Location determinants of creative industries' firms in Spain

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ABSTRACT: This paper examines the determinants of localization of creative industries by using plant-level microdata. The paper proposes a model tailored to differentiate the effect of general-economic and specific-creative forces on the localization of creative industries. The model is applied to the local labour systems of Spain. The results show that traditional external economies (localization and urbanization) affect the location of creative industries in Spain, complemented by the effect of specific creative externalities. The results offer a novel insight into the determinants of location of creative industries. The work thus provides some empirical basis for the design of policies that may boost the capacity of territories for creativity and innovation, in line with the objectives set out by the European Commission.

JEL Classification: R10; R30.

Keywords: creative industries; industrial location; count data models.

Determinantes de la localización de empresas en industrias creativas en España

RESUMEN: Este artículo analiza los determinantes de la localización de las industrias creativas utilizando microdatos de empresas. El artículo propone un modelo adaptado para distinguir el efecto de las fuerzas económicas generales y de las fuerzas específicas creativas sobre la localización de las industrias creativas. El modelo se aplica a los sistemas locales de trabajo de España. Los resultados revelan que las economías externas tradicionales (economías de localización y de urbanización) afectan a la localización de las industrias creativas en España y se complementan con fuerzas específicas creativas. Los resultados aportan una nueva visión sobre los principales determinantes de la localización de las industrias creativas. El estudio constituye así pues una base empírica para el diseño de políticas

destinadas a estimular la capacidad de los territorios para atraer la creatividad y la innovación, según los objetivos definidos por la Comisión Europea.

1. Introduction

Creative industries can be defined as those industries that produce and commercialise creative goods and services. Over the last years, creative industries have become an object of interest for academics and policymakers. Indeed, creative industries have experienced an important economic growth accompanied by important levels of trade and employment. As a consequence, the EU considered these industries as a driving force to reach the goal established in the Lisbon agenda to make Europe «*the most competitive and dynamic knowledge-based economy*».

The main study focusing on the analysis of creative industries in Spain is the one conducted by Boix and Lazzeretti (2012). According to this study, creative industries gave employment to 1,287,000 people in 2007, representing 6.5% of the total national employment. Since then, several other studies analysed this sector quantifying it between 2.8% and 4.1% of the total employment (Méndez *et al.*, 2012; Aguiar Losada, 2014; Ministerio de Cultura, 2014).

Creative industries are characterised by their tendency to concentrate in space (Scott, 2005; Cooke *et al.*, 2007; Florida, 2008; Florida *et al.*, 2008; Cooke and Lazzereti, 2008; Lazzereti *et al.*, 2008; Boix *et al.*, 2012) giving place to more creative intensive locations (Maskell and Lorenzen, 2004; Cooke *et al.*, 2007) such as creative clusters. A creative cluster is defined in the literature as «a place that brings together (a) a community of "creative people" (Florida, 2002) who share the same 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 (d) a thick, open and ever-changing network of interpersonal exchanges that nurture individuals' uniqueness and identity» (De Propris *et al.*, 2009).

Recently there is a growing interest in the study of the factors that explain the clustering pattern of creative industries in Europe. The analysis of firm location has been attracting a growing interest from scholars in recent years. Those analyses have been carried out using a diversity of methodological techniques, data bases and theoretical approaches but they share a wide agreement about the importance of territorial aspects in firm location decisions.

This article explores the main reasons observed in the literature for the clustering of creative industries in Spain. General determinants have been used to explain firm location in the literature (localization and urbanization), however according to Asheim *et al.* (2005), determinants might be different depending on the characteris-

tics of the firm. Traditional approaches such as external economies (localisation and urbanisation economies) have been seen as partial explanatory elements that might explain why creative industries tend to be geographically concentrated (Tschang and Vang, 2008, p. 3; Cooke *et al.*, 2007; Wenting *et al.,* 2011, pp. 1335-1336). A theoretical analysis shows the existence of other determinants that could help to explain the tendency of the creative industries to concentrate in the space. In this line, related variety of activities and people, urban assets and creative class have been observed as factors of attraction of creative industries (Florida, 2005; Sivitanidou, 1999; Van Oort *et al.,* 2003; Lazzeretti *et al.,* 2008; Lorenzen and Frederiksen, 2008).

The aim of this study is to identify the general and the specific- creative forces that are relevant for the localization of creative firms in the Spanish Local Labour Systems (LLS). This decision is based on the idea that governments are interested in encouraging creative industrial growth in particular places. Thus a clear understanding of what factors drive individual creative industries location decisions will be much more relevant for policy making than forces. This will be done on the basis of firm level data and an experimental count data model to carry out an empirical test of the decisions of individual creative firms.

This paper is organized as follows. The second section presents the review of the location determinants literature and the identification of traditional economic and specific creative territorial factors associated to the location of creative firms. The third section presents the model. The fourth section provides evidence on the location of creative industries in the Spanish LLS by using ORBIS database. The fifth section develops the Count Data Model used for the analysis, the econometric estimations and the variables used. The sixth section presents the main results and policy recommendations.

2. The determinants of creative industrial location

Early authors like Marshall (1890) and Hoover (1937), as well as contemporary scholars like Glaeser *et al.* (1992) established the relationship between economic concentration and externalities. In this line, Wenting *et al.* (2011, pp. 1335-1336) point out that the concept of agglomeration economies has been traditionally understood as forces that explain the concentration of traditional manufacture.

Recently researchers have renewed the interest on the understanding of the factors that explain why creative industries, in particular, tend to be geographically concentrated (Hanson, 2000; Tschang and Vang, 2008; Vang, 2005, 2007; Lazzeretti *et al.,* 2008; Lazzeretti *et al.,* 2012). Indeed, there is a need to understand if the multiple types of externalities that contribute to explain the spatial concentration of the economic activity in general can also help to explain the spatial organisation of creative industries in particular (Vang, 2007). Authors such as Tschang and Vang (2008, p. 3) suggest that traditional approaches only provide a partial explanation of the determinants that might affect creative industries. Other authors have incorporated in the

literature other elements that could help to explain the tendency of creative firms to concentrate in the space such as high amenity environments which determine the quality of live workers leaving in this territory.

2.1. Traditional economic forces

The existence of agglomeration economies, which appear from the interaction between productive agents, traditionally have been used to explain the tendency to spatial concentration of firms (Capello, 2004, pp. 42 and 44; Raspe and Van Oort, 2004, p. 18 and 2007, p. 2). Indeed, the concept of «agglomeration economies» is the result of the combination of three conceptualisations. First, Marshall (1890/1963, pp. 222-225) uses two essential elements (natural resources and internal and external economies) to explain the production, which can be interpreted as location factors. Second, Weber (1929/1968, pp. 124-173) introduces the concept of «factors of agglomeration» understood as transport costs advantages, to refer to the elements that cause a dense industrial localization on the territory. And third, Hoover (1937/1971, pp. 90-91) clarifies and extends the concept of «concentration economies» building on Ohlin (1933, p. 203). External economies as a part of the concentration economies are advantages derived from a particular industry or particular place. The companies concentrated in that place are capable of retaining and incorporating these advantages into their production function without any compensation (Camagni, 2005, p. 31).

Cooke (2002, p. 123) points out that agglomeration externalities are also relevant elements to understand current cluster configuration of new economic sectors. Audretsch and Feldman (1996) found that innovative firms, where the creation and exchange of knowledge are essential, tend to cluster spatially, in order to benefit from the external economies (see also Pascal and McCall, 1980; Cooke *et al.*, 2007). In this sense and since these innovation patterns demand clustering, creative industries could be clustered to take advantage of the existence of agglomeration economies (Henderson, 1983, p. 165; Lorenzen and Frederiksen, 2008, p. 175).

Wenting *et al.* (2011, pp. 1335-1336; 2008, pp. 8-9) show that agglomeration forces can also be useful to understand concentration of creative and cultural industries. Indeed, Turok (2003) shows that also the locations of a creative firm close to other specialized firms increase its opportunity to trade and recruit specialised workers, among other advantages. Additionally, Turok (2003, pp. 551-552, 562) underlines that the population and the economic size as well as the density of the economic agents of a territory determine the importance of the benefits that creative firms could gain from their co-location. Hanson (2000) points out that the concentration of an industry in one location ensures access to a wide variety of specialised services. More concretely, he states that the benefits of the agglomeration economies in the process of concentration of an industry will depend on their development stage. According to him, industries in new fields benefit from the exposure to the ideas from many different sources, while more mature firms benefit more from the proximity to firms with similar production process. In this line, Henderson *et al.* (1995, p. 1069) and

Audretsch (1998) point out that industries in more creative and innovative sectors will tend to be located in diversified places, while mature industries tend to be located in places with similar specialisations.

According to Camagni (2009), relational capital refers to the linkages developed among a set of individuals facilitated by an atmosphere composed of trust, shared behavioural models and values. Capello (2001) and Camagni (2008, p. 41) point out that relational capital represents the rules, habits and relationships of individuals which might facilitate collective learning and knowledge creation. Indeed, better mutual understanding among individuals might reduce transaction cost of knowledge. Reciprocal trust might facilitate collective learning which is defined as a dynamic and cumulative process of knowledge production, transfer and retention. Additionally, Bourdieu (1960) defines social capital as the set of actual or potential resources related to a long lasting network or relationships among a set of individuals. In this sense, the presence of public or semi-public spaces such as bars, restaurants can help people to meet (Murphy and Redmond, 2009, p. 73) and thus to facilitate social interactions.

2.2. Specified-creative forces

Some studies claim that the conditions that explain the spatial concentration of economic activity do not affect in the same way all industries. As it is underlined by Lorenzen and Frederiksen (2008, p. 162), creative industries contain innovation patterns (such as variety, novelty and radical innovation) in their production process that could explain why cultural industries cluster in particular places. Asheim *et al.* (2005) claim that the location of creative industries will be determined by different factors on the basis of their innovation process. In this line, creative industries such as media, advertising, design and fashion with a *symbolic knowledge* base, are mainly based on tacit knowledge. These industries are characterised as project-based industries and this knowledge is normally linked to the habits and norms learned in specific communities and which are exchanged mainly through informal interpersonal interaction in the professional community (face-to-face).

a) Creative heritage and creative amenities

Several authors from the economic geographic literature showed that creative firms will prefer to be located in high amenity environments because it is in these places where creative people prefer to live (Sivitanidou, 1999, p. 25; Van Oort *et al.,* 2003, p. 521). According to Turok (2003, p. 562) these amenities are important elements to attract and retain highly skilled workers, which tend to be extremely mobile. Residential or worker amenities are exogenous goods or services that could increase the attractiveness, value or comfort of a specific place. Sovotanidou (1999, p. 9) divides the amenities into two categories. Firstly, productive amenities are those local traits that directly contribute to the reduction of the costs or to the increase of the benefits of a firm. Sivitanidou (1999, p. 9) includes in this category good access

to clients, specialised labour, specialised firms, universities, transportation nodes and networks (airports, freeways, train stations). Secondly, non-productive amenities are these attributes that affect residents and workers utilities, and that indirectly contribute to the firm objectives of maximising profits or minimising costs. This kind of amenities include good access to urban amenities such as restaurants, cafes, shops; good access to residential environments such as low-crime neighbourhoods, high quality houses, cultural and entertainment amenities (theatres, museums, cinemas, music and sport clubs), arts and heritage (historic places, buildings, monuments, paintings and artefacts) and good environmental quality (number of green spaces such as parks or natural areas or levels of pollution) (Sivitanidou, 1999, p. 9; Van Oort *et al.,* 2003, p. 516; Viladecans, 2002, p. 9).

Lazzeretti *et al.* (2012, p. 1244) exposes how cultural heritage might influence the creation of creative industries. Indeed, artistic, cultural and historic environments can influence creativity of people living in these places. Additionally, the presence of these amenities might promote cultural activities such as conservation. These authors also underline that the presence of cultural heritage in a territory might be influenced by the historic political role of these places (such as capital region).

In this line, Markusen *et al.* (1986) and DeVol (1999) highlight the impact of quality of life on the spatial distribution of innovative firms. Indeed, places with accessible natural environments can facilitate the attractiveness of certain places to creative firms and employees. Additionally, the presence of people working in creative occupations can attract other kinds of talent and creative firms (Clifton and Cooke, 2007, p. 23).

b) Related variety in creative industries

According to Boschma and Iammarino (2009), related variety is understood as industrial sectors that are characterized by complementary competences. The concentration of these elements in the same place could facilitate the generation of a dense and varied network of agents that foster economic and social collaboration, enhancing knowledge transfer through cross-fertilisation mechanisms and promoting innovation (Lazzeretti *et al.*, 2008; Lorenzen and Frederiksen, 2008, p. 171). It is important to note that, some authors have shown that the access to a diversified pool of firms will not have the same effect as a pool of diversified related firms and industries (Porter, 2000, p. 259). According to Lazzeretti *et al.* (2012, p. 1246) related variety promotes creativity due to transversely and spillover processes of innovation in other sectors.

c) 3 Ts (Florida)

Assmo (2010, p. 314) shows that creative actors are determinant for the development of new creative and cultural firms and products. In this line, Florida (2002), uses the concept of creative class as a source of entrepreneurship and economic growth. The difference between human capital and the creative class theory is that in the former case people need to have high education levels in order to provide added value to

their activity, while in the latter people do not necessary need to have high education level but just certain abilities acquired over their professional working life. According to Florida, the geography of creativity depends on the ability of places to attract, retain and generate creative individuals. This ability will be determined by the theory of the 3Ts (Florida, 2002; 2005): (a) the number of innovations developed and the number of high tech activities concentrated (technology); (b) the concentration of talented workers (talent); (c) the level of openness, diversity and opportunity to work (tolerance), also highlighted by Saxenian (1994), Bounken (2009, p. 189) and EIS (2008, p. 11). By extension, creativity will be the source of new innovations as well as a factor of attraction of creative industries (Florida, 2005; Lazzeretti *et al.*, 2008).

3. Model

Ellison and Glaeser (1997, p. 892) suggest a location model based in the existence of natural advantages and externalities or inter-firm spillovers inside the same industry. This model assumes an industry divided in *N* business units, which choose in a consecutive way their location among the M areas in which the territory is divided. In this case, and to make the model tractable, the authors take only one company to expose the model. Thus, the *k*th business will maximize its profits through their decision to locate v_k inside the area *i*, by the following function:

$$\log \pi_{ki} = \log \overline{\pi_i} + g_i(v_1,...,v_{k-1}) + \varepsilon_{ki} \qquad (1)$$

where $\overline{\pi_i}$ is a random variable reflecting the probability of locating in area *i* (as influenced by observed and unobserved area characteristics), v_j is the location of the business *j*, while is ε_{ki} the random component.

Equation (1) shows that the profits derived from the location of a business are related with two elements. First of all, they are related to an average measure of the territory profitability (*general-economic factors*), while secondly, to a random variable that collects idiosyncratic elements of the industry (*specific-creative forces*). The authors suggest a simple parametric specification of this model.

$$\log \pi_{ki} = \log(\pi_i) + \sum_{l \neq k} e_{kl}(1 - u_{li})(-\infty) + \varepsilon_{ki} \qquad (2)$$

Where e_{kl} is the Bernouilli random variable equal to one with probability γ_0 that indicate whether a potential valuable spillover exists between each pair of plants, and u_{li} is an indicator for whether plant *l* is located in area *i* ($v_l = i$), and ε_{ki} again, is a random component independent from e_{kl}.

Discrete choice models are used to analyse the location from the perspective of the firm. Researches done following these models are particularly focused on the individual elements of firms as determinants of the location of each firm, such us dimension of the firm or the sector to which the firm belongs (Manjón and Arauzo-Carod, 2006). However, one of the main drawbacks of this empirical approximation

is the difficulty to calculate the likelihood function when there are so many location alternatives, which is so common at a local level (Arauzo-Carod, 2007, pp. 4-5).

According to Guimarães *et al.* (2003), a possible solution could be to apply Count Data Models which allow to use large data sets (the number of alternatives in a Conditional Logit Model equals the number of observations in a Count Data Model). Thus the increment of alternative locations when analysing the phenomenon at a local level is not a major problem using a Count Data Model. Moreover, null observations (territorial units that do not locate any industry over the period analysed) do not imply modelisation problems in Count Data Models (unlike Conditional Logit Models).

The count models allow to analyse then the localization of creative industries from the geographical space chosen (municipality, region or non administrative territory). The characteristics of the territory analysed (differentiating among general-economic and specific creative forces) will affect the probability to be chosen as the location of a company. Since this paper aims at providing evidence of the determinants of location of creative firms in the LLSs in Spain from a territorial perspective a count model will be used.

a)   Poisson model

Figure 1 displays the histogram of the frequency of the dependent variable (location of creative firms in the Spanish LLSs). As it is also observed in the industrial location literature (Arauzo-Carod *et al.,* 2010, pp. 692-696), the distribution of creative industries in Spain appears to be highly skewed. Indeed, there are many LLS which have few or no creative industries. Such industry distribution has to be properly taken into account in the model's specification and estimation. Given this fact an OLS regression would be inappropriate. Count data often follow a poisson distribution, thus some type of poisson analysis might be appropriate.

Figure 1.   Frequency of the number of firms in creative industries by local labour system in 2009
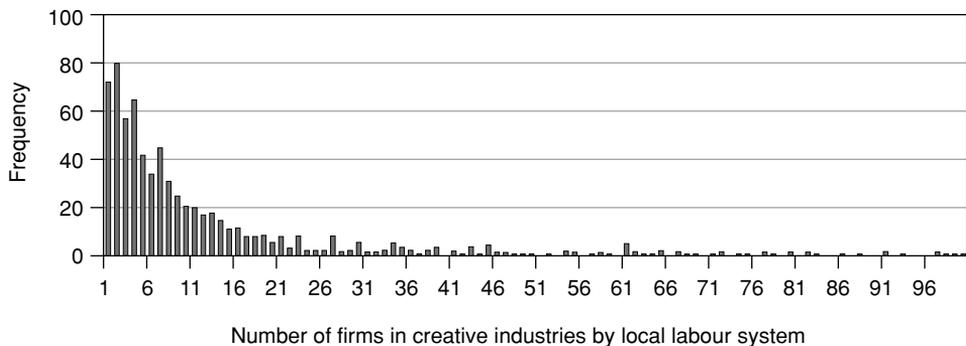
Note: The number of firms in creative industries by local labour system (horizontal axis) has been reduced for a better display of the data.
Source: Own calculations based on ORBIS data.

The most popular specification of Count Data Models is probably the Poisson model. Poisson models are used when the dependent variable is a count variable (such as the number of creative industries localized in a LLS)[1]. This model assumes that the probability of observing a count location y_{ij} (an industry i (such as creative industry) in territorial unit j (such as municipality or LLS in Spain) can be written as a function of specific location characteristics of the territory that affect firms' spatial profit function.

$$Prob(y_{ij}) = f_i(x_j) \qquad (3)$$

where x_j denotes the vector of location characteristics that affect the profit functions of firms and act as a location determinant.

Mathematically, if y_{ij} is the realisation of the aleatory variable based in a Poisson with a parameter μ_{ij} (ratio of occurrence of event of interest), given a vector of explanatory variables x_j, the density function of y_{ij}, will have the following form:

$$Prob(y_{ij} = 0, 1, 2, ... \mid x_j) = \frac{e^{-\mu_{ij}}\mu_{ij}^{y_{ij}}}{y_{ij}!} \qquad (4)$$

In which the most common representation of the conditional mean μ_{ij} is:

$$E\left[y_{ij} \mid x_j\right] = \mu_{ij} = \exp(\beta' x_j) \qquad (5)$$

Where β is the parameter vector to be estimated and x_j is a vector of municipality attributes that affect profit functions of firms.

b)   Negative Binomial Model

The Poisson regression models are the common starting point for count data analysis. However, count data might exhibit some futures that might violate some of the Poisson assumptions. The use of Poisson regression in the presence of any of these futures (ex. overdisperion or excess of zeros) may lead to a poor fit, loss of efficiency and incorrect reported standard errors.

The first assumption is generally called «equidispersion», which implies that the mean and the variance should be equal. However, unobserved heterogeneity might lead to overdispersion due to the failure of the assumption of independence of events which is implicit in the Poisson Model. In this line, Arauzo-Carod (2007, p. 199) points out that industrial location generally violates this assumption, due to the large concentration of certain firms in few locations. Indeed, as it can be observed in Table 1, the distribution of creative industries location in Spanish LLSs is displaying a

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[1] Given that count models show how many times a location (LLS) has been chosen by a creative firm, the LLSs with no creative firms are relevant for the analysis. Indeed independent variables in these locations will explain why these territories have not been chosen by any creative industry.

greater variance than the mean (variance nearly 3,000 times larger than the mean). This problem can be addressed by the Negative Binomial Models (NBM) given the fact that it includes a dispersion parameter to accommodate the heterogeneity of the count data.

Table 1. Descriptive statistics: Dependent variable

Dependent variable	Mean	Standard deviation	Min.	Max.	% of zeros
# creative industries	55.68	437.11	0	10,651	8.93%

Source: Own calculations based on ORBIS data.

The second assumption refers to the «excess of zeros» problem. Poisson Models can deal with situations where the dependent variable is characterized by a large number of observations whose value is zero. However, some adjustments need to be done in the model when this number is excessive. Table 1 also shows the % of LLSs where a zero number of creative firms has been identified. Indeed, 72 out of 806 LLS in Spain do not concentrate any creative industry (9% of the Spanish LLSs). Thus, these results suggest that there is no need to use other Count data model such as Zero-Inflated Poisson Model (ZIPM) or Zero-Inflated Negative Binomial (ZINB) given the fact that both, Poisson Model and Negative Binomial Models can deal with situations where the dependent variable exhibit few zero observations.

4. Location of creative industries in the Spanish Local Labour Systems: territorial units and data

4.1. Territorial level of analysis: Local Labour Systems

The Spanish territory is mainly organised in four administrative levels (NUTS 1 or major socio-economic regions, NUTS 2 or basic regions, NUTS 3 as small regions or provinces and local administrative units (LAU) defined as municipalities. These administrative levels do not capture neither the economic nor the social interaction area.

NUTS 2 were used by Power and Niélsen (2010) to provide a first evidence of the clusters of creative industries in Europe. However, as it becomes evident from the mapping, these units are excessively large to capture the real processes of clustering and give only a preliminary idea of the concentration. In fact, as pointed out by Lazzeroni (2010), the regional and provincial scale would seem too broad and diversified to represent the real economic area while, the municipality level does not capture all the spillovers that occur in a creative cluster since its spillovers usually extend to neighboring municipalities.

Local functional units such as the Local Labour Systems (LLS) have the advantage over the administrative boundaries to better portray current social and economic conditions, because their boundaries are made according to commuting data (such as commuting flows from home to work). For that reason, several researchers have used these territorial units in their location analysis. Indeed, Overman and Puga (2010) use TTWA (Travel To Work Areas) to analyse the manufacture establishment location in the UK. Similarly, Lazzeretti *et al.* (2008) and Boix *et al.* (2012) use labour markets (or systems) (LLS)[2] as the territorial unit for the study of the processes of creative clustering in Europe.

4.2. Data source and quality

A growing number of researchers have used Bureau van Dijk's firm-level dataset in recent years to analyse spatial location of economic activities, including international studies such as Abramovsky *et al.* (2008) or Boix *et al.* (2015).

Based on the international classifications of creative industries used in the literature, a common list of 14 creative sectors is used in this study. In order to make it operationalised, a list of NACE sectors 4 has been provided in Table 2.

Table 2.   Creative industries (NACE rev. 1.1)

Fashion			Publishing & printing	
1771	Manufacture of knitted and crocheted hosiery		2211	Publishing of books
1772	Manufacture of knitted and crocheted pullovers, cardigans and similar articles		2212	Publishing of newspapers
1810	Manufacture of leather clothes		2213	Publishing of journals and periodicals
1821	Manufacture of workwear		2214	Publishing of sound recordings
1822	Manufacture of other outerwear		2215	Other publishing
1823	Manufacture of underwear		2221	Printing of newspapers
1824	Manufacture of other wearing apparel and accessories n.e.c.		2222	Printing n.e.c.
1830	Dressing and dyeing of fur; manufacture of articles of fur		2223	Bookbinding
1930	Manufacture of footwear		2224	Pre-press activities
			2225	Ancillary activities related to printing

[2] Boix and Galletto (2006), following the Sforzi-ISTAT (1997) methodology identified 806 Local Labour Systems in Spain.

Table 2. *(cont.)*

Film, video and music			Crafts	
2232	Reproduction of video recording		3621	Striking of coins
2233	Reproduction of computer media		3622	Manufacture of jewellery and related articles n.e.c.
9211	Motion picture and video production		3630	Manufacture of musical instruments
9212	Motion picture and video distribution		3650	Manufacture of games and toys
9213	Motion picture projection			
2231	Reproduction of sound recording			
Software			R&D	
7221	Publishing of software		7310	Research and experimental development on natural sciences and engineering
7222	Other software consultancy and supply		7320	Research and experimental development on social sciences and humanities
7260	Other computer related activities			
Architecture			Photography	
7420	Architectural and engineering activities and related technical consultancy		7481	Photographic activities
Advertising			Broadcasting	
7440	Advertising		9220	Radio and television activities
Heritage			Performing arts	
9251	Library and archives activities		9231	Artistic and literary creation and interpretation
9252	Museums activities and preservation of historical sites and buildings		9232	Operation of arts facilities
9253	Botanical and zoological gardens and nature reserves activities		9233	Fair and amusement park activities
			9234	Other entertainment activities n.e.c.

Source: Based on UNCTAD (2008) and Boix *et al.* (2012) and Boix and Lazzeretti (2012).

The territorial distribution of creative economic activities in Spain is obtained from the information provided by the ORBIS database, provided by Bureau van Dijk[3]. Among all information provided (financial and other operational information), the ORBIS database provides the spatial coordinates of around 852,330 economic activities of all productive sectors in Spain in 2009. Among these, 64,628 creative industries were identified in Spain Figure 2 presents the creative industries identified in Madrid.

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[3] For further more information about this database, please see:
http://www.bvdinfo.com/en-gb/our-products/company-information/international-products/orbis.

Figure 2. An example: the location of creative industries in Madrid (city)

Source: Based on ORBIS data.

As it is underlined by Boix *et al.* (2015) there is a source of bias concerning the use of Bureau van Dijk's database that needs to be mentioned. In relation to the use of firm level data as a proxy of local units (establishments) data, the magnitude of the bias between the real number of establishments and the establishments provided by the database is related to the presence of multi-plants firms and the geographical scale of the territorial unit of analysis. However, given that ORBIS relies on country level national sources, this bias is assumed to be limited.

In this research, the use of ORBIS is justified obtaining territorial administrative data disaggregated by creative industrial sectors and homogeneous across countries is a difficult task. As has been also observed in Driffield and Menghinello (2010, p. 4) data provided by official statistics normally present significant confidentiality and data quality constraints. The coverage of firm-level data in EU countries in ORBIS database allows to overcome these limitations. Secondly, individual-firm data (size,..) will also be used in latter stages of the analysis. Despite its limitations, ORBIS can be considered one of the few sources that contain this kind of data.

Concentration of creative industries in Spain

Creative industries' firms have been aggregated for each of the 806 LLSs in Spain. Figure 3 shows that most of these plants are concentrated around the LLSs of Madrid, Barcelona and Valencia highlighting a strong spatial concentration of creative industries in the space. In fact, in 2009, Madrid LLS concentrates more than

24% of the firms in creative industries in Spain, Barcelona the 13%, and Valencia the 4%. This is in the line of the results obtained by Lazzeretti *et al.* (2008) and Boix *et al.* (2012) using jobs from Census data.

Figure 3.   Number of creative industries by LLS in Spain (2009)
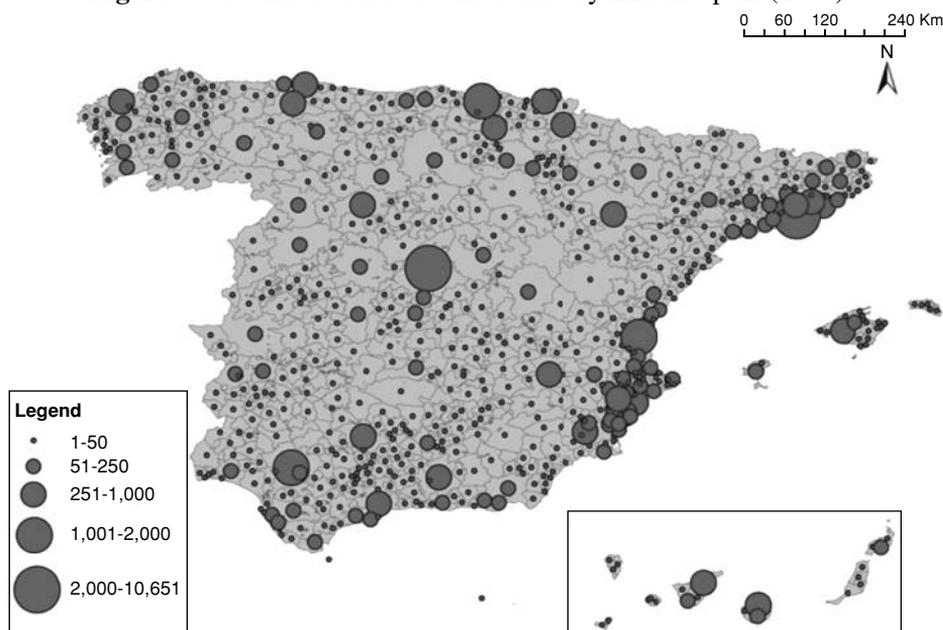
Source: Own calculations based on ORBIS and Spanish LLS from Boix and Galletto (2006).

4.3. Variables

The data used in this paper refer to Spain. The data include one dataset which account the location of creative industries (dependent variable) and another dataset about the territorial characteristics of LLS in Spain (independent variable).

Econometric studies normally analyse the effect of the explanatory variables on the dependent variable. However there is the possibility that the dependent variable has simultaneously an effect on the explanatory variables (Kennedy, 2003, p. 401). In order to avoid the simultaneous causation bias the dependent variable has been computed at time *t*, whilst all explanatory variables in the model are defined at time $t - 1$. The use of explicative variables established in the initial year of the period reduces in a logic way the problem.

Following the literature, traditional external economies are usually divided in two categories (Hoover, 1937), localisation economies and urbanisation economies. Based on Marshall (1890, p. 222), the localisation economies have been addressed by

several indicators which approximate the advantages derived from the concentration in a particular location of structure and organization of the industry, qualified workers and specialised suppliers (that belong to the same industry or sector of production). Regarding urbanization economies, it has been used traditional proxies to measure the advantages derived from the urban environment factors or characteristics to all the economic activities that are located into it, such as the Ohlin-Hoover's potential size of the local market, the economic density (Hoover and Vernon, 1959; Ciccone and Hall, 1996, p. 54), the economic diversity of the productive structure of the LLSs (Chinitz, 1961, pp. 281-282; Jacobs, 1961 and 1969), as well as the relational and social capital.

Table 3.   Traditional location determinants

Organization of the industry	$Organisatiton = (F\ withup\ to\ 50\ workers_{ij}/F_j) \times 100$
Qualified workers	$Q_{ij} = (QL_{ij}/L_{ij}) \times 100$
Specialized suppliers	$SpecializedSupp_{ij} = 1 \Big/ \sum_{i,j}\left[(L_{i,j}/L_{ij})^2\right]$
Knowledge and information spillovers	$KnowledgeSpill_{ij} = (L_{ij}/L_i)\big/(L_j/L)$
Potential size	$Size_j = Total\ population_j\big/1000$
Economic density	$EMPD_j = Lj\big/U_j$
Economic diversity	$DIV_{ij}\Big/\sum_j\left[(L_{ij}/L_j)^2\right]$
Relational capital	$Relational\ capital_j = \left(\dfrac{VN_j}{RP_j} - \dfrac{VM_j}{RP_j}\right) \times -1$
Social capital	$SK_j = (L_j/Total\ population_j) \times 100$

Notes: L is the employment (Jobs), *QL* is the qualified employment (university graduates), *U* is the urbanized land (MODIS DATABASE, 2008), *VN* refers to voters in the national elections and *VM* voters in the municipal elections, *RP* refers to registered population and *F* is the number of firms, *i* is the creative industry and *j* is the *LLS*. Employment and number of firms refer to the census year (2001).

Specific creative forces have been approximated by a set of indicators aimed at measuring the four components previously developed. **Creative heritage and creative amenities** of the LLSs have been approximated by three variables, heritage, political power and access to green spaces. The **related variety** has been measured using the three-digit level entropy index proposed by Boschma and Iammarino (2009). This indicator consists of an entropy index defined at different levels of sectorial aggregations. As it is observed in Lazzeretti *et al.* (2012), the value of the entropy index increases when a higher diversity exist in the LLS. The effects of talent have been measured using **Florida's 3Ts approach** (technology, talent and tolerance).

Table 4. Specific location determinants

Heritage	$\text{Heritage}_j = \big((\text{Art}_j + \text{Build}_j + CH_j)/\text{Population}_j\big) \times 10,000$
Political power	1 = capital region
Green	$\text{Green}_j = (\text{Forest}_j + \text{Vegetation}_j + \text{Ice and Snow}_j)/\text{Population}_j$
Related variety	$RELEVAR = \sum_{g=1}^{G} P_g H_g$
Technology	$TP_j = (PAT_j/L_j) \times 10,000$
Talent	$CC_j = (C_j/L_j) \times 100$
Tolerance	$TO_j = (FB_j/L_j) \times 100$

Notes: Local street art (Art) is provided by a worldwide graffiti website (*www.fatcap.com*). Representative buildings (Build) are provided by a worldwide buildings database (*www.skyscraperpage.com*). Protected cultural heritage (CH) goods (monuments, gardens, historic and arqueological places) are obtained from the UNESCO World heritage website and Ministry of Culture of Spain Green area (km²) is derived from MODIS DATABASE (2008). $P_g = \sum_{i \in S_s} p_i$ is the aggregation from three digits to two digits sector of the share of each industry employment (year 2001) on the total employment (year 2001) and $H_g = \sum_{i \in S_s} \frac{p_i}{P_g} \log_2 \left(\frac{1}{p_i/P_s} \right)$. *PAT* stands for average total patents (1991-2004) from the OECD Regpat database (2011), *C* refers to the creative occupations or the creative class and *FB* stands for foreign born workers. Employment (*L*) and population refers to the census year (2001).

5.   Econometric analysis

The results of the econometric estimations are presented in Table 5 and 6. Negative binomial regressions have been used in this paper for the analysis of the determinants of concentration of creative firms in Spanish LLSs. As it has been observed in the previous section, negative binomial regressions are considered as a generalization of Poisson regressions (since both have the same structure) but it contains an extra parameter to model the overdispersion of the data (situation where the conditional variance exceeds the conditional mean).

The analysis started by estimating two separate regressions (Table 5 and 6) in order to test separately the contribution of different levels of independent variables to the location of creative industries. Indeed, Table 5 presents the results of the general externalities (those that might affect the whole economic sectors) which also might have an impact on the location of the creative industries. While Table 6 present the results of the variables that are more specific to explain the location of these creative industries. For each model, two statistical tests are indicating the good fit of the negative binomial model to the data vs. the Poisson Model. Indeed, both the Wald test (represented by Alpha) and the likelihood ration test allow the rejection of the null hypothesis that alpha equals zero (which is the case of Poisson regressions).

Both tables are presenting results for the independent variables in partial and full models. In general terms it is worthy to say that these results are significantly consistent showing a strong capacity of explanation of the findings. Combination of

both tables into one single full model was not provided due to multiple collinearity problems between explanatory variables (see correlations between dependent and independent variables in Table 7).

Localisation economies (General variables):

As expected, localisation economies have a positive and significant effect to the number of creative industries located in Spanish LLSs (with the exception of creative industrial mix). Indeed, the share of qualified jobs in creative industries in LLS has a statistically significant coefficient 0.36 in the partial regression. This means that for each one-unit increase of the share of qualified jobs in creative industries, the expected log count of the number of creative industries located in the LLS increases by 0.36 (see Model 1). When other general variables are included to the model (urbanization and social variables) this variable maintains its positive sign but it reduces its statistical significance. The result of the creative filière shows a positive and statistically significant coefficient of 0.34 (see Model 1). This result goes in line with the theoretical part of this article since a higher homogeneous composition of the creative industry means a higher share of local suppliers. Contrary to the previous localization economy indicator (share of qualified jobs) when other variables are introduced the sign and statistical significant of this indicator remain remarkably consistent. Similarly, the creative industry location quotient also presents a positive and statistically significant coefficient of 0.70 (Model 1) which also remains statistically significant when other relevant variables are included in the model (Full partial model table 5). These results suggest the importance of information spillovers generated inside the creative industry cluster to explain the location of those firms in LLS.

Social and relational capital (General variables):

As expected, the presence in the LLS of people involved in the local society (computed by the differential of population who participate at the national elections with respect to the local elections) is positive (0.16, see Model 3) and strongly significant. This coefficient shows how in a territory where there is more involvement of people on local society (higher than the involvement on national society) there is a positive impact on the presence of creative industries in the LLS. In the same line, the social capital indicator computed as the density of jobs by population also provides a positive and statistical significant coefficient of 0.14 (see Model 3).

Urbanisation economies (General variables):

The results show the low impact on the presence of local creative industries in LLS by the population size and the labour density variables. Contrary to these results,

the diversity of sectors of different industries shows a positive and statistical significant indicator (0.09, see Model 2). This means that for each one-unit increase on the diversity of the LLS, the expected log count of the number of creative industries in the LLS increases by 0.09 (in line with Chinitz and Jacobs theory). Results on the urbanization economies remain stable when other external economies (such as social capital or localization economies) are included (see Full partial model of general economic forces).

Creative heritage, creative amenities and related variety in creative industries (Specific creative variables):

From the theoretical section of this paper it could be expected that the presence of local street art, representative buildings and cultural heritage in the LLS might have an impact on the number of creative industries located in LLSs. However, as it has been also observed by Lazzaretti *et al.* (2012), this indicator is negative, which is mainly explained by the high dispersion of cultural and artistically goods over the territory. However, the presence of a capital region in the LLS has a positive and statistically significant impact on the presence of creative industries located in the territory (see Model 4 and 5). These results are also stable when other specific creative variables are introduced in the model (see Full partial model of specific-creative forces).

The related variety in creative industries indicator is provides also a positive and statistical significant coefficient (similarly to what it has been observed in Lazzeretti *et al.,* 2012).

Florida's 3 T's (Specific creative variables):

Regarding variables that approach the Florida's 3T's (Technology, Talent and Tolerance) we observe the positive and statistical significance of the three coefficients related to these variables. Indeed, the presence of creative class jobs in the LLS is the main element among the three to explain the location of creative firms in the territory (see Model 6). This is followed by the technology intensity, or knowledge spillovers. Finally, the presence of foreign born people and thus the level of openness of the society to new ideas and cultures is also positive and statistically significant. These results are particularly robust since these variables provide similar coefficients when other specific creative variables where included in the model.

6. Conclusions

The main purpose of this paper was to contribute to the broad topic of geographical concentration of creative industries. Departing from theoretical and empirical

literature on localization of creative industries, this paper provides and explanatory approach of the location determinants of creative industries in Spanish LLSs.

One of the main contributions of this paper is the use of micro-level data on creative industries to identify the location of creative firms in Spanish LLSs. Findings show a high concentration of creative industries around capital cities such as the LLSs of Madrid, Barcelona, Valencia, Sevilla, Bilbao or Zaragoza highlighting a strong spatial concentration of creative industries in the space. Indeed, the top-5 LLS account for almost 50% of the national creative industries.

Another contribution of this paper is the construction of an explanatory economic model (count regression model) to investigate the distinct characteristics that bring a certain LLS to have more creative industries located in its territory. Additionally to the traditional approaches of externalities (urbanisation, localisation, social and relational capital) this research also observes that more tailored creative externalities (heritage, related variety and Florida's 3Ts) also affect the location of firms as well as creative firms. Econometric models suggest that the location of creative industries in Spanish LLSs is derived from different general and creative specific determinants (similarly suggested by Lazzaretti *et al.,* 2012). On the one hand, regarding the general determinants, it has been observed how variables capturing the urbanisation economies provide a better explanation of the location of creative industries than the presence of localisation economies or social capital. On the other hand, the variables capturing the territorial resources variables seem to offer a more powerful explanation of creative industries among the creative specific externalities (specially the related variety or the access to political power).

Policy implications of this research based on the findings are of significant importance for regional and local policy makers in Spain. It is important to understand that, the new EU initiative called Europe 2020 strategy (smart, green and inclusive growth) aims at boosting the growth of national economies and jobs by supporting a diversified, strong and competitive industrial base in Europe. At the same time, several studies have recently provided sound evidence on the contribution of creative industries to local and regional development in EU (De Miguel *et al.*, 2012; Rausell *et al.,* 2012; the European Competitive Report 2010). Indeed, the European Competitive Report (2010) underlines that those creative industries can be considered important innovators as well as important drivers of innovation to other sectors of the economy. It is for this reason that regional policy makers need sound evidence on the factors that might attract creative industries. Indicators of such factors can indeed be integrated into concrete policy frameworks.

Future research in this area should address the specific location and the location determinants of firms in creative industries by creative sub-sector, such as manufacture and services. Indeed, these sub-sectors may reveal specific behaviours that may remain hidden in the analysis of creative industries altogether and that should nevertheless be taken into account in the design of regional policies.

Table 5. Negative Binomial Regression: General agglomeration results

Variable	Model 1 (General variables)	Model 2 (General variables)	Model 3 (General variables)	Full partial model (General-economic forces)
	LOCALIZATION	URBANIZATION	SOCIAL/RELATIONAL CAPITAL	
	Coefficient (Std. Err)	Coefficient (Std. Err)	Coefficient (Std. Err)	Coefficient (Std. Err)
Constant	53.1420*** (9.1794)	1.3491*** (0.1364)	-2.3646*** (0.3232)	12.4238** (5.7856)
Organization	-0.5422*** (0.0914)			-0.1512*** (0.0571)
Qualified workers	0.3622*** (0.0239)			0.0460 (0.0283)
Specialized suppliers	0.3387*** (0.0400)			0.2164*** (0.0344)
Knowledge spillovers	0.6959** (0.2257)			0.5740** (0.1888)
Relational capital			0.1611*** (0.0068)	-0.0867*** (0.0074)
Social capital			0.1449*** (0.0101)	0.0686*** (0.0072)
Size		0.0093*** (0.0007)		0.0040*** (0.0006)
Economic density		-0.0000 (0.0000)		-0.0000 (0.0000)
Economic diversity		0.0940*** (0.0110)		0.0685*** (0.0129)
Alpha	1.46*** (0.0713)	1.33*** (0.0665)	1.74*** (0.0831)	0.97*** (0.0524)
Pseudo R2	0.12	0.13	0.09	0.16
Log Likelihood	-3090.33	-3052.35	-3176.93	-2928.50
LR chi2	820.82 (LR χ^2(4))	896.77 (LR χ^2(3))	647.61 (LR χ^2(2))	1144.48 (LR χ^2(9))
Likelihood-ratio test of alpha=0	52000***	41000***	83000***	22000***
Sample size	806	806	806	806

Note 1: The dependent variable is the absolute number of creative industries by LLS (source ORBIS). Note 2: Parameters should be interpreted as log of the ratio of expected counts. In this case, the count refers to the «rate» of creative firms per LLS. Note 3: Negative binomial regression does not have an equivalent to the R-squared measure found in OLS regression (the proportion of variance for the response variable explained by the predictors). Due to that, it is recommended to interpret this statistic with caution. For a discussion of various pseudo-R-squares, see Long and Freese (2006). Asterisks represent *p*-values: $p < 0.10$ (*), $p < 0.05$ (**), $p < 0.01$ (***). Standard errors in parentheses.

Table 6. Negative Binomial Regression: Specific creative forces results

Variable	Model 4 (specific-creative forces) TERRITORIAL RESOURCES/ RELATED VARIETY Coefficient (Std. Err)	Model 5 (specific-creative forces) TERRITORIAL RESOURCES/ RELATED VARIETY Coefficient (Std. Err)	Model 6 (specific-creative forces) 3Ts FLORIDA Coefficient (Std. Err)	Full partial model (specific-creative forces) Coefficient (Std. Err)
Constant	2.8078 *** (0.0625)	2.4880 *** (0.0598)	-1.7105 *** (0.1643)	0.4527 ** (0.1923)
Heritage		-0.0051 *** (0.0018)		-0.0051 *** (0.0018)
Political power (dummy)	1.2289 *** (0.1914)	1.0520 *** (0.2052)		0.8358 *** (0.1910)
Green	-0.0143 *** (0.0000)			-0.0130 *** (0.0012)
Related variety	4.1348 *** (0.4901)	5.5474 *** (0.5726)		2.0354 *** (0.3940)
Technology			0.1551 *** (0.0298)	0.0690 *** (0.0189)
Talent			0.1987 *** (0.0078)	0.1039 *** (0.0096)
Tolerance			0.0265 *** (0.0048)	0.0162 *** (0.0037)
Alpha	1.31 *** (0.0660)	1.50 *** (0.0660)	1.57 *** (0.0929)	1.08 *** (0.0567)
Pseudo R2	0.13	0.11	0.11	0.15
Log Likelihood	–3047.59	–3104.09	–3122.48	–2968.49
LR chi2	906.29 (LR χ^2 (3))	793.28 (LR χ^2 (3))	756.51 (LR χ^2 (3))	1064.49 (LR χ^2 (7))
Likelihood-ratio test of alpha=0	29000***	35000***	77000***	21000***
Sample size	806	806	806	806

Note 1: The dependent variable is the absolute number of creative industries by LLS (source ORBIS). Note 2: Parameters should be interpreted as log of the ratio of expected counts. In this case, the count refers to the «rate» of creative firms per LLS. Note 3: Negative binomial regression does not have an equivalent to the R-squared measure found in OLS regression (the proportion of variance for the response variable explained by the predictors). Due to that, it is recommended to interpret this statistic with caution. For a discussion of various pseudo-R-squares, see Long and Freese (2006). Asterisks represent *p*-values: $p < 0.10$ (*), $p < 0.05$ (**), $p < 0.01$ (***). Standard errors in parentheses.

Table 7. Correlations table between the dependent and the independent variables

	Organization	Specialised suppliers	Knowledge spillovers	Size	Economic density	Economic diversity	Related variety	Heritage	Relational capital	Social capital	Qualified workers	Talent	Technology	Tolerance	Green
Organization	1														
Specialised suppliers	-0.12	1													
Knowledge spillovers	-0.05	0.08	1												
Size	-0.09	0.18	0	1											
Economic density	-0.11	0.02	-0.09	0.05	1										
Economic diversity	-0.19	0.32	0.18	0.26	-0.07	1									
Related variety	-0.08	0.15	0	0.99	0.05	0.25	1								
Heritage	-0.07	0	0.23	-0.06	-0.03	0.02	-0.05	1							
Relational capital	0.04	0.12	-0.08	0.25	0.03	0.18	0.22	-0.21	1						
Social capital	-0.27	0.16	0.04	0.11	-0.01	0.22	0.12	0.14	-0.11	1					
Qualified workers	-0.20	0.30	-0.06	0.52	0.02	0.61	0.52	0	0.20	0.29	1				
Talent	-0.19	0.37	0.37	0.30	-0.05	0.67	0.28	0.11	0.24	0.11	0.63	1			
Technology	-0.08	-0.04	0.04	0.06	-0.03	0.18	0.07	-0.03	0	0.26	0.15	0	1		
Tolerance	-0.09	0.17	0.33	0.03	-0.12	-0.04	0.02	0.10	-0.09	0.21	-0.06	0.09	0	1	
Green	0.11	-0.24	0.10	-0.11	0.07	-0.10	-0.10	0.21	-0.20	-0.20	-0.12	-0.04	-0.10	-0.14	1

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