Paper to be presented at the DRUID 2011

on

INNOVATION, STRATEGY, and STRUCTURE -
Organizations, Institutions, Systems and Regions
at
Copenhagen Business School, Denmark, June 15-17, 2011

The Importance of Creative Industry Agglomerations in Explaining the Wealth of European Regions

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Abstract

This paper examines the existence of regional agglomerations of manufacturing, service and creative industries, the relationship between these industries and the wealth of regions and their industrial structure. Through an analysis of 250

European regions, three important conclusions can be inferred from the results obtained in this paper. The first is that creative industries play an important role in the wealth of a region. The second is that the most creative regions are characterized by having more high-tech manufacturing industries than the rest of the regions although the number of low-tech manufacturing firms is similar. Lastly, the industrial structure of each region has a greater influence on regional wealth than the existence of industrial agglomerations. The importance of this paper resides in the fact that up until now no analysis has demonstrated that creative industries are the most important industries in regional wealth.

Jelcodes:L60,O40

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Abstract

This paper examines the existence of regional agglomerations of manufacturing, service and creative industries, the relationship between these industries and the wealth of regions and their industrial structure. Through an analysis of 250 European regions, three important conclusions can be inferred from the results obtained in this paper. The first is that creative industries play an important role in the wealth of a region. The second is that the most creative regions are characterized by having more high-tech manufacturing industries than the rest of the regions although the number of low-tech manufacturing firms is similar. Lastly, the industrial structure of each region has a greater influence on regional wealth than the existence of industrial agglomerations. The importance of this paper resides in the fact that up until now no analysis has demonstrated that creative industries are the most important industries in regional wealth.

1. Introduction

The localization of creative industries, as highlighted by the work of Stam et al. (2008), Cooke (2008), Lazzeretti et al. (2008), Capone (2008) and Power and Nielsen (2010), is an area of increasing importance in the literature on geographic agglomerations. These industries are in fact groupings of specific sectors of low-technology manufacturing and knowledge-intensive services, which is why their importance is related to the ever-increasing dependence of manufacturing sectors on service industries (Peneder et al., 2003; Pilat and Wölfl, 2005; Drejer and Vinding, 2005; Wood, 2006; Aslesen and Isaksen, 2007b), and on what we could call the *Knowledge and Service Economy* (Windrum and Tomlinson, 1999; Bishop, 2008; Aslesen and Isaksen, 2007a; Aslesen and Isaksen 2007b; Strambach 2008).

Existing studies show which activities can be included in creative industries, and why these industries form agglomerations (Lazzeretti et al., 2009; Lorenzen and Frederiksen, 2008). However, although the existence of relationships between manufacturing and services agglomerations in their different definitions of high and low (Leydesdorff et al., 2006; Leydesdorff and Fritsch, 2006; Vence-Deza and González-López, 2008; Heidenreich, 2009) have been the focus of some analyses, the above mentioned analyses have not been carried out to examine the possible relationship between manufacturing agglomerations – including both high and low-tech industries – and creative industries. This paper attempts to fill this gap as at the present time we are not aware of the existence of any paper which focuses on this subject. In addition, the core importance of the paper is based on the fact that it points out empirically how important creative industries are in developing economies and bringing prosperity to European regions.

The paper strives to answer the question of how much influence the existence of industrial agglomerations has on the wealth of a region and the relationships between these agglomerations and the industrial structure of the region. The results obtained have implications for academia as well as for policymakers.

The empirical study is based on a sample of 250 regions in 24 European countries. The data was taken from Eurostat's *Structural Business Statistics* and *Regional Economic Accounts* databases. The data was used to evaluate manufacturing, service and creative industry agglomerations based on the *Location Quotient* (LQ) of firms by regions. Following this, the relationship between these agglomerations and GDP was verified. Finally, the industrial structure of the regions was determined. Three important conclusions are pointed out. The first is that creative industries play an important role in the wealth of a region. The second is that the most creative regions are characterized by having more high-tech manufacturing sectors than others, although they have a similar number of low-tech manufacturing firms. The third is that the industrial structure of each region has a greater influence on regional wealth than the existence of industrial agglomerations, thus showing the importance of creativity.

The outline that we have used in this paper is as follows: in Sections 2 and 3, we briefly summarize the recent basic theory on the study of maps of manufacturing, service and creative industry agglomerations to determine the localization patterns and the relationships they have on the aforementioned studies. In Section 4, we include the empirical study where we set out the variables used, the sources the data was extracted from and the methodology used for their study as well as the results obtained. Our conclusions can be found in Section 5.

2. Maps of agglomerations in manufacturing and services.

The maps of agglomerations in manufacturing and services are representations of sectors which are located in a geographic zone, whether it is a city, region or country. Examples of these maps can be found in studies on the different terminologies used to name these agglomerations: industrial districts, clusters, milieux and Local Production Systems. Therefore, we have maps of sectoral concentrations for the majority of European countries (Becattini and Coltorti, 2006; Crouch and Farrel, 2001; Pitelis and Pseiridis, 2006; Boix and Galletto, 2006; Trullén, 2006).

Recently, the study of maps of clusters and districts has acquired a new dimension, in which instead of limiting the localization of the different industries and services at separate levels, the maps are more aggregated. Examples of the former can be found in the studies carried out by Becattini and Coltorti (2006), who point out the different industrial districts in Italy – the shoe industry located in Brenta, Fermano Maceratese and Verona, the tile industry in Sassuolo and the textile industry in Prato and Biella, among others. In Spain, these types of studies have also been carried out by Boix and Galleto (2006) and Trullén (2006), among others and the same has occurred in the majority of European countries and on other continents. At first, the agglomerations studied corresponded to industry while the service sector (O'Donoghue and Gleave, 2004) was incorporated later as its influence on the economies increased. Pilat and Wölfl (2005) have pointed out that this increase is the result of the relationship between manufacturing and service industries and because the former tends to subcontract some activities to firms with specialized services located in the same country or in a foreign country. Studies such as the one by Heidenreich (2009) found that regions specialize

either in manufacturing or in services, while Wood (2006) pointed out the dependence that industry has on services, and especially knowledge-intensive services (KIS).

Secondly, the most aggregated analysis studies high, medium and low-technology manufacturing sectors globally, sometimes separately (Cooke et al, 2007, chap. 8), and other times jointly (Robertson and Patel, 2007). The differences in technology levels are based on R&D intensity (Hatzichronoglou, 1997), which the OECD uses to establish its four types of manufacturing industries: a) high-technology, b) medium-high-technology, c) medium-low-technology and d) low-technology. What is taken into account in services is knowledge, since the relationship existing between the manufacturing and service sectors allows the latter to transfer knowledge to the former, as well as to create it (Miles, 2008). This is why the analysis of knowledge-intensive services (Bishop, 2008) predominates in the services industry, since they are associated with the *knowledge-based economy* (Windrum and Tomlinson, 1999; Aslesen and Isaksen, 2007a; Bishop, 2008; Strambach, 2008).

Lastly, we find the analysis of the relationship between manufacturing and service agglomerations (Leydesdorff et al. 2006; Leydesdorff and Fritsch, 2006), to which the relationship between agglomerations and wealth – measured by GDP per inhabitant – is sometimes added (Heidenreich, 2009; Vence-Deza and González-López, 2008). However, the relationship with creative industries has not been sufficiently explored.

In Table 1 we have included the sectors that come under manufacturing and services industries from the NACE Rev.2 classification and have separated them according to their technology and knowledge levels.

Table 1- Aggregations of manufacturing and services based on NACE Rev 2, 2-digit level

Manufacturing	
High-technology	***21*** *Manufacture of basic pharmaceutical products and pharmaceutical preparations* ***26*** *Manufacture of computer, electronic and optical products*
Medium-high-technology	***20*** *Manufacture of chemicals and chemical products* ***27*** *Manufacture of electrical equipment* ***28*** *Manufacture of machineryand equipment n.e.c.* ***29*** *Manufacture of motor vehicles, trailers and semi-trailers* ***30*** *Manufacture of other transport equipment*

Medium-low-technology		***19*** *Manufacture of coke and refined petroleum products* ***22*** *Manufacture of rubber and plastic products* ***23*** *Manufacture of other non-metallic mineral products* ***24*** *Manufacture of basic metals* ***25*** *Manufacture of fabricated metal products, except machinery and equipment* ***33*** *Repair and installation of machinery and equipment*
Low-technology		***10*** *Manufacture of food products* ***11*** *Manufacture of beverages* ***12*** *Manufacture of tobacco products* ***13*** *Manufacture of textiles* ***14*** *Manufacture of wearing apparel* ***15*** *Manufacture of leather and related products* ***16*** *Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials* ***17*** *Manufacture of paper and paper products* ***18*** *Printing and reproduction of recorded media* ***31*** *Manufacture of furniture* ***32*** *Other manufacturing*
Services		
Knowledge-intensive services (KIS)	High-tech Knowledge-intensive services (HTKIS)	***59*** *Motion picture, video and television programme production, sound recording and music publishing activities* ***60*** *Programming and broadcasting activities* ***61*** *Telecommunications* ***62*** *Computer programming, consultancy and related activities* ***63*** *Information service activities* ***72*** *Scientific research and development*
	Other Knowledge-intensive services (OKIS) [(1)]	***50*** *Water transport* ***51*** *Air transport* ***58*** *Publishing activities* ***64*** *Financial service activities, except insurance and pension funding* ***65*** *Insurance, reinsurance and pension funding, except compulsory social security* ***66*** *Activities auxiliary to financial services and insurance activities* ***69*** *Legal and accounting activities* ***70*** *Activities of head offices; management consultancy activities* ***71*** *Architectural and engineering activities; technical testing and analysis* ***73*** *Advertising and market research* ***74*** *Other professional, scientific and technical activities* ***75*** *Veterinary activities* ***78*** *Employment activities* ***80*** *Security and investigation activities* ***84*** *Public administration and defence; compulsory social security* ***85*** *Education* ***86*** *Human health activities* ***87*** *Residential care activities* ***88*** *Social work activities without accommodation* ***90*** *Creative, arts and entertainment activities* ***91*** *Libraries, archives, museums and other cultural activities* ***92*** *Gambling and betting activities* ***93*** *Sports activities and amusement and recreation activities*
Less-Knowledge-intensive services (LKIS)		***45*** *Wholesale and retail trade and repair of motor vehicles and motorcycles* ***46*** *Wholesale trade, except of motor vehicles and motorcycles* ***47*** *Retail trade, except of motor vehicles and motorcycles* ***49*** *Land transport and transport via pipelines* ***52*** *Warehousing and support activities for transportation* ***53*** *Postal and courier activities* ***55*** *Accommodation* ***56*** *Food and beverage service activities* ***68*** *Real estate activities* ***77*** *Rental and leasing activities* ***79*** *Travel agency, tour operator reservation service and related activities* ***81*** *Services to buildings and landscape activities* ***82*** *Office administrative, office support and other business support activities* ***94*** *Activities of membership organisations* ***95*** *Repair of computers and personal and household goods* ***96*** *Other personal service activities* ***97*** *Activities of households as employers of domestic personnel* ***98*** *Undifferentiated goods-and service-producing activities of private households for*

	own use ***99** Activities of extraterritorial organisations and bodies*

(1) KIS except High-tech knowledge-intensive services
Source: Eurostat: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/High-tech_statistics

In the studies currently being carried out on maps at aggregate level, some patterns have been detected with respect to the importance of high-tech sectors in manufacturing and services in relation to the generation of knowledge and to regional wealth (measured by GDP per inhabitant).

There is not a common opinion (Leydesdorff and Fritsch, 2006; Leydesdorff et al., 2006; Robertson and Patel, 2007; Bishop, 2008; Vence-Deza and González-López, 2008; Heidenreich, 2009; The Center for Strategy and Competitiveness, 2009) about whether high-tech manufacturing sectors are the only relevant ones since their importance is usually associated with that of medium-high tech sectors, even though the presence of medium-tech industries is considered important for regional wealth.

In the case of service sectors, however, the importance of knowledge-intensive services (KIS) and high-tech knowledge-intensive services (HTKIS, which are included in KIS) can indeed be observed.

Vence-Deza and González-López (2008) pointed out that the principal trend in European regions is towards geographic concentration of high-tech sectors in manufacturing and services and that this concentration takes place in the regions with the greatest GDP per inhabitant. However, Leydesdorff and Fritsch (2006) and Leydesdorff et al. (2006), in two studies for Germany and Holland, verified that medium-tech sectors are much more important than high-tech sectors in the knowledge base of a region or country.

It has also been observed that high-tech knowledge-intensive services (HTKIS) are the most important for the service sector while other knowledge-intensive services (OKIS) have a lesser effect on the territorial knowledge base.

In Heidenreich's opinion (2009), the richest regions – those with a high GDP – are those which have a high percentage of jobs both in high-tech sectors as well as medium

high-tech manufacturing sectors and in knowledge-intensive services (KIS), but have a low percentage of jobs in low and medium-tech manufacturing sectors. The Center for Strategy and Competitiveness (2009) in its study on KIBS (knowledge-intensive business services) sectors in Europe found that regions with strong KIBS sectors had the highest prosperity levels in Europe. Contrary to this finding, Bishop (2008) argues that for the United Kingdom development depends on diversification rather than depending solely on KIS sectors or on any other single sector. It is not strange to reach this conclusion for the United Kingdom, which is one of the countries that places greatest importance on the role of creative industries. Therefore, the evidence is not really clear about what type of industries determine the wealth of regions.

Our next question refers to the relationship between industries and whether the studies existing at present show a regional trend towards specialization in high or low sectors.

Heidenreich (2009) found a pattern in European regions where low and medium low-tech (LMT) sectors coexist with high and medium-high sectors, but did not find a similar situation in manufacturing and services, i.e., in regions which specialize in manufacturing and services.

Accordingly, Robertson and Patel (2007) evidenced the compatibility between high-tech manufacturing and low-tech manufacturing industries. Therefore, in European countries, the presence of high-tech manufacturing industries is compatible with the presence of low-tech manufacturing industries. In our empirical study we have broadened these conclusions to include the study of creative regions which has not been carried out previously.

3. Maps of agglomerations in creative industries: extending the evidence

A specific case study of agglomerations which includes manufacturing and services of different types is that of *creative industries* (Stam et al. 2008; Lazzeretti et al., 2008; Capone, 2008; De Propis et al., 2009; Power and Nielsén, 2010). According to Pratt (2008), it was toward the end of the 1990s when this terminology began to be used in

Europe, to be more precise, when the British Department for Culture, Media and Sport (DCMS) drew up its map of creative industries in 1998.

The question about which activities are creative was influenced by the inclusion of activities that involve copyright or other intellectual property (Towse, 2010). The most widely extended definition of creative industries is that of the DCMS (2009) which defined creative industries, as "those industries that are based on individual creativity, skill and talent. And which have the potential to create wealth and jobs through developing intellectual property". Howkins (2005) believes that it "is more consistent to restrict the term to an industry where intellectual labour is predominant and the result is intellectual property". UNCTAD (2010) considers creative industries as "any economic activity producing symbolic products with a heavy reliance on intellectual property and for as wide a market as possible". The difference is in the DCMS's use of the term "individual", which has been argued by some authors (Healy, 2002; Garnham, 2005; Pratt, 2005; O'Connor, 2007).

The debate about creative industries is focused mainly on four points: the name cultural or creative (DCMS, 2009; UNESCO, 2009; Power and Nielsén, 2010; UNCTAD, 2010), the activities which are included in them (DCMS, 2009; UNCTAD, 2010; Chapain et al., 2010), where they are located (Stam et al. 2008; Lazzeretti et al., 2008; Capone, 2008; Power and Nielsén, 2010) and their impact on development (UNCTAD 2010).

The use of the term cultural or creative is related to the concept of these industries and the activities included in them. The definitions are usually based on sectoral classifications and the authors use criteria that do not always coincide (Nählinder 2005). When the DCMS (2009) defined creative industries, it included advertising, architecture, art and antiques markets, computer and video games, crafts, design, designer fashion, film and video, music, the performing arts, publishing, software, television and radio within these activities, although it excluded the heritage sector, archives, museums, libraries, tourism and sport. However, other authors and organizations consider heritage activities as creative (UNCTAD 2010).

The most comprehensive taxonomy of creative industries, which is particularly appropriate to cross-country comparisons has been proposed by UNCTAD (2010). Table 2 contains the transformation to NACE Rev 2 of these activities, separating them by manufacturing or service industries. It has been verified that creative industries are made up of sectors pertaining to low-tech manufacturing and knowledge-intensive services, although the majority of the sectors included are service industries and especially KIS. When comparing the definition of creative industries as per the British Department for Culture (Pratt 2008, DCMS 2009) with the characteristics attributed to KIS sectors (Nählinder, 2005; Doloreux et al., 2008; Strambach, 2008; Muller and Doloreux, 2009; Shearmur and Doloreux, 2009), both make reference to the talent and abilities of persons and firms to create knowledge (Larsen, 2001; Aslesen and Isaksen, 2007b).

Table 2- Aggregations of creative industries based on NACE Rev. 2. Adaptation to 2 digits.

Manufacturing	**Creative**	**Non-creative**
High-tech		21, 26
Medium-high tech		20, 27, 28, 29, 30
Medium-low tech		19, 22, 23, 24, 25, 33
Low-tech	14, 15, 18,	10, 11, 12, 13, 16, 17, 31, 32
Services	**Creative**	**Non-creative**
High-tech Knowledge-intensive services (HTKIS)	59, 60, 62, 72	61, 63
Other Knowledge-intensive services (OKIS)	58, 71, 73, 74, 90, 91, 92, 93	50, 51, 64, 65, 66, 69, 70, 75, 78, 80, 84, 85, 86, 87, 88,
Less-Knowledge-intensive services (LKIS)		45, 46, 47, 49, 52, 53, 55, 56, 68, 77, 79, 81, 92, 94, 95, 96, 97, 98, 99

Source: UNCTAD (2010), DCMS (2009), KEA European Affairs (2006) and Lazzeretti et al. (2008)

Power (2002, 2003), Cooke (2008), Stam et al. (2008), Lazzeretti et al. (2008), Capone (2008), De Propris et al (2009), Baum et al. (2009), and Power and Nielsén (2010) have studied the location of creative and cultural industries from an aggregated viewpoint.

These studies conclude that creative industries tend to be located in the major urban areas of each country (Lazzeretti et al., 2008; Stam et al., 2008; De Propris et al, 2009; Baum et al. 2009; Power and Nielsén, 2010).

In terms of the relationship between location and wealth, the DCMS creative industries concept expresses "their potential for wealth and job creation". Power and Nielsén (2010) found that creative and cultural industries are located in the wealthiest European regions, while Stam et al. (2008) showed that the presence of the creative class has a higher impact on employment growth than creative industries. Baum et al. (2009) also pointed out that locations need human capital if they intend to prosper in creative industries.

4. Methodology

a) Sample and variables

The sample comprises 250 European regions. The countries whose data was not available, such as Greece, Luxembourg and Malta, were not included.

The data for this study was compiled from Eurostat's *Structural Business Statistics* (SBS) and *Regional Economic Accounts (REA)* databases and corresponds to 2008[(1)]. The main limitation comes from the fact that Eurostat data does not allow three or more digit codes to be used, as recommended by Chapain et al. (2010), thus the classification has been adapted to two digits. However, as the new NACE 2 is particularly well suited to knowledge-based classifications, the loss of detail and the introduction of noise in the aggregation are surprisingly low.

The variables extracted were used to calculate the *Location Quotient* (LQ) for manufacturing (high, medium-high, medium-low and low tech), services (HTKIS, OKIS and LKIS) and creative industries for each region with relation to EU-27. The Location Quotient (LQ) is an indicator of the existence of industrial agglomerations in a region. The formula used in our study is:

$$LQd = \frac{\text{Firms in NACE}_i \text{ in region A / Total firms in NACE}_i \text{ in EU}}{}$$

Manuf. or service firms in region A / Total manuf. or service firms in EU

Although there are other methods to analyze geographical concentration, the use of the LQ is very common in the analysis of creative industry agglomerations (Lazzeretti et al., 2008; De Propris et al., 2009; Baum et al., 2009). As Lazzeretti et al. (2008) indicated, the main advantages of the LQ are simplicity, transparency and data requirements.

Additionally, the data on GDP per inhabitant for each region was taken in order to examine its relationship with creative industries and to compare it with the results in reference to manufacturing and services. To calculate regional structures, the data on regional jobs was extracted from the previously mentioned NACEs by calculating the percentages of jobs in each sector with respect to regional industry. The groupings of manufacturing, services and creative industries were used as per Table 2 for statistical calculations.

The following statistical calculations were carried out based on the aforementioned limitations. First, the correlations between industries were calculated to find out in which cases there were positive or negative correlations as well as their correlation with respect to GDP per inhabitant. Second, a cluster analysis was carried out to see whether groups of regions by GDP per inhabitant and the number of creative agglomerations could be established. An analysis of whether there were norms with respect to high-tech and low-tech manufacturing agglomerations was carried out on groups of clusters of more or less creative regions. Third, a regression analysis was carried out to analyze whether the wealth of a region depends on the existence of agglomerations or on its industrial structure.

b) Results

b.1) Results of the correlations

The results of the correlations are shown in Table 3. To analyze them, we focused first on the correlations between sectors without taking GDP into account. Afterwards we looked at the correlations between GDP and industry (manufacturing and services).

From the results in Table 3, the following can be deduced:

- The results of the relationship between manufacturing sectors show that there is a positive correlation between high-tech manufacturing, medium-high manufacturing and medium-low manufacturing sectors. However, the correlation is negative between high-tech and low-tech non-creative sectors, and between medium-high and low-tech non-creative sectors. Consequently, the results do coincide with those of Heidenreich (2009), who concluded that high and medium-high coexist with medium-low manufacturing. Robertson and Patel (2007) also found this coexistence.
- High-tech, medium-high and medium-low manufacturing and the three groups of non-creative services are correlated. Therefore, contrary to what Heidenreich (2009) states, regions do not specialize in manufacturing or in services. Moreover, it is important to notice that low-tech non-creative manufacturing has a negative correlation with knowledge-intensive non-creative services.
- In the case of creative industries, there is a positive correlation with services as well as with manufacturing, except for low-tech non-creative manufacturing.

Based on these initial results, if there is a positive correlation with high-tech industries and knowledge intensive services, then it can be concluded that there are more high-tech industries in creative regions than other types of industries.

Table 3. Descriptive statistics and Spearman's correlation coefficients (number of industry agglomerations and GDP)

	Mean	SD	High (LQs)	MedHigh (LQs)	MedLow (LQs)	Low non-creative (LQs)	HTKIS non-creative (LQs)	OKIS non-creative (LQs)	LKIS (LQs)	Creative (LQs)	GDP perinhab (€)

High (LQs)	0.92	0.84	1								
MedHigh (LQs)	2.31	1.60	0.649**	1							
MedLow (LQs)	2.69	1.23	0.249**	0.392**	1						
Low non-creative(1) (LQs)	2.62	1.20	-0.262**	-0.244**	-0.050	1					
HTKIS non-creative(2) (LQs)	0.85	0.64	0.326**	0.208**	0.218**	-0.142*	1				
OKIS non-creative(3) (LQs)	2.85	1.88	0.613**	0.636**	0.282**	-0.223**	0.271**	1			
LKIS(4) (LQs)	5.27	2.10	0.283**	0.460**	0.323**	0.004	0.243**	0.578**	1		
Creative (LQs)	3.58	2.38	0.543**	0.442**	0.248**	-0.230**	0.455**	0.544**	0.219**	1	
GDP perinhab(€)	24,250	9,000	0.433**	0.455**	-0.011	-0.179**	0.105	0.419**	0.203**	0.440**	1

**Correlation is significant at the 0.01 level (bilateral). *Correlation is significant at the 0.05 level (bilateral).
High: High-tech manufacturing industries; MedHigh: Medium-high-tech manufacturing industries; MedLow: Medium-low-tech manufacturing industries; Low non-creative: Low-tech non-creative manufacturing industries; HTKIS non-creative: High-tech knowledge-intensive non creative services; OKIS non-creative: Other knowledge-intensive non-creative services; LKIS: Less-knowledge-intensive services; Creative: Creative industries; GDPperinhab: GDP per inhabitant

(1) Excluding wearing apparel, leather, and printing, included in "creative industries".
(2) Includes only telecommunications and information service activities as the rest (motion picture, video and television, sound recording and music, broadcasting, computer programming, and scientific research and development) are included in "creative industries".
(3) Excluding publishing, architectural and engineering activities, advertising, and arts, entertainment and recreation, included in "creative industries".
(4) Excluding retail sale of other goods in specialized stores, included in "creative industries".

Source: Eurostat. *Structural Business Statistics* (SBS) Database

If we include the results obtained when relating sectors with GDP per inhabitant, the results obtained show:

- There is a positive correlation between GDP per inhabitant and the localization of high-tech manufacturing industries, medium-high tech manufacturing, OKIS non-creative (other knowledge-intensive non-creative services), and less-knowledge intensive services and creative industries.
- The correlation is negative with low-tech non creative industries.

These results do not coincide with Heidenreich (2009) or Vence-Deza and González-López (2008), who find that the wealth of a region does depend exclusively on high-tech industries and knowledge-intensive services.

Another result shows that there is a positive correlation between GDP per inhabitant and creative industries, which include low-tech manufacturing, HTKIS and OKIS. However, they do not include high-tech manufacturing industries. Therefore, creative regions do

not depend exclusively on high-tech industries and knowledge-intensive services, contrary to the findings of Heidenreich (2009), Vence-Deza and González-López (2008).

b.2) Cluster results

The cluster technique was conducted in order to obtain group structures. Thus, the process was divided into two stages, as recommended by various authors (Punj and Stewart, 1982; Hair et al., 1996:515). In the first phase, a hierarchic method was used to obtain a suitable number of groups, followed by a non-hierarchic method (k-means) to establish the group distribution and definitive composition, based on the number of groups obtained during the first stage. A dendogram was obtained for application in three to five groups. However, in our opinion, it seemed more suitable to choose five groups to show all the diversity within the European regions. The coincidence between the two methods in the assignment of regions to the groups was 90%. Description of the groups is shown in Table 4.

In addition, the ANOVA analysis applied to each independent variable (LQs) used to obtain the groups revealed that all variables discriminate the classification into the five groups with all of them being significant at $p<0.01$. Additional statistical procedures were based on the ANOVA test to identify the differences between the group of belonging of regions and their GDP pps. The test was significant at $p<0.01$. This exercise shows that the group of belonging or cluster of regions, presents GDP pps differences across regions in general (Table 4). The results we obtained (Table 4) are:

- Five cases can be verified in the clusters depending on whether or not regions are creative, and the importance of all groups of industries. The first are the regions we call high-manufacturing regions; the second are the LKIS regions (less-knowledge intensive services); the third are the intermediate regions; the fourth are the low-tech non-creative regions; and the fifth are the super-creative regions, which have a higher mean of creative agglomerations than the rest.
- When calculating the mean GDP per inhabitant for these regions we can see that it is highest in the super-creative regions.

- High-manufacturing regions have a mean of agglomerations in all groups of industries which is higher than the super-creative, except for the creative industry group. Both regions have a higher number of OKIS non-creative agglomerations than the others.
- Creative agglomerations in intermediate regions are higher than those in LKIS regions and low-tech non-creative regions.

Table 4. Mean of agglomerations in the 5 clusters
(Industry agglomerations and GDP PPS per inhabitant)

Agglomerations/ Clusters	**1 High-manufacturing regions**	**2 LKIS regions**	**3 Intermediate regions**	**4 Low-tech non-creative regions**	**5 Super-creative regions**
High-tech (LQs)	2	0	1	0	2
MedHigh-tech (LQs)	4	1	1	1	4
MedLow-tech (LQs)	3	2	2	2	3
Low-tech non creative (LQs)	2	3	2	4	2
KIHTS non creative (LQs)	1	1	1	1	1
OKIS non creative (LQs)	5	2	2	1	4
LKIS (LQs)	7	6	3	3	6
Creative (LQs)	4	1	4	2	8
Mean GDP PPS per inhabitant	26,180 (2nd)	22,900 (4th)	23,612 (3rd)	16,780 (5th)	33,850 (1st)
Number of regions	69	62	42	44	32

In super-creative regions there is a greater number of high-tech manufacturing industries and creative industries. However, the mean of low-tech industry agglomerations is very similar in the five clusters. Therefore, we can conclude that in the more creative regions, where the mean GDP per inhabitant is higher, high-tech manufacturing industries go hand in hand with low-tech manufacturing industries, which is comparable to the results obtained by Robertson and Patel (2007).

Examples of *super-creative regions* (Figure 1) include Berlin, Hamburg, Utrecht, Northern Holland, Vienna, Stockholm, Inner London, Outer London, Berkshire, Buckinghamshire and Oxfordshire. *High-manufacturing* regions include Düsseldorf,

Greater Manchester, East Anglia and Essex. *Intermediate regions* include Madrid, Île de France, Veneto, Lazio and Emilia-Romagna. *LKIS regions* include Catalonia, Valencian Region, Salzburg and Brittany. *Low-tech non-creative regions* include Puglia, Campania and Extremadura.

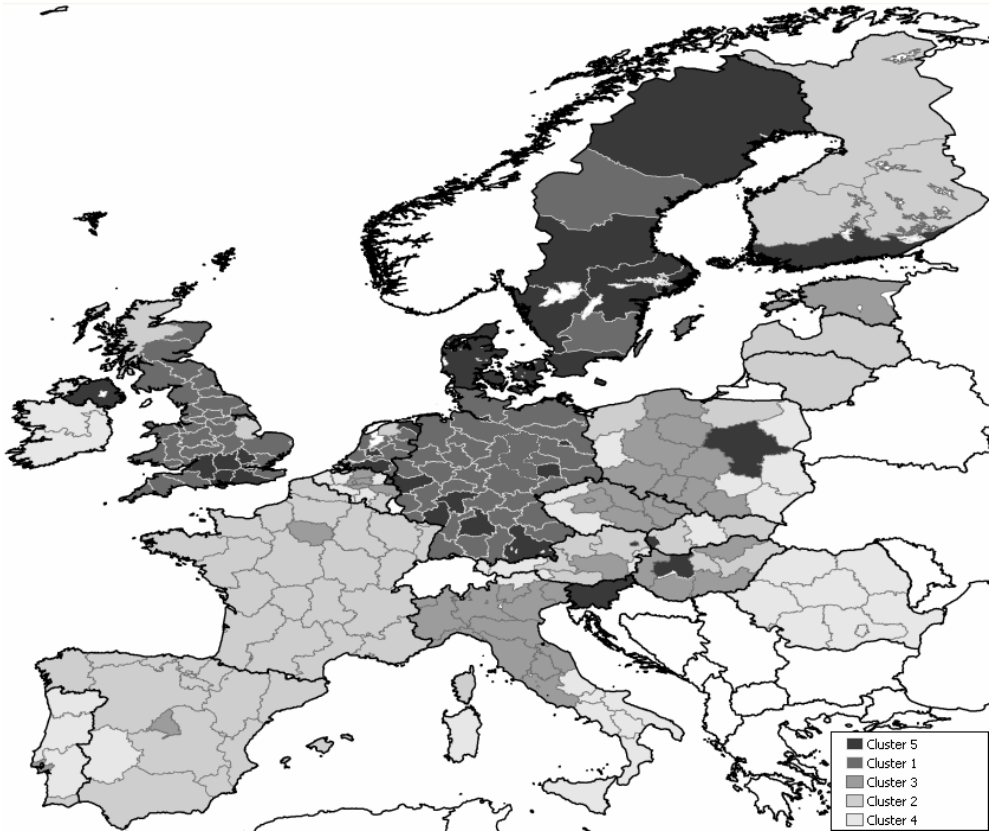

Figure 1. Regions in the five clusters

b.3) Results of the regression analysis

The regression analysis was used to analyze whether the wealth of a region depends on the existence of industrial agglomerations or on its industrial structure. By industrial structure we mean the percentage of jobs in each region that are included in high-tech manufacturing industries, low-tech manufacturing, knowledge-intensive services, creative industries, etc.

In the regression model, the dependent variable was GDP per inhabitant and the independent variables were the *LQs* (*Location Quotient*) and the percentage of workers (Table 5). The LQs were calculated using the number of businesses.

Table 5. Variables in the regression model

Dependent variable	GDP per inhabitant
Independent variables	1. LQs: Number of industrial agglomerations in each region for each one of the following collectives: • LQs in high-tech manufacturing (LQ High) • LQs in medium-high-tech manufacturing (LQ MedHigh) • LQs in medium-low-tech manufacturing (LQ MedLow) • LQs in low-tech non-creative manufacturing (LQ Low non-creative) • LQs in high-tech knowledge-intensive non-creative services (LQ HTKIS non-creative) • LQs in other knowledge-intensive non-creative services (LQ OKIS non-creative) • LQs in less-knowledge-intensive services (LQ LKIS) • LQs in creative industries (LQ creative) 2. Industrial structure of the region: percentage of workers in each region for each of the following collectives: • % workers in high-tech manufacturing (PtgL High) • % workers in medium-high-tech manufacturing (PtgL MedHigh) • % workers in medium-low-tech manufacturing (PtgL MedLow) • % workers in low-tech non-creative manufacturing (PtgL Low non-creative) • % workers in high-tech knowledge-intensive non-creative services (PtgL HTKIS non-creative) • % workers in other knowledge-intensive non-creative services (PtgL OKIS non-creative) • % workers in less-knowledge-intensive services (PtgL LKIS) • % workers in creative industries (PtgL creative)

The equation used as the basis of the regression model was[(2)]:

$$GDPperinhab_i = Const + \beta_1\ LQHigh + \beta_2\ LQMedHigh + \beta_3\ LQMedLow + \beta_4\ LQLow\ non\text{-}creative + \beta_5\ LQHTKIS\ non\text{-}creative + \beta_6\ LQOKIS\ non\text{-}creative + \beta_7\ LQLKIS + \beta_8\ LQcreative + \beta_9\ PtgLHigh + \beta_{10}\ PtgLMedHigh + \beta_{11}\ PtgLMedLow + \beta_{12}\ PtgLLow\ non\text{-}creative + \beta_{13}\ PtgLHTKIS\ non\text{-}creative + \beta_{14}\ PtgLOKIS\ non\text{-}creative + \beta_{15}\ PtgLLKIS + \beta_{16}\ PtgLcreative + \varepsilon_i$$

A stepwise regression model was applied, verifying the statistical significance of the model. Table 6 provides the results of the final specification (parsimonious) without the

non-significant variables. The variables that stand out as important in the wealth of a region are those which reflect the industrial structure of a region and not those related to industrial agglomerations.

In fact, the variable which has the greatest importance in the income per inhabitant of European regions is the percentage of workers in creative industries. Each increase of 1% in the share of creative industries on regional employment is correlated with an increase of 0.6% in GDP per capita, that is to say, an average increase of €1,424.

The second group of variables in importance is the percentage of workers in medium-high-tech manufacturing and in other-knowledge-intensive services. In both cases, an increase of 1% in their contribution to the structure of regional employment equals an increase of 0.2% in GDP per capita, which means €588 in the first case and €288 in the second one. Workers in less-knowledge-intensive services also contribute positively, with a coefficient of 0.10 and an additional impact of €231 in GDP per capita.

In contrast with these high-tech knowledge-intensive services which are classified as creative industries, those classified as non-creative prove to be economically and statistically non-significant in the estimations (the coefficient comes closer to zero). Thus, the affirmation of Leydesdorff and Fritsch (2006) and Leydesdorff et al. (2006) that OKIS (other knowledge-intensive services) are not less important than HTKIS (high-tech knowledge-intensive services) is qualified as false in the case of creative HTKIS and true for the rest of HTKIS.

Finally, we found that a higher share of workers in medium-low-tech manufacturing had a marginal impact of -0.25 and was correlated with a decrease of €664 in GDP per capita.

In summary, the results show the importance that the *Knowledge and Service Economy* has on regional wealth (Windrum and Tomlinson, 1999; Bishop, 2008; Aslesen and Isaksen, 2007a; Strambach, 2008) and the importance of the variables which reflect the industrial structure of a region, particularly its creative industries.

Table 6. Model Summary. OLS estimates.

Dependent variable: GDP per capita in PPS		Coefficient	Beta coefficient
Non-creative	Constant	**-96.96**	-
		(-0.982)	
	% workers in medium-high-tech manufacturing	**588.82**	**0.2055**
		(0.000)	
	% workers in medium-low-tech manufacturing	**-664.20**	**-0.2561**
		(0.000)	
	% workers in other knowledge-intensive services [3]	**288.55**	**0.2067**
		(0.000)	
	% workers in less-knowledge-intensive services [4]	**231.22**	**0.1070**
		(-0.032)	
Creative	% workers in creative industries	**1,424.70**	**0.6008**
		(0.000)	
	R2	0.5835	
	RD-adj	0.5749	
	Mean VIF	1.38	
	Obs	250	

Value of the coefficient in euros per capita. The beta coefficient indicates the marginal change.
Robust Huber-White estimators. Values in brackets are the probabilities.

[1] Excluding wearing apparel, leather, and printing, included in "creative industries".
[2] Includes only telecommunications and information service activities as the rest (motion picture, video and television, sound recording and music, broadcasting, computer programming, and scientific research and development) are included in "creative industries".
[3] Excluding publishing, architectural and engineering activities, advertising, and arts, entertainment and recreation, included in "creative industries".
[4] Excluding retail sale of other goods in specialized stores, included in "creative industries".

5. Conclusions

This paper strives to answer the question of how much influence the existence of manufacturing, service and creative industrial agglomerations has on a region's wealth, and what is the relationship between these agglomerations and the industrial structure of a region. To respond to this question, the industrial agglomerations of manufacturing, services and creative industries of 250 regions in 24 European countries were calculated. Afterwards, the relationships between agglomerations and between agglomerations and GDP were verified. Lastly, the industrial structure of the regions was determined.

The studies carried out up until now on the maps of manufacturing and service agglomerations (Leydesdorff and Fritsch 2006, Leydesdorff et al 2006, Vence-Deza and

González-López 2008, Heidenreich 2009) have shown the importance of the relationships between both. However, when analyzing whether the most important sectors in the development of a region are high-tech and services, as measured by GDP, the results obtained do not always coincide (Vence-Deza and González-López 2008, Leydesdorff and Fritsch 2006, Leydesdorff et al 2006). Additionally, the studies usually show an incompatibility between the agglomerations of high-tech and low-tech manufacturing sectors within the same region (Heidenreich 2009). Nevertheless, the empirical analysis carried out in this paper demonstrates that this incompatibility should be qualified. In fact, in the more creative regions the agglomerations of high-tech manufacturing industries are greater than in the rest of the regions, while they are similar in low-tech manufacturing industries. The compatibility of high-tech and low-tech manufacturing industries was also shown by Robertson and Patel (2007).

In addition, this paper verifies that the wealth of a region is not only related to the agglomerations of high-tech manufacturing industries found in the region, but also to the creative industries found there. Another relationship which has been verified in this paper is the relationship of creative industries and knowledge-intensive services (KIS), which emphasizes their importance in the creation of knowledge and regional development (Windrum and Tomlinson, 1999; Bishop, 2008; Aslesen and Isaksen, 2007a; Strambach, 2008).

Three important conclusions can be inferred from the results obtained in this paper. The first is that creative industries play an important role in the wealth of a region. The second is that the most creative regions are characterized by having more high-tech manufacturing industries than the rest of the regions although the number of low-tech manufacturing industries is similar. Lastly, it has been proved that the industrial structure of a region has a great influence on regional wealth.

The contributions and results found in this work are important for both academia as well as for policymakers. It opens new lines of research for the former in the relationships between industries, as our study goes beyond those carried out on manufacturing and services. Policymakers will find the study of use because the results show the role creative industries play on regional wealth, in addition to demonstrating that the most creative regions have a need for the coexistence of diversified sectors that

simultaneously include high numbers of both high-tech and low-tech manufacturing industries.

Notes

(1) The Amadeus database was also used as a last resort to add to the number of firms in some subsectors where the SBS and REA did not offer coverage.

(2) Several functional forms were tested based on a more general function and taking into account non-linearities in the specification. However, the linear form in levels proved to be the most suitable.

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