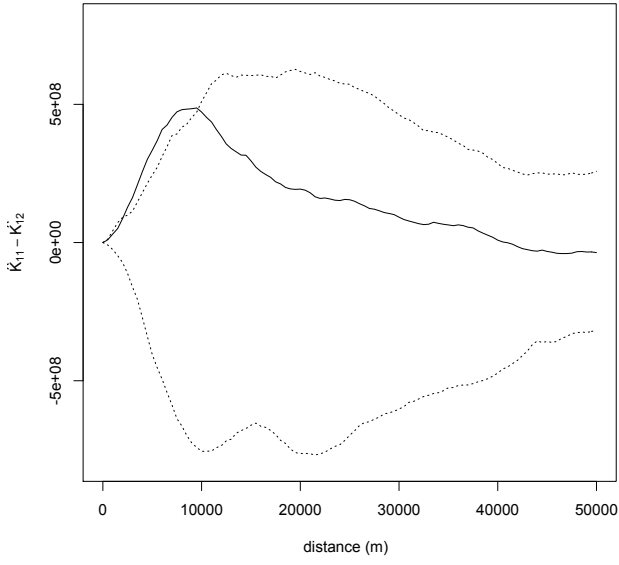


**Radio and TV vs Design**

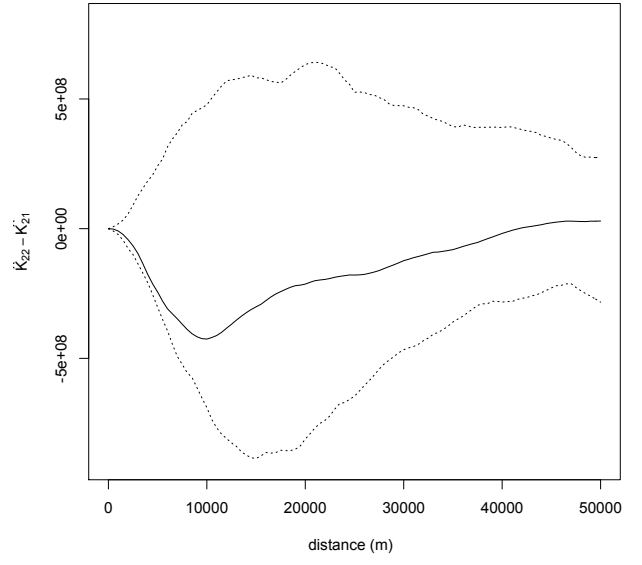




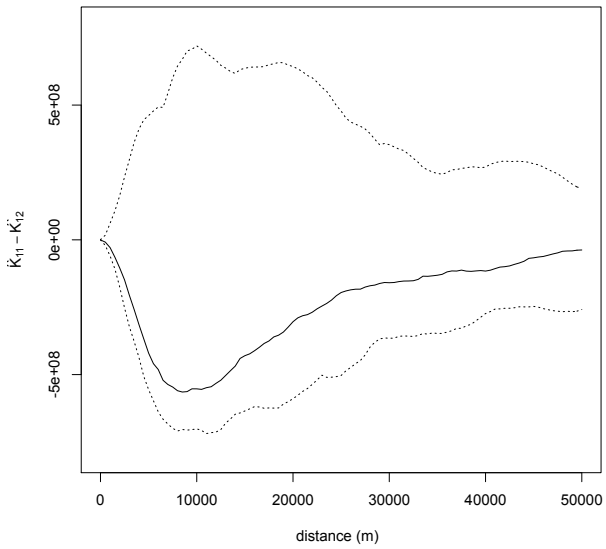
**Design vs Software and computer games**



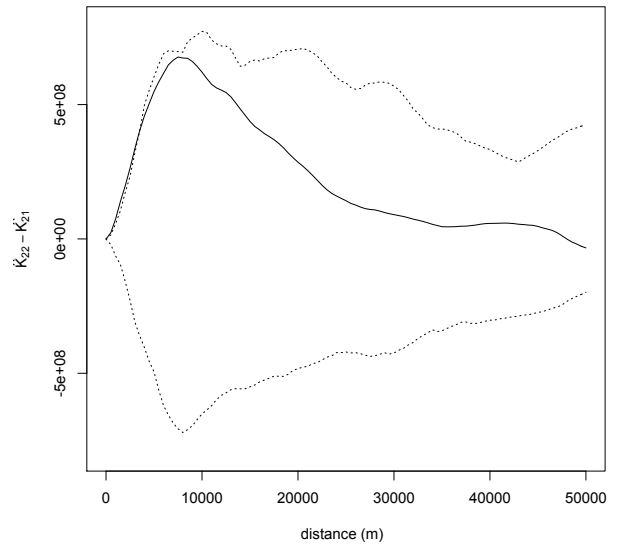
**Software and computer games vs Design**



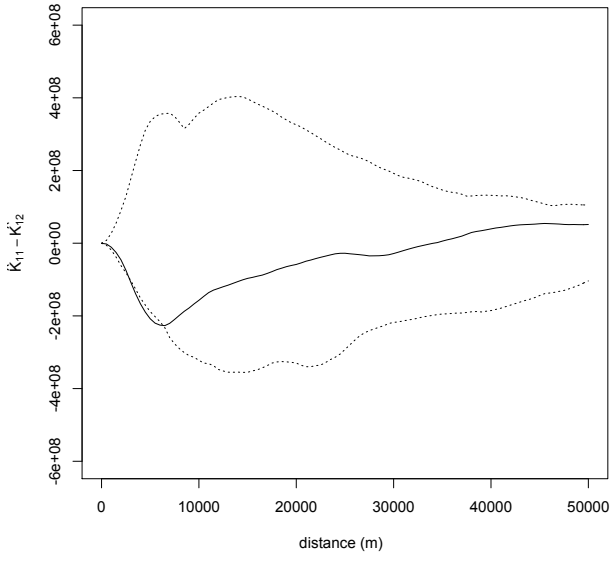
**Design vs Video, film and photography**



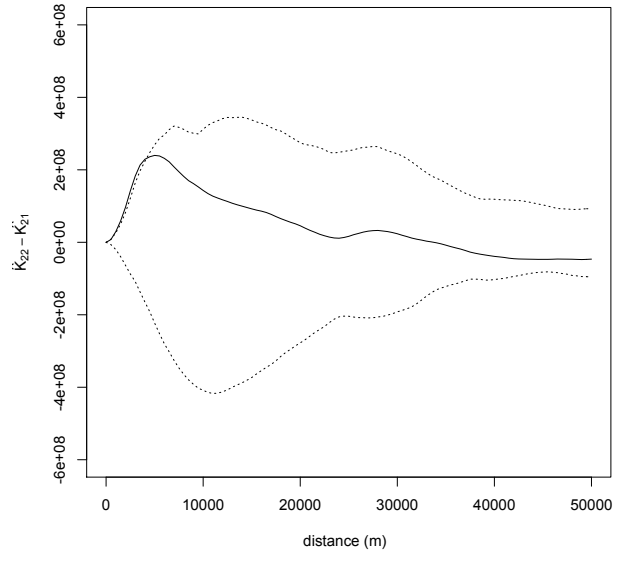
**Video, film and photography vs Design**



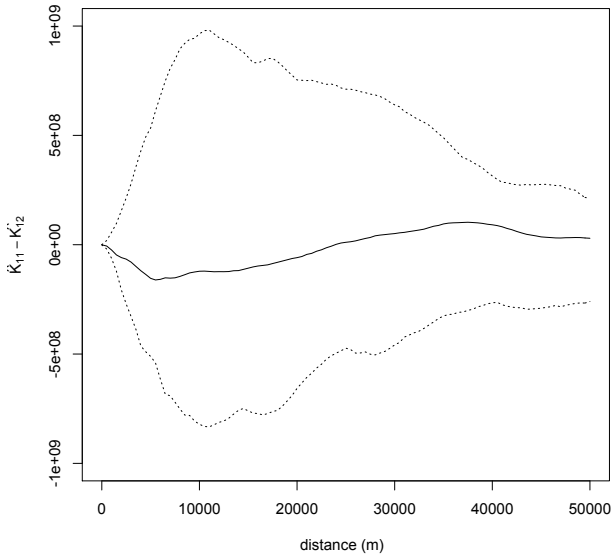
Music and performing arts vs Publishing



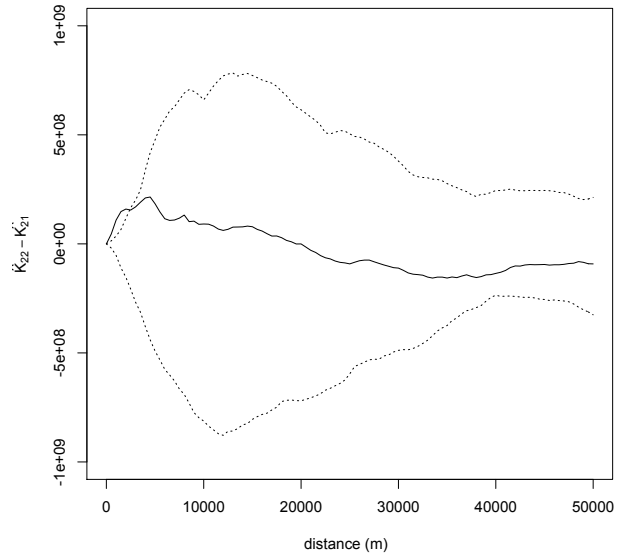
Publishing vs Music and performing arts



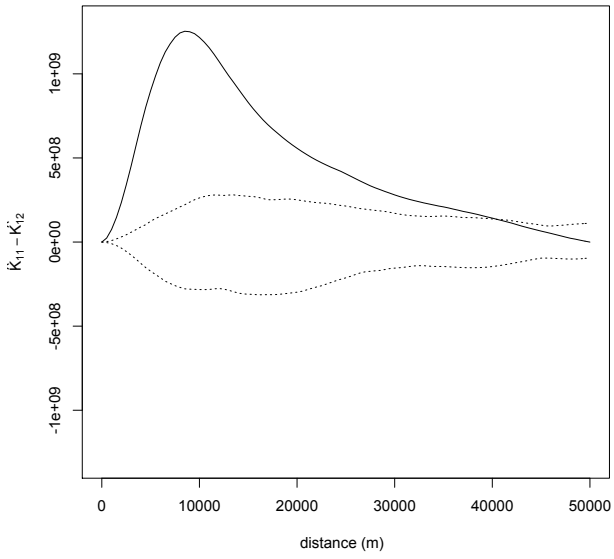
Music and performing arts vs Radio and TV



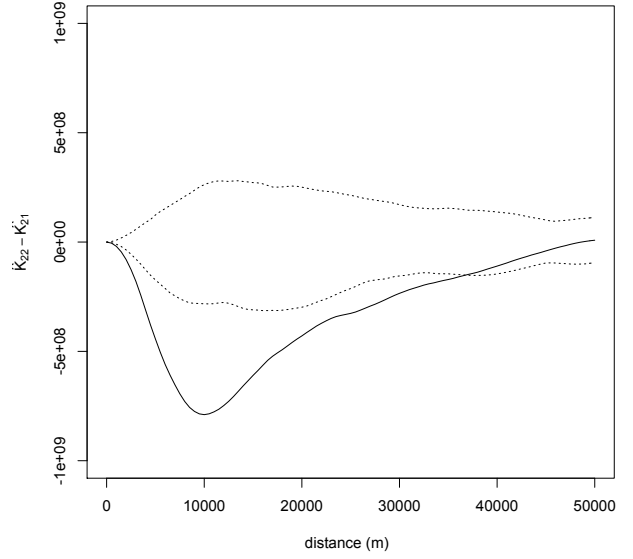
Radio and TV vs Music and performing arts



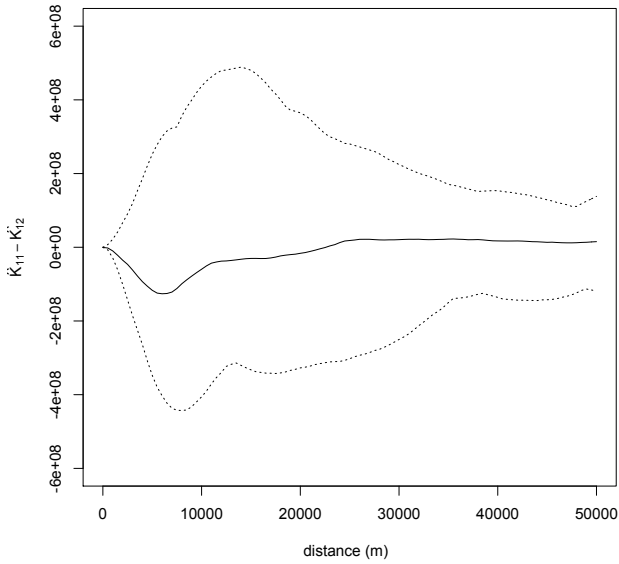
Music and performing arts vs Software and computer games



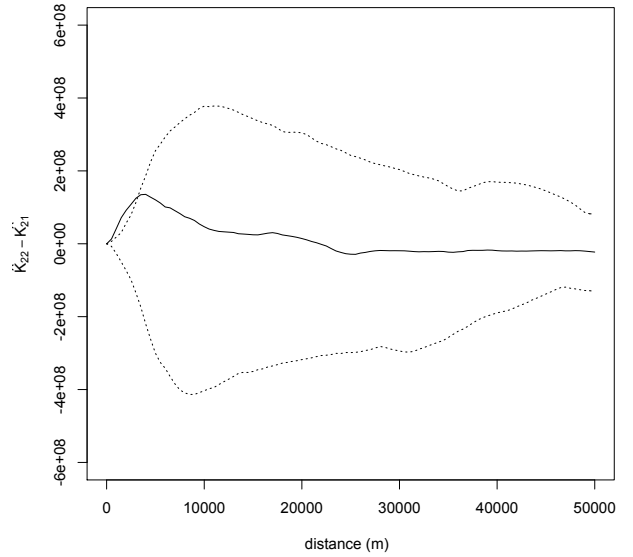
Software and computer games vs Music and performing arts



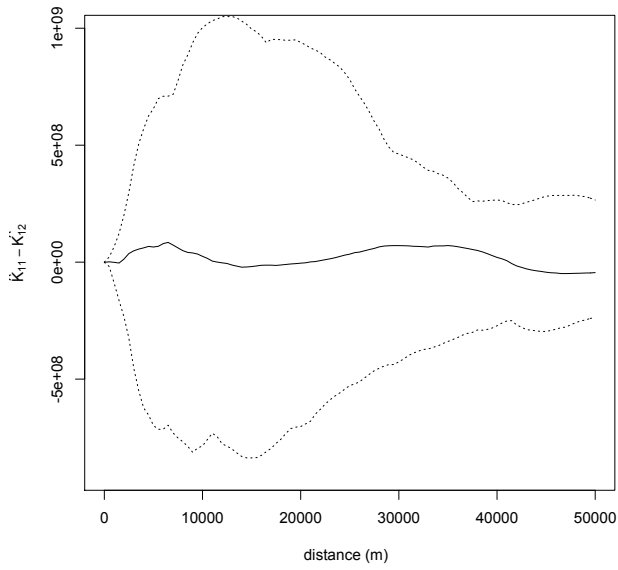
Music and performing arts vs Video, film and photography



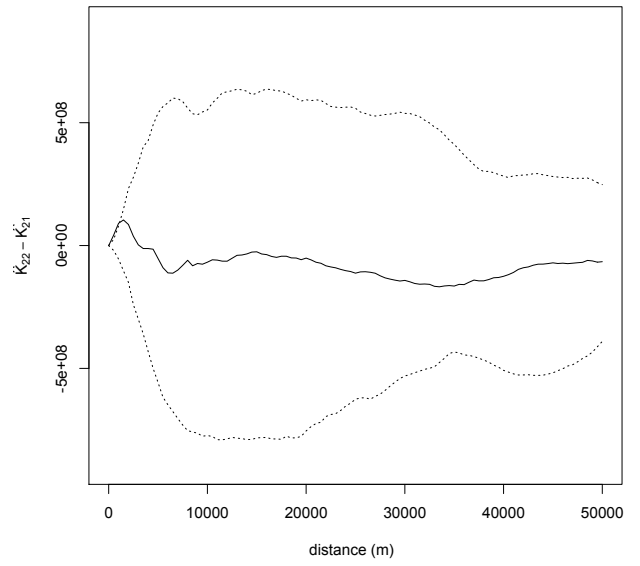
Video, film and photography vs Music and performing arts



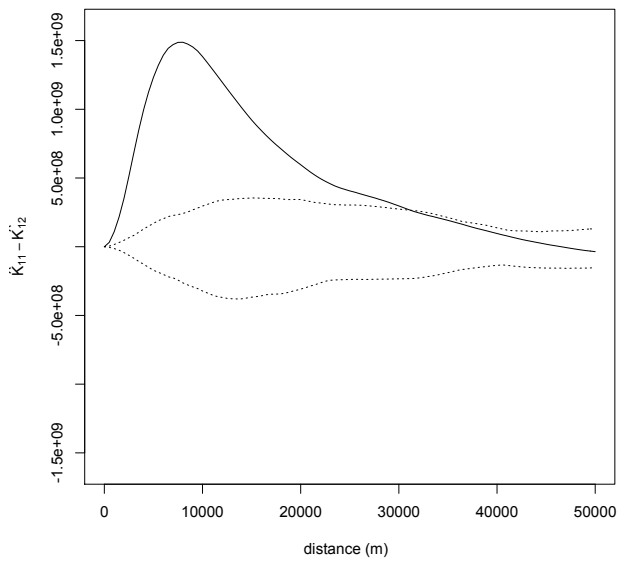
**Publishing vs Radio and TV**



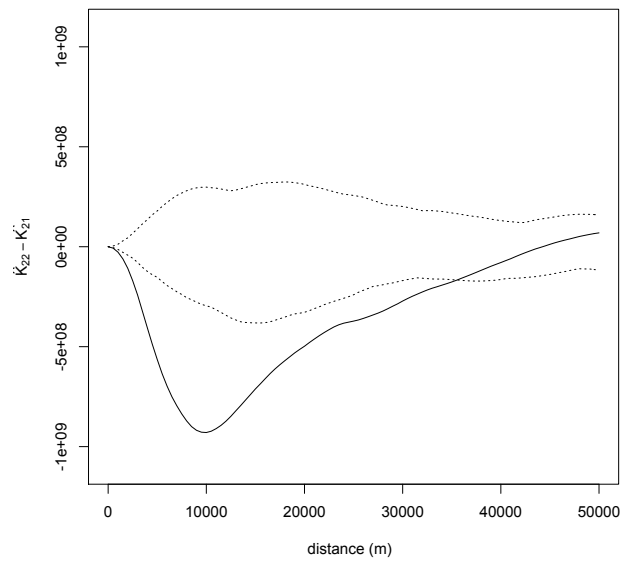
**Radio and TV vs Publishing**



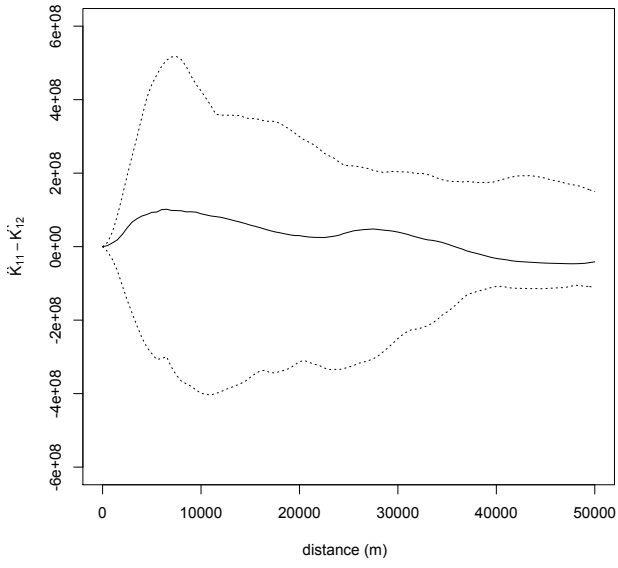
**Publishing vs Software and computer games**



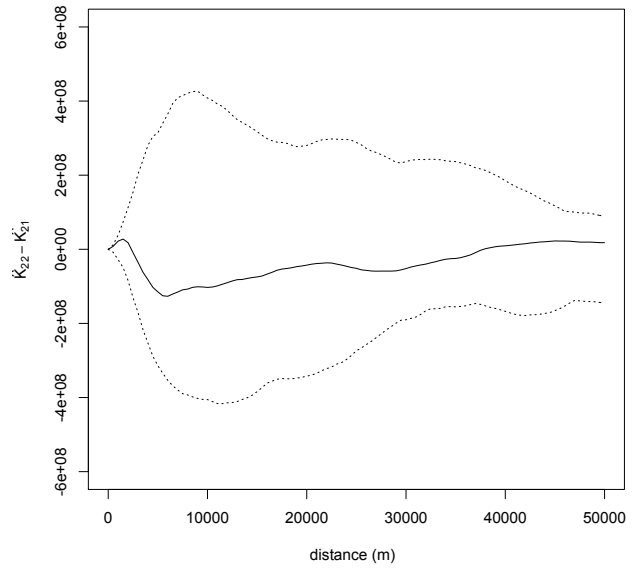
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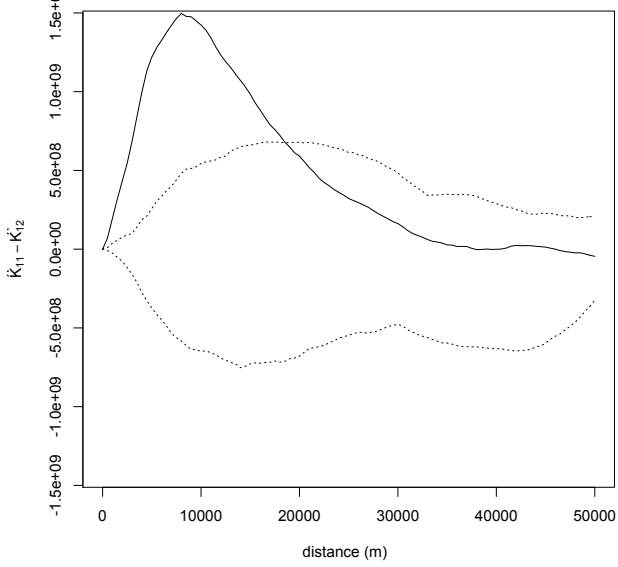
**Publishing vs Video, film and photography**



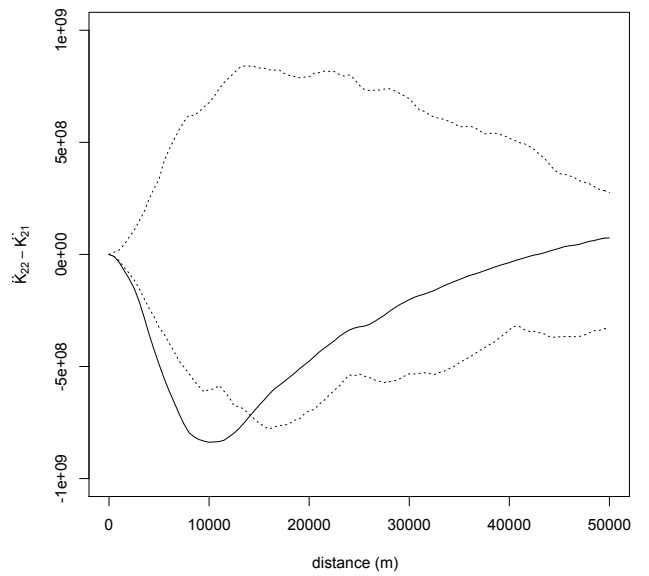
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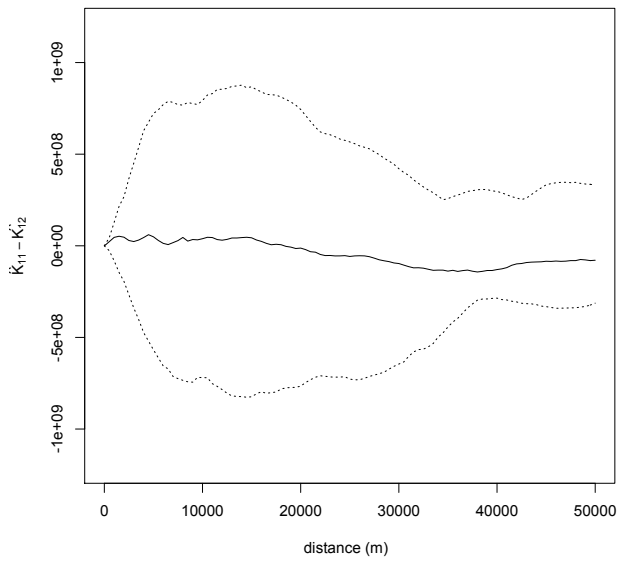
**Radio and TV vs Software and computer games**



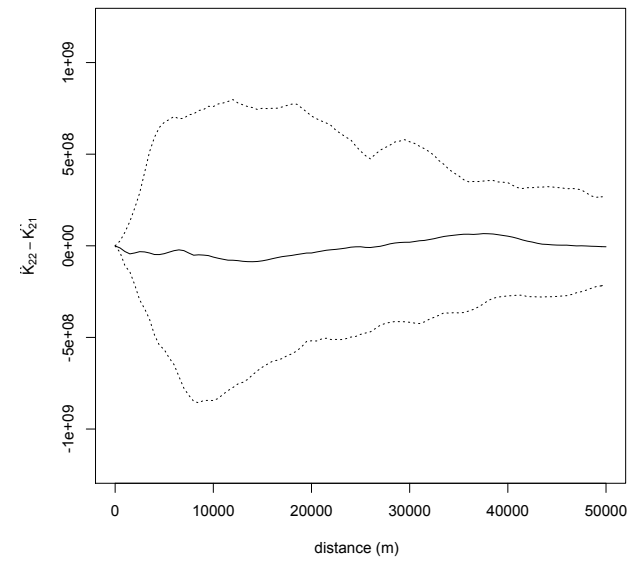
**Software and computer games vs Radio and TV**



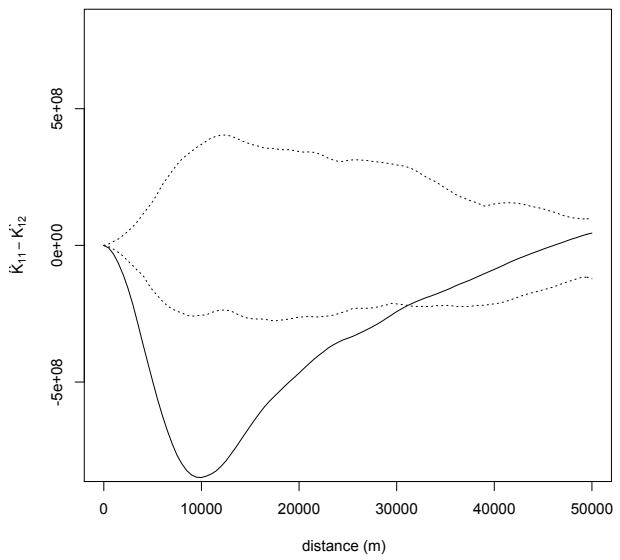
Radio and TV vs Video, film and photography



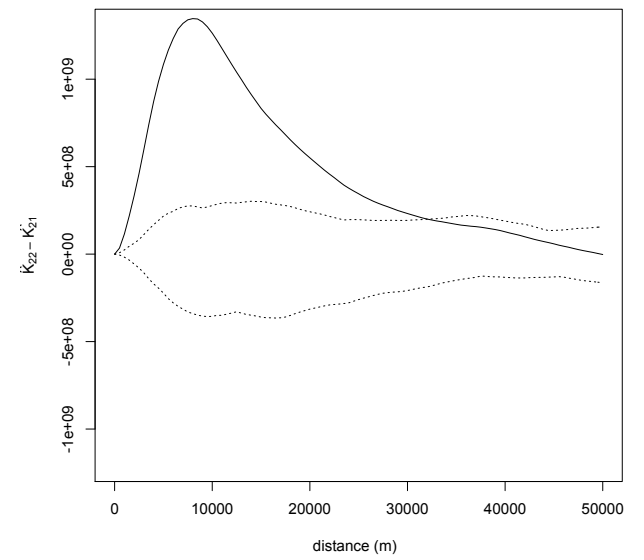
Video, film and photography vs Radio and TV



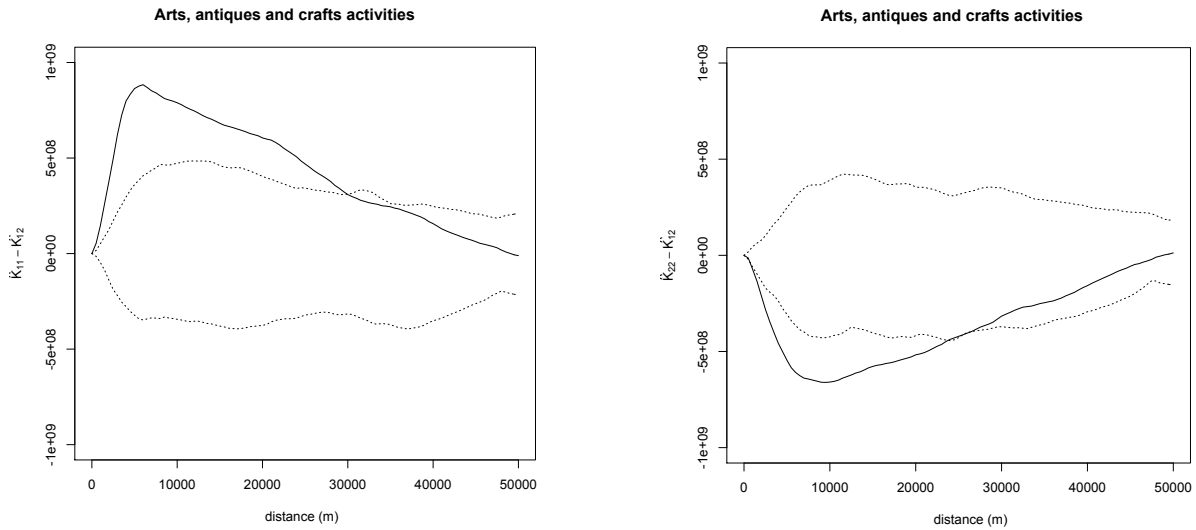
Software and computer games vs Video, film and photography



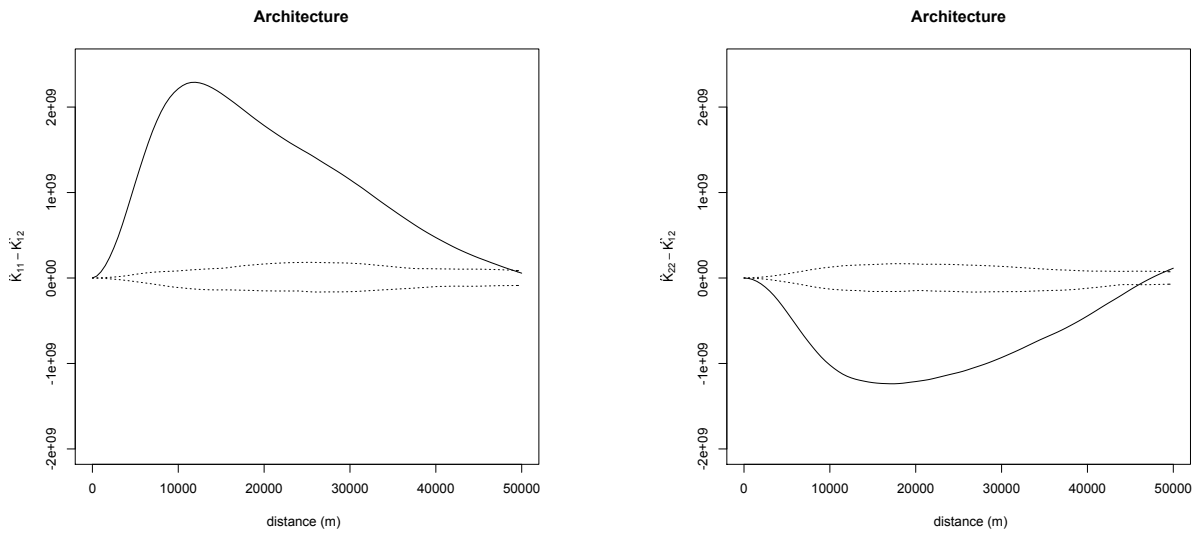
Video, film and photography vs Software and computer games



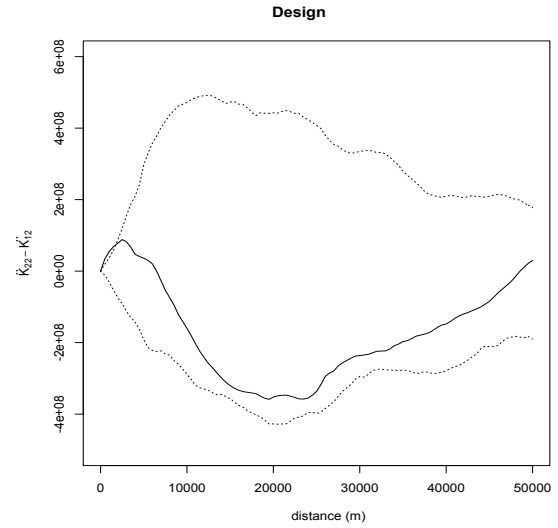
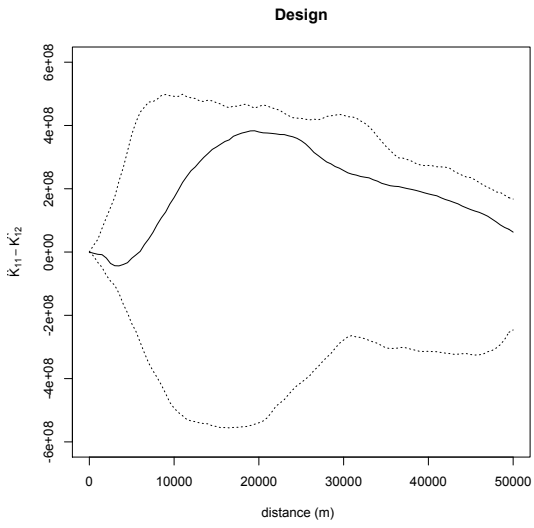
**4.5 Behaviour of the statistics  $\widehat{K}_{cc}(d) - \widehat{K}_{cs}(d)$  and  $\widehat{K}_{ss}(d) - \widehat{K}_{sc}(d)$  (solid line) and of the corresponding min and max envelopes (dashed lines) estimated on the bases of 999 random labelling.**



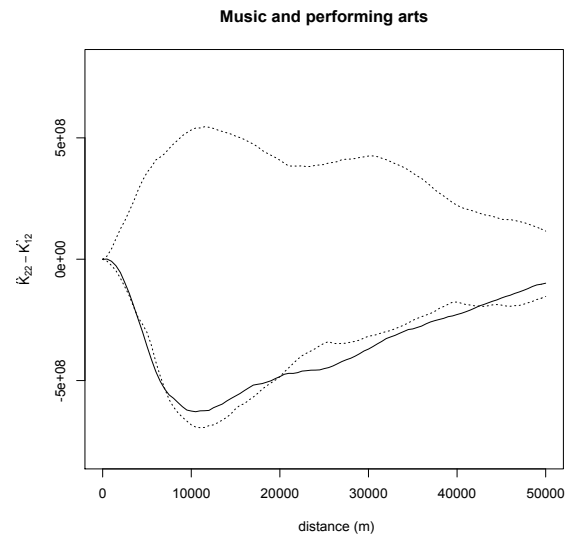
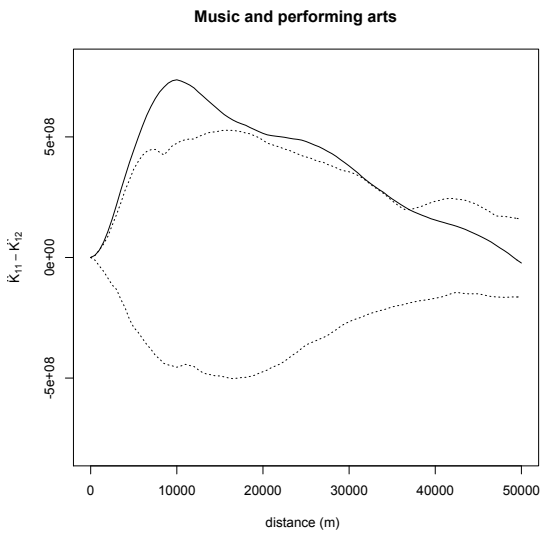
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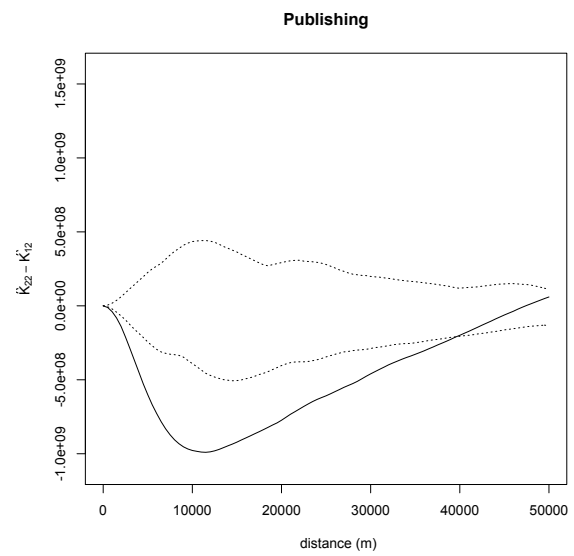
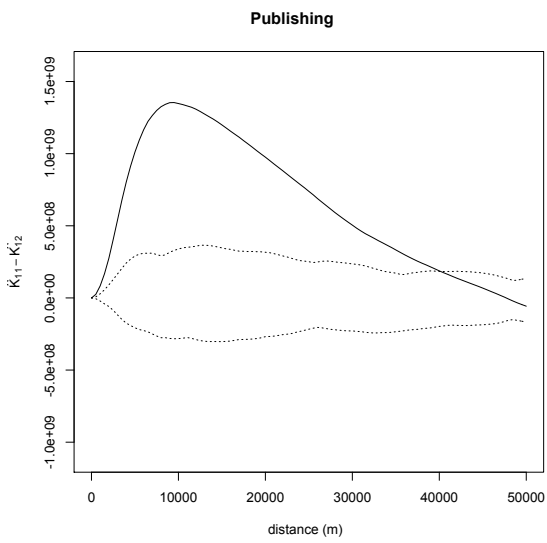
**b**



**c**



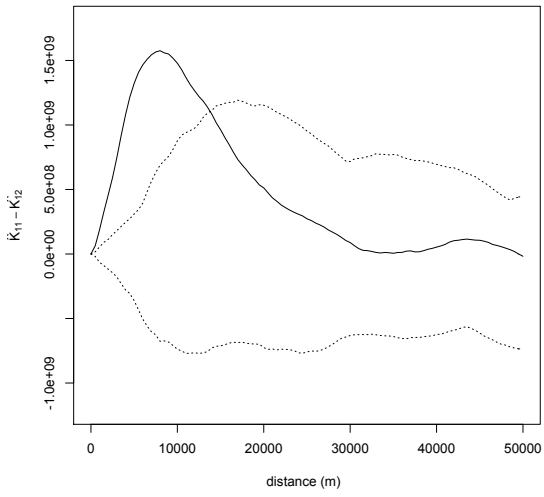
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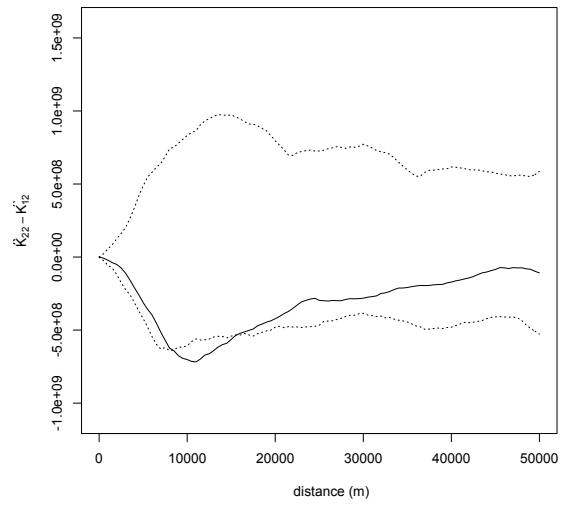
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**Radio and TV**

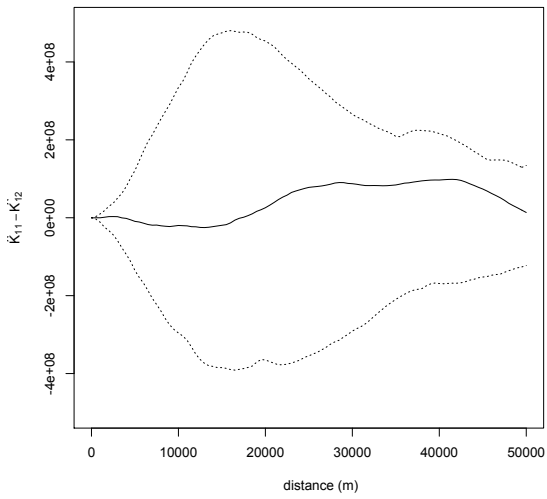


**Radio and TV**

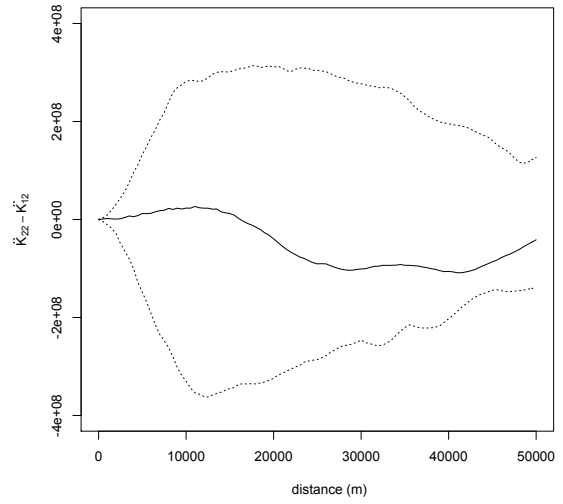


**f**

**Software and computer games**

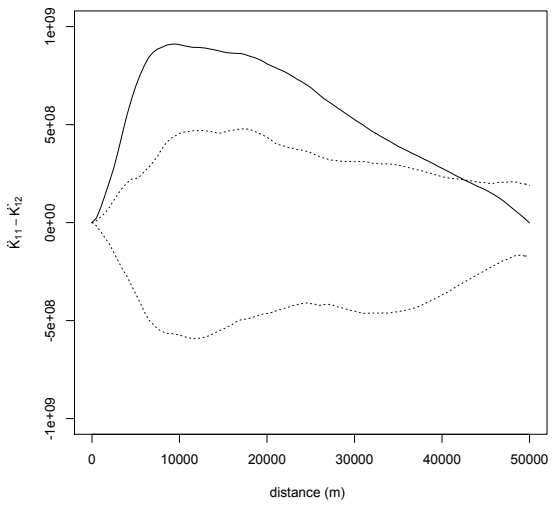


**Software and computer games**

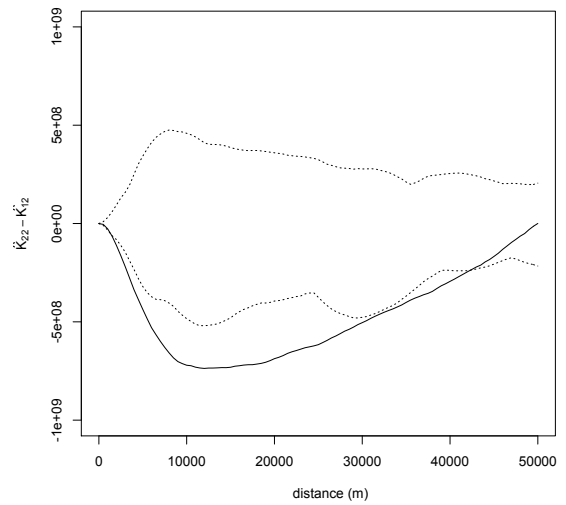


**g**

**Video, film and photography**



**Video, film and photography**



**h**