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Creativity and entrepreneurship: Empirical evidence
for Catalonia

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Creativity and entrepreneurship: Empirical evidence for Catalonia

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Abstract:

In recent years creativity has gained importance because of its potential to generate economic growth based on their role in the innovation processes and economic development. In this regard, this work is twofold. First, it addresses the mechanisms through which creativity promotes knowledge externalities and innovation contributing to regional economic growth and competitiveness. And second, it aims to analyse the role of creativity, diversity and innovation on entrepreneurship at a municipality level for Catalonia. To conduct this analysis, information provided by the Register of Industrial Establishments of Catalonia (REIC) – a register that includes the creation of new establishments located in Catalonia between 2002 and 2007 – , and by the Statistical Institute of Catalonia (IDESCAT) are used. Main results highlight the role of creativity in the spreading of ideas and the creation of new projects encouraging entrepreneurship at local level. However, the role of cultural diversity does not seem to be so relevant in deciding the location of new firms in Catalan municipalities. Finally, intellectual and technological productivity in the municipality (in terms of patents) favours the creation of new firms but only in municipalities closer to technologic and scientific centres.

Keywords: *creativity, diversity, innovation, entrepreneurship, industrial location*

JEL codes: O31, M14, O32, L26, O14

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1. Introduction

In a globalised world with continuous technological changes and where consumer preferences are continuously changing, creativity is one of the key factors for economic development in advanced societies. In this sense, creativity has become one of the most outstanding topics in various disciplines. This growing interest is due to its potential in terms of growth and economic development at the local level. The introduction of the positive association between creativity and economic development mainly comes from the contributions of Richard Florida (2002), the European Commission (2010) and UNCTAD (2008, 2010), among others. Therefore, in this context it seems crucial to understand the factors that promote business creativity.

One of the areas of study where there has been more interest in recent years has been entrepreneurship. Although most works in this field take into account traditional factors such as the personal characteristics of entrepreneurs (Storey 1994), geographic or industrial organization factors (Reynolds et al. 1994; Saxenian 1999), all these contributions they do not usually account for local characteristics associated with social and cultural environments which are prone to creativity and, at the same time, to entrepreneurship. Exceptions to this traditional approach are Florida (2004), Lee et al. (2004), Boschma and Fritsch (2009), Piergiovanni et al. (2012), Audretsch and Belitski (2013), among others. All of these authors emphasise the role of creativity and diversity in the dissemination of knowledge, favouring entrepreneurship at the local level.

For the case of Catalonia it is more difficult to find contributions taking into account those social factors linked to local environment such as creativity and diversity. While the majority of contributions analyse the impact of human capital on the creation of firms (i.e., Arauzo and Manjón 2004; Arauzo 2005; Arauzo and Viladecans 2009), it should be considered the fact that the concentration of human capital in certain areas can be strongly influenced by the specific environment that defines the levels of creativity and diversity of the municipality (Coll-Martínez and Arauzo-Carod 2017). So, by following this main argument, I wonder whether the creation of firms is positively associated with creativity and diversity at a municipality level. That is, if creativity has a great potential in terms of economic growth through its capacity for innovation and creation of new ideas, those municipalities able to generate these creative environments should have a certain comparative advantage over the rest of municipalities when attracting the creation of firms to the municipality.

Taking into account the potential of creativity and diversity for firm dynamism, this article has as main aim to analyse the impact of creativity and diversity on the creation of firms at local level in Catalonia while controlling for the traditional factors of industrial location. In order to carry out this empirical work, data referring to the location of 7,895 new industrial establishments that were

created in Catalonia between 2002 and 2007 are used. These data are extracted from the Register of Industrial Establishments of Catalonia (REIC) provided by the *Generalitat de Catalunya*. Moreover, data referring to the local characteristics of the Catalan municipalities was taken from other sources such as the Statistics Institute of Catalonia (IDESCAT) and Trullén and Boix (2005), as well as, cartographic information provided by the Cartographic Institute of Catalonia.

The empirical approach is conducted by the use of Count Data Models (CDM) to estimate the effect of creativity and diversity in the decision to locate of new firms in all the Catalan municipalities. Main results suggest the importance of creativity (in terms of artistic or bohemian population) in the dissemination of ideas and creation of new projects and businesses encouraging entrepreneurship in the municipality. However, the role of cultural diversity seems to be a less relevant factor for the location decision of new firms in Catalan municipalities. Finally, intellectual and technological productivity (in terms of patents) favours the creation of new firms but only in those municipalities located nearby to technological and scientific centres.

The remainder of the paper is as follows. Section 2 reviews the literature on the role of creativity in location decision process for new firms. Then, Section 3 presents data and econometric methodology used in the paper. Section 4 presents main results and, finally, Section 5 discusses main conclusions.

2. Literature Review

In the existing literature we find different definitions of creativity. Santagata (2002, 2009) argues that creativity is associated with historical heritage as well as the characteristics and history of the society in which it is developed. According to this definition, time and space are the main sources of creativity. Alternatively, creativity can be understood as the ability to synthesise (Florida 2002). In a more formal way Sternberg (1999) defines creativity as the ability to produce novice work (original and unexpected) and appropriate (useful).

Although creativity may seem an abstract concept that can be addressed from various perspectives, this could be broadly defined as: ‘The formulation of new ideas and the application of these ideas to the production of original works and cultural products, functional creations, scientific inventions and technological innovations’ (UNCTAD 2008).

This definition allows differentiating between a cultural or artistic creativity, a scientific creativity and an economic creativity. Artistic creativity is associated with the imagination and the ability to generate original ideas and new ways of interpreting the world, in the forms of text, sound and image; Scientific creativity implies curiosity and the will to experiment and make new connections when solving problems; and Economic creativity is a dynamic process that focuses on the

application of innovation in technology, business models, marketing, etc., and is closely linked to having a certain competitive advantage in the economy. And all these forms of creativity specifically intervene in the development of technological creativity.

In an economic context, creativity has been recognized for its potential to generate wealth and employment, as well as its ability to facilitate technological change and business innovation. In this way, creativity is understood as a key element for the promotion of innovation. Actually, in 1961 Jacobs emphasized the role of creativity as a relevant factor for economic growth and cities. In this regard, the concentration of creative activities can generate a certain creative environment that facilitates the generation of new ideas (Power 2002; Scott 2006; Lazzaretti et al. 2008; Stam et al., 2008; Cerisola 2016, 2017). It is this creative environment that facilitates the development of new products and projects by firms, that is, creativity encourages innovation in the different productive processes of the economy (Müller et al. 2009).

From the concept of creativity, the idea of the *creative city* emerges as an engine of a new economic paradigm (see, for example, Clifton 2008 and Chapain et al. 2010). In this line, some authors argue that in creative cities, firms are more likely to introduce process and product innovation than in those cities with lower levels of creativity (Müller et al. 2009; Lee and Rodríguez-Pose 2014; Rammer et. to 2016).

2.1. Literature about creativity and firm location

The determinants of the location decision of firms can be approached from both the firm's perspective and the territory's perspective. The first approach analyses how firm characteristics affect the location decision taking into account aspects such as the characteristics of the entrepreneur, the size of the firm and the sector to which the firm belongs to. While from the second perspective, the object of study are the characteristics of the territory and its capacity to attract the creation of firms taking into account territorial factors, such as the availability of resources, geographic issues, the distribution of the population and skill levels of the workforce (Arauzo-Carod 2008).

Regarding the first approach, some studies focus on studying the individual characteristics of entrepreneurs. Among the most analysed individual characteristics, we find personality, education levels or the origin. In this regard, features such as business vision, proactivity or family tradition are associated with entrepreneurship (Storey 1994). On the other hand, human capital-based studies find that entrepreneurship is related to higher levels of education and work experience (Evans and Leighton 1990). Other studies find that immigrants are more likely to be entrepreneurs given the lack of contacts and connections, and thus creating their own business is the only possibility to avoid unemployment (Yoon 1997).

Alternatively, under the territorial approach, we must consider Hayter's classification of the determinants of location (1997). The literature is divided into three different approaches: a neoclassical approach, a behavioural approach and an institutional approach. According to the neoclassical approach, firms take into account factors that influence earnings such as manpower, transportation costs and external economies. The behavioural approach is focused on situations of imperfect information and the personal characteristics of the entrepreneur. Finally, according to the institutional approach, the decision to locate depends on local characteristics, such as wages, trade unions, tax regulations, etc.

In addition to these approaches, there are other approaches that emphasise the role of agglomeration economies on the entry of new firms, most of which are based on the idea of Marshall's external economies (1920). This idea holds that firms benefit from being located in places where there is a high concentration of firms and jobs. These benefits are driven by specialised job markets, suppliers' availability and knowledge spillovers. Later, Hoover (1936) subdivides these economies into localisation and urbanisation economies. The first refers to the concentration of similar activities while the second refers to the diversity of activities.

Arauzo-Carod et al. (2010) summarised the main contributions and show that most studies in this field highlight the importance of the agglomeration economies, but there are also other important determinants that must be taken into account, such as transport infrastructures. Several empirical studies have supported the hypothesis that better accessibility to transport infrastructures has a positive impact on firms' location decisions, but this effect will be different for each economic activity (Friedman et al 1992; Smith and Florida 1994; Arauzo-Carod 2005). Other factors are population density and human capital characteristics. Many studies have shown that knowledge-intensive industries benefit from being located in larger agglomerations (see Bade and Nerlinger 2000; Arauzo-Carod and Viladecans 2009). Concerning human capital characteristics, main findings suggest that firms generally prefer locations with a more educated and less well-paid workforce, although it will depend on the characteristics of the firm (see, for example, Smith and Florida 1994; Arauzo-Carod 2005). Other determining factors are taxes; even their effect is ambiguous according to different studies, Gabe and Bell (2004) argue that there is a balance between taxes and the provision of public goods and services. Finally, one must consider the specific behaviour of each type of firm. Arauzo-Carod and Manjón (2004) find that larger firms are primarily guided by 'objective' factors, such as market characteristics, while small businesses seem to be mainly guided by entrepreneur's preferences (residence location, family problems, etc.).

Among the studies focused on analysing the role of creativity and cultural diversity on the creation of new firms the following works should be highlighted. Audretsch et al. (2010) find that higher levels of knowledge and cultural diversity positively affect the creation of technology-oriented firms

in Germany. In the case of the USA, Lee et al. (2004) analyse the effect of creativity and diversity on the formation of new firms and find that open and creative areas favour a dynamic business climate. Also for the USA, Wojan et al. (2007) find that an unobservable creative environment is positively associated with several indicators of economic dynamism. In a similar approach, De Jong et al. (2007) use Dutch data to analyse the relationship between creativity and firm entry rates at a regional scale, and show that areas with higher levels of concentration of creative industries have higher firm entry rates. Finally, Audretsch and Belitski (2013) find that there is a positive relationship between local creativity and the creation of new firms for some European cities.

So, how can creativity be related to entrepreneurship? In accordance with the aforementioned definitions, entrepreneurship is a form of creativity because it allows the creation and dissemination of new ideas and projects that are unique and useful. Therefore, and following the argument of Lee et al. (2004), in this paper I assume that the concentration of bohemians in a municipality creates an environment that attracts other types of creative or highly qualified agents, which promotes the creativity of human capital and business.

3. Methods and Data

3.1. Data

To carry out this study I use data referring to Catalonia. Concretely, I use data on the location of new establishments to define the dependent variable, and independent variables are constructed from a dataset on territorial characteristics.

The database used to define the dependent variable is the Register of Industrial Establishments of Catalonia (REIC), provided by the Government of Catalonia (Ministry of Innovation, Universities and Enterprise), which has a series of microdata on the location of new and relocated establishments. This dataset includes a total of 10,033 establishments with codes 011-930 according to the CNAE-93 Rev. 1 that were located in Catalonia between 2002 and 2007. In the case of this study, it has been preferred to work only with newly created firms, as an approach to the concept of entrepreneurship. In this way, I work with 7,895 firms that located the 946 Catalan municipalities between 2002 and 2007.

Regarding the explanatory variables, the empirical literature on industrial location has been followed to select them. In particular, determinants linked to creativity, diversity and innovation, human capital, agglomeration economies, industrial mix and various indicators on the level of income and population growth are included. Tables 1 and 2 show the definition and some descriptive statistics for these variables. All these variables are taken from the 2001 Census (IDESCAT) and Trullén and Boix (2005).

Table 1. Description of variables and sources

Variable	Description^a	Source	Year
<i>Firm creation</i>	Number of firms created between 2002 and 2007	REIC	(2002-2007)
<i>creativity</i>	Number of creative employment and bohemians	IDESCAT	2001
<i>diversity</i>	Ratio of foreign population	IDESCAT	2001
<i>human capital</i>	Ratio of population with university studies	IDESCAT	2001
<i>population density</i>	Inhabitants per Km ²	IDESCAT	2001
<i>income</i>	Mean income level per inhabitant	IDESCAT	2001
<i>patents</i>	Number of registered patents	Trullén and Boix (2005)	2001
<i>population growth</i>	Population change between 1991 and 2001	IDESCAT	2001
<i>unemployment</i>	Number of unemployed among active population	IDESCAT	2001
<i>sme</i>	Ratio of Small and Medium enterprises	IDESCAT	2001
<i>industrial intensity</i>	Ratio of industrial employment	IDESCAT	2001
<i>metropolitan</i>	It indicates if the municipality belongs to a metropolitan area (1) or not (0)	Trullén and Boix (2005)	2001
<i>jobs</i>	Number of jobs	IDESCAT	2001

Notes: ^aAll variables are in natural logarithms.

Table 2. Descriptive Statistics

Variable	N	Mean	St. Dev.	Min	Max
firm creation	946	8.340	30.357	0	645
creativity	946	0.614	1.019	0	8.216
diversity	946	0.014	0.018	0	0.171
human capital	946	0.069	0.073	0	1.486
population density	946	3.769	1.856	-0.198	9.849
income	946	9.072	0.369	7.664	10.401
patents	946	0.070	0.300	0	3.972
population growth	946	0.109	0.246	-1.985	1.397
unemployment	946	0.026	0.013	0	0.085
sme	946	0.598	0.145	0	0.693
industrial intensity	946	0.196	0.093	0	0.475
metropolitan	946	0.443	0.497	0	1
jobs	946	6.122	1.663	2.564	13.378

Table 3 shows the results on the correlation between explanatory variables in order to certify that there are no problems of colinearity between the explanatory variables used.

Table 3. Correlation among explanatory variables

	1	2	3	4	5	6	7	8	9	10
1. creativity	1									
2. diversity	0.167*	1								
3. human capital	0.019	0.112*	1							
4. population density	0.496*	0.123*	-0.028	1						
5. income	0.382*	0.215*	0.277*	0.335*	1					
6. patents	0.566*	0.017	0.043	0.337*	0.229*	1				
7. population growth	0.174*	0.252*	0.109*	0.153*	0.465*	0.014	1			
8. unemployment	0.337*	0.059	-0.079*	0.303*	0.126*	0.146*	0.135*	1		
9. sme	-0.299*	0.006	0.066*	-0.159*	-0.238*	-0.236*	-0.137*	-0.172*	1	
10. industrial intensity	0.203*	-0.12*	-0.092*	0.283*	0.227*	0.135*	0.459*	0.303*	-0.373*	1

Creativity can be approximated using a bohemian index (Florida 2002) - a measure of the number of bohemians and other types of artistically creative population in each municipality. According to Florida (2002), this indicator measures the opening of a municipality to creativity not directly related to technological and business innovation. In other words, it is an index that allows measuring the artistic and intellectual dynamism. In this way, those municipalities with higher levels of this index should attract more creative employment, favouring the dissemination of ideas and new projects that are key factors for the creation of firms. This index counts the number of bohemians in the municipality and it includes professions such as authors, musicians, composers, actors, directors, painters, sculptors, dancers, etc. In this regard, Florida (2002)'s work shows how there is a positive and significant relationship between creativity and the concentration of the intensive high-tech industry.

With regards to diversity, it is assumed that municipalities with higher levels of diversity should have a certain advantage in attracting and retaining creative population. This concentration of creative people that is characterized by a more open mindedness to changes and tolerance allows reducing entry barriers favouring the dissemination, creation and acceptance of new ideas. As a measure of diversity, this paper uses the proportion of foreign population based on the 2001 Census. Previous studies such as Reynolds et al. (1994), Saxenian (1999) and Lee et al. (2004) show that this variable has a positive and significant sign in the creation of firms. Given that immigrants arriving in a new region must have a more autonomous character in order to move forward and adapt to changes more easily than the resident population. In addition, it is a measure of cultural diversity that enriches local population with new ideas and opportunities.

It is supposed that the educational level of the population (*human capital*) is a relevant location factor for any type of firm. However, possible spatial imbalances in terms of labour market can be largely solved by mobility flows provided that the territory has adequate transport infrastructures (Arauzo-

Carod 2005). According to the literature on industrial location and industrial districts, agglomeration economies (*population density*) generate more productive environments that favour the creation of new firms. However, higher income levels should encourage the creation of firms by facilitating access to possible additional financial support at the time of running a new business. With regard to innovation and access to technology in the municipality, the number of patents per municipality (*patents*) is introduced, assuming that there is a positive relationship between patents and entrepreneurship. The growth of the population between 1991 and 2001 (*population growth*) should allow capturing all the changes that have occurred in the municipality and that cannot be captured in the model. Regarding the level of unemployment (*unemployment*), there are several theories in this regard. On the one hand, some studies show that high levels of unemployment favour the creation of firms given the difficulty of finding an alternative job (Wagner and Sternberg 2004), while other authors argue that high levels of unemployment are associated to economic recession and, therefore, lower levels of consumption (Reynolds et al. 1994). In the same way, as suggested by the Incubator Hypothesis (Garofoli 1994), a greater presence of small businesses (*sme*) encourages the creation of new firms. Finally, the structure of the municipality's economic activity (*industrial intensity*) helps explain the location decision.

3.2. Estimation issues

In order to analyse the determinants of the creation of firms and their relation with creativity, the number of new establishments is estimated based on the specific local characteristics that have been described above:

$$\begin{aligned}
 \text{Firm creation}_i = & \beta_0 + \beta_1 \text{creativity}_i + \beta_2 \text{diversity}_i + \beta_3 \text{human capital}_i + \\
 & \beta_4 \text{population density}_i + \beta_5 \text{income}_i + \beta_6 \text{patents}_i + \beta_7 \text{population growth}_i + \beta_8 \text{unemployment}_i + \\
 & \beta_9 \text{sme}_i + \beta_{10} \text{industrial intensity}_i + u_i
 \end{aligned} \tag{1}$$

This model is considered by the set of Catalan municipalities as well as by the municipalities that belong to a metropolitan area in terms of labour mobility and those that do not belong to a metropolitan area, that is, rural areas. This distinction has been made following the work of Trullén and Boix (2005) and allow to distinguish how the effects of local characteristics in the creation of firms can vary when this distinction is considered.

For econometric estimation, Count Data Models (CDM) have been in common use when dealing with this location phenomenon from a spatial point of view. Among the alternative models, Poisson models seem to be the starting point, but they involve certain limitations, such as an overdispersion problem (failure to fulfil the property of equality between the mean and the variance) given the excess of entries in certain municipalities. However, this problem can be solved by the generalized form of the Poisson model (the Negative binomial model), which introduces an individual unobserved effect into the conditional mean and allows the variance to exceed the mean.

Moreover, location analysis deals with an additional problem, that of zero inflation (i.e., sites where no plants are located), which can be easily solved by using zero inflated counterparts of previous models. These models are two-step models in which the first step is used to model the probability of belonging to the zero-group vs. the non-zero group (in terms of location at specific sites) while the second step is a traditional count model. They require additional variables (i.e., inflated variables) that are hypothesized to explain zero inflation.

As the descriptive statistics of the dependent variables showed signs of both overdispersion and zero inflation (34% of all entries), a basic Poisson model was initially discarded and alternative count data models were considered (i.e., Negative Binomial – NB –, Zero-Inflated Poisson – ZIP – and Zero-Inflated Negative Binomial – ZINB). Therefore, I estimated a baseline specification, compared it with previous count data models (including Poisson) and selected the one with the best fit using the Akaike information criterion (AIC), the Bayesian information criterion (BIC) and the Vuong test (Vuong 1989). Table 4 shows the results for these statistics. Due to the ZINB model is the one that performed best according to AIC, BIC and Vuong, the ZINB is used for all the specifications.

Table 4. Model selection statistics

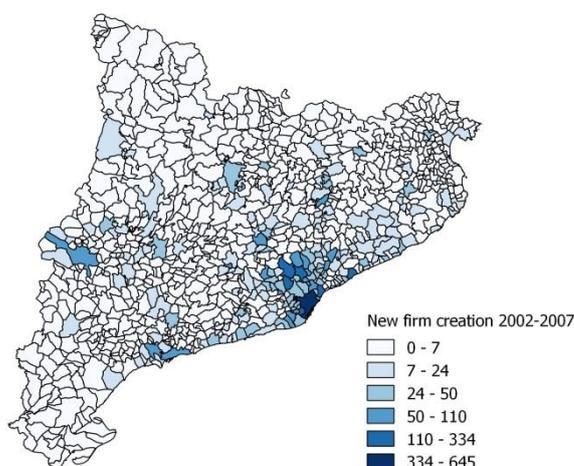
Total	AIC	BIC	Vuong test
Poisson	7338.39	7391.76	-
NB	4281.45	4339.68	-
ZIP	6487.64	6550.72	6.40**
ZINB	4127.59	5.90	5.90***

3.3. Spatial distribution of new firm location and creativity indicators in Catalonia

In this section a brief description of the spatial distribution of new firm creation, creativity, diversity and innovation is conducted. The visualization of the data with the use of cartographic tools allows for an accurate descriptive analysis. Moreover, the ranking of the municipalities with the highest levels of these indicators are also provided.

According to the REIC dataset, 7,895 new industrial establishments were located between 2002 and 2007 in Catalan municipalities. As evidenced by previous studies for other countries, new establishments show a clear tendency to agglomerate in the most populated areas. In the Catalan case, the city of Barcelona, its metropolitan area and the other three provincial capitals (Girona, Lleida and Tarragona) concentrate the highest levels of new firm entries (see Figure 1). Thus, it seems clear that firms prefer to be located around the areas that concentrate most part of the population and economic activity.

Figure 1. Location of new firm creation (2002 – 2007)



Source: Author with REIC's data

Table 5 shows a ranking for those municipalities with the larger number of firms created between 2002 and 2007. As can be deduced from Figure 1, Barcelona is the leading city with a larger number of firm entries during the period. Other municipalities with larger number of firm entries are capitals and cities belonging to the metropolitan area of Barcelona.

Table 5. Ranking of municipalities: number of new firm entries (2002-2007)

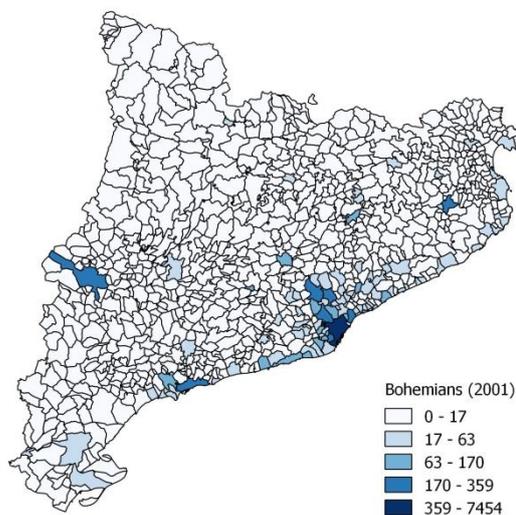
First # 10	Municipality	New firm entries
1	Barcelona	645
2	Terrassa	334
3	Mataró	278
4	Sabadell	205
5	Badalona	180
6	l'Hospitalet de Llobregat	169
7	Rubí	154
8	Lleida	110
9	Montcada i Reixac	103
10	Igualada	90

Source: Author with REIC's data

Regarding the distribution of bohemian population as a proxy for creativity, Figure 2 shows that Barcelona concentrates most of bohemians (population with cultural or artistic occupation) in Catalonia. Apart from Barcelona, the three provincial capitals (Girona, Lleida and Tarragona) stand out; also the nearest municipalities to Barcelona have a larger number of bohemians among its

inhabitants. In Catalonia this distribution may also be largely explained by the benefits arising from the concentration in large cities in terms of higher levels of income and different preference ranges, which favours the demand for cultural and artistic products and services; proximity to historical and cultural infrastructures; the infrastructure of specialised public and social actors that provide support for these activities; and ‘soft characteristics’ or amenities in terms of quality of life, tolerance, and cosmopolitan environments; and also a greater tacit and informal interaction between bohemians, which facilitates the development and spreading of new ideas (Coll-Martínez et al. 2017).

Figure 2. Spatial Distribution of creativity – bohemians (2001)



Source: Author with IDESCAT's data

Table 6 shows the ranking of municipalities with a larger number of bohemians for the year 2001. These results confirm information previously found in Figure 2. Barcelona leads ranking with more than 7,000 bohemians which represents the 47% of bohemian population in Catalonia. Other municipalities that concentrate a larger number of bohemians among their inhabitants are important cities belonging to the metropolitan area of Barcelona (i.e, Sabadell, Terrassa, Badalona, etc.), and also Tarragona (with 217 bohemians), Lleida (212) and Girona (203) as provincial capitals. Thus, even if lifecycle choices may also act as pull factors for young artists looking for training and access to arts and cultural infrastructures within cities, whilst experienced artists may be mostly attracted to rural areas due to lower living costs (Markusen and Johnson 2006), they have a clear preference to be located in the most important municipalities of the territory, since in larger cities they have access to the aforementioned factors enhancing their activity.

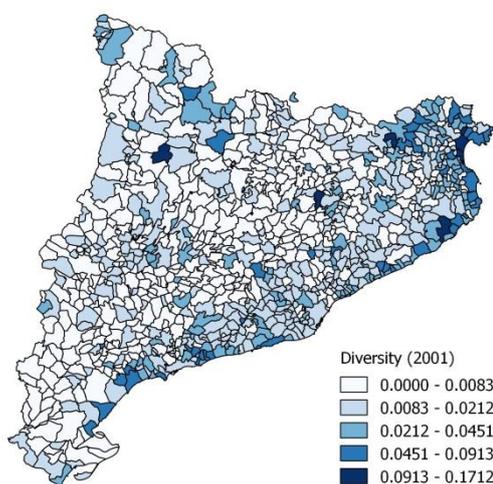
Table 6. Ranking of municipalities: creativity (bohemians) (2001)

First # 10	Municipality	Bohemians
1	Barcelona	7,454
2	Sant Cugat del Vallès	359
3	Sabadell	320
4	Terrassa	320
5	l'Hospitalet de Llobregat	311
6	Badalona	268
7	Tarragona	217
8	Lleida	212
9	Girona	203
10	Mataró	170

Source: Author with IDESCAT's data

Concerning the spatial distribution of foreign population in terms of diversity in the territory, Figure 3 shows how the proportion of foreign population is mainly concentrated along seaside municipalities and around the four provincial capitals following the same pattern that population has followed over last years. However, there are some exceptions in the north of Lleida, possibly associated to snow and mountain tourism.

Figure 3. Spatial Distribution of diversity (2001)



Source: Author with IDESCAT's data

Table 7 shows the municipalities with a larger proportion of foreign population among their inhabitants. It seems that the seaside municipalities, and especially those located in the province of Girona, are those with a greater diversity in terms of foreign population, while foreign population

seems to be less attracted to inland municipalities. However, the potential heterogeneity between foreign population must be taken into account. That is, preferences among foreign population may differ substantially among them according to their age and education and income levels. Even so, the attractiveness of being near the sea for most of these individuals seems obvious, as well as the possibility of establishing new contacts more easily due to the agglomeration of population and economic activities.

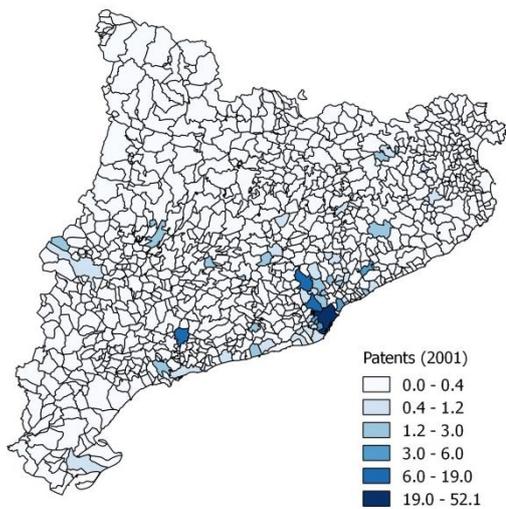
Table 7. Ranking of municipalities: diversity (2001)

First # 10	Municipality	Ratio of foreign population
1	Castelló d'Empúries	0,171
2	Sales de Llierca	0,154
3	Pau	0,151
4	Santa Cristina d'Aro	0,113
5	Sant Pere Pescador	0,103
6	Abella de la Conca	0,102
7	Sant Bartomeu del Grau	0,099
8	Roses	0,091
9	Renau	0,089
10	Calonge	0,088

Source: Author with IDESCAT's data

Regarding the access to technological and scientific knowledge and innovation proxied by the number of registered patents per municipality, Figure 4 shows that it is mainly concentrated in Barcelona and around the different university and technological centres existing in the territory.

Figure 4. Spatial Distribution of innovation (2001)



Source: Author with Trullén and Boix (2005)'s data

Additionally, the above results can be completed with the information provided in Table 8. This table shows the ten municipalities that registered the largest number of patents in the year 2001. Generally speaking, municipalities close to Barcelona and those belonging to its metropolitan area are the ones that register more patents since they are municipalities that coexist with different universities and technology and research centres; consequently, the direct interaction with science and technology is more accessible and this facilitates innovation in the municipality. The only exception is the municipality of Valls (with 19 registered patents) which accounts for an important industrial park where some headquarters and subsidiaries of the most important world motoring and electronic companies are located (Segarra et al. 2013). Still, it seems that emerging innovation in Catalan municipalities is mainly associated to the existence of research and technology centres in the area of proximity.

Table 8. Ranking of municipalities: innovation (2001)

First # 10	Municipality	Number of patents ¹
1	Barcelona	52
2	Valls	19
3	Terrassa	8
4	Sant Cugat del Vallès	8
5	l'Hospitalet de Llobregat	6
6	Sant Just Desvern	5
7	Esplugues de Llobregat	4
8	Llinars del Vallès	4
9	Badalona	4
10	Parets del Vallès	3

Source: Author with Trullén and Boix (2005)'s data

¹ The number of patents per municipality is defined by the year of application and concession according to the municipality of origin of the authors according to Trullén and Boix (2005).

4. Results

Table 9. Location determinants of firms (ZINB)

	New firm creation (2002-2007)		
	1. Total	2. Metro	3. Non-metro
<i>creativity</i>	0,630*** (0,049)	0,508*** (0,054)	0,848*** (0,099)
<i>diversity</i>	-5,311** (2,484)	-7,715* (4,503)	-3,980 (3,486)
<i>human capital</i>	-2,294** (1,112)	-11,26*** (2,688)	-0,941 (1,208)
<i>Population density</i>	0,086*** (0,027)	0,120*** (0,032)	-0,024 (0,046)
<i>income</i>	0,567*** (0,203)	1,143*** (0,341)	0,779*** (0,293)
<i>patents</i>	0,162 (0,131)	0,340** (0,143)	0,106 (0,265)
<i>Population growth</i>	0,256 (0,208)	-0,112 (0,225)	0,784 (0,497)
<i>unemployment</i>	8,328* (4,355)	8,366 (6,083)	2,778 (6,316)
<i>sme</i>	-0,708* (0,366)	-0,050 (0,490)	-0,968* (0,558)
<i>industrial intensity</i>	2,608*** (0,569)	1,868** (0,830)	3,122*** (0,829)
<i>constant</i>	-4,636** (1,856)	-9,389*** (3,001)	-6,422** (2,707)
Inflated variables			
<i>jobs</i>	-1,765*** (0,194)	-2,219*** (0,359)	-1,715*** (0,317)
<i>constant</i>	8,442*** (0,945)	10,98*** (1,795)	7,643*** (1,448)
Vuong test	5,9***	4,58***	3,31***
N	946	420	526
Obs. Different from zero	584	310	274
LR X ²	708,61	430,33	199,24
/lnalpha	-0,306*** (0,084)	-0,646*** (0,108)	0,0328 (0,130)
alpha	0,736 (0,062)	0,524 (0,056)	1,033 (0,134)

Notes: Standard errors in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

The results for the determinants of new firm location estimated by a ZINB model are shown in Table 9. As explained in Section 3 the same specification is estimated for all municipalities of Catalonia (column 1), for municipalities belonging to a metropolitan area (column 2) and for non-metropolitan municipalities (column 3). The results for all three subsamples confirm much of our initial hypotheses. The decision to create a firm is closely associated to the existing creativity regardless of the type of municipality. This result supports the theory that there is a positive and significant relationship between entrepreneurship and creativity at the local level (Lee et al. 2004; De Jong et al. 2007; Audretsch and Belitski 2013). The results for diversity are not those that were

expected, since a negative and significant coefficient is given for all the municipalities and the metropolitan ones. However, this is not a surprising result if among foreign population there are high levels of heterogeneity in terms of education and income levels. Unfortunately, this diversity indicator does not include these differences due to data availability; consequently, the effect it may have on the location decision of new firm creation may explain this result, as observed by Lee et al. (2004). The fact that the indicator of diversity is only significant for all and metro municipalities may indicate that metropolitan areas, which are usually the most populated, are also the ones that most attract this kind of population since there they have more possibilities to enter the labour market.

Regarding the other factors that may influence the location of new firms, higher levels of income, population density and industrial intensity attract the location of new firms for all municipalities, while there is a negative relationship between human capital and the creation of firms. This result is only significant for all and metro municipalities. Despite being a surprising result, other contributions on this issue find similar results and argue that the impact of human capital on firm location will vary depending on the characteristics of the firm (Arauzo-Carod and Manjón-Antolín 2004; Arauzo-Carod i Viladecans-Marsal 2009; Arauzo-Carod 2005; 2013). On the other hand, there is a significant and positive relationship between the number of patents registered in the municipality and location of new firms but only for metropolitan municipalities, which indicates that access to technology and knowledge favours the creation of firms but it is an impact that is limited to municipalities close to science and technology parks. Finally, higher levels of unemployment seem to be positively and significantly associated with the creation of firms as suggested by Wagner and Sternberg (2004), so it seems that in the case of Catalan municipalities the fact of being in unemployed gives incentives to create new ideas and businesses. However, this result is only confirmed for all municipalities.

5. Conclusions

This article analyses the impact of creativity and diversity on the location of new firms. Using plant-level microdata on the location of new manufacturing plants for the period 2002-2007 (REIC) and data from Census 2001 (IDESCAT), the Bohemian index is introduced for the case of Catalonia as an approximation to the level of creativity of the municipality in line with the work of Lee et al. (2004) for the USA. The results allow confirming the main hypotheses of the article, despite the existence of some exceptions.

Broadly speaking, the results confirm that the concentration of bohemian population or those workers directly related to the arts favours entrepreneurship. On the other hand, the diversity in terms of foreign population in the municipality does not favour the creation of firms. The effect of

innovative productivity in terms of the number of registered patents per municipality seems to favour the entrepreneurial spirit of the municipality, but this result can only be confirmed for all Catalan municipalities. Regarding the rest of factors taken into account, it is worth highlighting the role of agglomeration economies and the income level of the municipality. Therefore, these results suggest that municipalities capable of attracting bohemian population should encourage entrepreneurship at a municipality level based on the creativity and dissemination of innovative ideas that will arise from the interaction between these individuals and the rest of the population.

Therefore, these results suggest that both researchers and policy-makers should place more emphasis on the social and artistic environment of municipalities, since the concentration of the bohemians may entail the attraction of highly qualified individuals, promotion of new ideas, as well as a clear entrepreneurial dynamism, as suggested by Florida (2002; 2004). However, given the great weight of Barcelona and its metropolitan area in terms of creativity, innovation and business dynamism, policies aiming to promote creativity should adapt to metro and non-metro municipalities characteristics. For example, for non-metropolitan municipalities these strategies should focus on the preservation of those factors that define their quality of life, whereas for the metropolitan municipalities the efforts should be directed to the creation and development of facilities promoting accessibility to networking and cultural experiences.

Despite all this, this study does have some limitations. In this regard, any future research should focus on looking for alternative proxies for creativity, diversity and innovation to reduce the potential bias of the results.

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