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Creative Class and Regional Growth − Empirical Evidence from Eight European Countries

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Abstract

We analyze the regional distribution and the effect of people in creative occupations based on data for more than 450 regions in eight European countries. The geographic distribution of the creative class is highly uneven. The creative class is not attracted to highly urbanized regions *per se*, but rather a climate of tolerance and openness seem to be rather important factors. We find that the creative class has a positive and significant effect on employment growth and new business formation at the regional level. Human capital as measured by creative occupation outperforms indicators that are based on formal education.

JEL-classification: O31, O18, R12
Keywords: Creativity, innovation, entrepreneurship, regional development

1. Introduction

In his book "The Rise of the Creative Class," Richard Florida (2003, 2004) has argued that creative people are a key driver of urban and regional growth. His ideas on the creative class have drawn international attention, by scholars as well as by policy makers and civic leaders (Lang and Danielsen 2005). What makes these ideas particularly interesting from a geographical perspective is that the creative class is not evenly distributed among cities and regions. According to Florida, the creative class is especially attracted to places that are characterized by, along with other things, an urban climate of tolerance that is open to new ideas and new people. Florida states that this type of 'people's climate', rather than 'business climate' (such as low taxes or a rich supply of physical infrastructure *per se*) is crucial for regional development. Creative people not only generate novelties[1], but they also attract new economic activities, resulting in innovative businesses settling into to the region. In other words, jobs will follow people, instead of people following jobs.

Most of the empirical work based on Florida's ideas has remained rather descriptive. In addition, there are no empirical studies that provide a comparison between regions in different countries. The objective of our contribution is to fill in this gap. We present the main results of a large research project[2] on the creative class and regional growth in eight

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[1] Florida (2004, 33) identifies three forms of creativity – *technological creativity* (invention), *economic creativity* (entrepreneurship), and *artistic and cultural creativity* – that " are in fact deeply interrelated. Not only do they share a common thought process, they reinforce each other through cross-fertilization and mutual stimulation."

[2] The European research project was titled "Technology, Talent and Tolerance in European Cities: A Comparative Analysis." The project was supervised by Bjorn Asheim and Meric Gertler and financed by the European Science Foundation, among other national financial sources. Data were collected by eight European teams in the 2004-2006 period based on national data sources that were made comparable between the eight participating countries. The members of the national teams were Kristina Vaarst Andersen and Mark Lorenzen (Denmark); Irina van Aalst, Oedzge Atzema, Ron Boschma and Frank van Oort (Netherlands); Mika Raunio and Markku Sotarauta (Finland); Michael Fritsch (Germany); Arne Isaksen and Markus Bugge (Norway); Bjorn Asheim and Hogni Kalso Hansen (Sweden); Christof Kloepper and Tina Haisch (Switzerland); Phil Cooke and Nick Clifton (United Kingdom).

European countries (Denmark, Finland, Germany, Netherlands, Norway, Sweden, Switzerland and United Kingdom). Data at the regional level were collected for each country drawn from national sources and made comparable by using similar definitions. For most of the countries, the data are at the level of NUTS III–regions which more or less correspond to city-regions or labor market areas[3]. At this spatial scale, place of residence and place of work can be expected to coincide within the same region, which makes it a relevant scale for analyzing the relationship between the creative class and regional economic development. The data set comprises information on 471 regions.

Based on this unique European database, we focus on three research questions. First, how big are the differences of the share of creative class across European regions and how concentrated is the regional distribution? Second, what are the determinants of the share of creative population in a region? Third, how does the creative class affect entrepreneurship, innovation, and regional growth. Due to data limitations, the analyses of the effects of creative people on regional development will be restricted to only a few European countries. In the following section (section 2), we briefly describe the main ideas of Florida's work, which will be tested with the European data set. Details on this data set are provided in section 3, and section 4 deals with the geographical distribution of the creative class in the eight European countries. We then attempt to explain this spatial pattern by means of regression analyses (section 5). Section 6 assesses the effects of the creative class on entrepreneurship, employment growth, and innovation in several European countries at the regional level. Section 7 concludes.

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[3] NUTS (*Nomenclature des Unites Territoriales Statistiques*) is a hierarchical regional classification system used for the member states of the European Union. While NUTS I regions are the national states, the NUTS III regions are much smaller. Because the NUTS III regions for Germany are not always functional units, the analysis for this country is at the level of planning regions, which are functional regions in the sense of travel to work areas that comprise at least one city and its surroundings. For a more detailed description of the German data, see Fritsch (2007).

2. Creative class, urban climate, and regional growth

Florida's main hypothesis is that people who belong to the creative class are a key driver of urban and regional growth (Florida 2004). Hence, it is the nature of the population (i.e., being creative or not) in a place that makes the difference. According to Florida, regions with a high share of creative people will perform economically better because they generate more innovations, have a higher level of entrepreneurship, and attract creative businesses.

A basic element of Florida's approach is the notion that geography matters[4]. According to Florida, the creative class is not evenly distributed across space: not every city or region is equally well endowed with members of the creative class. As the creative class is highly mobile, the supply-side of the regional economy is crucially important in order to explain the locational decision of creative people. Florida asserts that the creative class is especially attracted to places that are characterized, among other things, by an urban climate of tolerance that is open to new ideas and to newcomers. According to Florida, creative class members have a non-conformist lifestyle that combines disciplined work ethics with hedonistic values. He assumes that creative people are attracted to tolerant and open-minded regional societies that offer a diversity of people with different cultural and ethnical backgrounds. This is because creative people perceive the inherent values of a tolerant environment as being extremely positive and because diversity serves as a source of inspiration for innovative activities (Andersen and Lorenzen 2005). In addition, the creative class attaches great values to urban facilities and small-scale cultural services such as cinemas, bars, museums, art galleries, restaurants, and trendy shops.

In other words, Florida places emphasis on socio-cultural underpinnings of regional development. It is a tolerant, diverse, and open-minded urban culture that is a major economic asset because it attracts

[4] Florida takes this issue almost to the extreme when he claims that "… places have replaced companies as the key organizing units in our economy" (Florida 2004, 30).

the creative class. As a consequence, urban cultural artifacts are valued in terms of their economic utility (Peck 2005). Interestingly, according to Florida, these are not the places that are well endowed with social capital. He explicitly takes a critical stand towards the ideas of Putnam (2000), who stressed the positive effect of social capital for regional development. He points to the adverse effects of homogeneous communities that have established strong ties between their members because such environments often tend to suppress new ideas and creativity. Therefore, the future is moving towards "… places with looser networks and weaker ties" that "are more open to newcomers and thus promote novel combinations of resources and ideas" (Florida 2004, 273).

According to Florida, it is this type of 'people's climate' that is crucial for regional growth. This stands in contrast to conventional explanations that refer to the qualities of places in terms of 'business climate,' such as low taxes or rich supply of physical infrastructure. The essence of Florida's proposition is that places with a good 'people's climate' retain and attract creative people who, in turn, induce new economic activities, such as start-ups and innovation. Thus, the creative class is not attracted to places with high growth *per se*. On the contrary, regional growth is expected to be a result of the presence of creative people. Or in the terminology of Florida, jobs will follow people, instead of people following jobs (Florida 2004).

Florida latest research also stresses the importance of knowledge spillovers for regional growth. Knudsen, Florida, and Stolarick (2007) combined the argument concerning the effect of the creative class with endogenous growth theory. Endogenous growth theory is based on the idea that human capital and knowledge accumulates in cities because a great number of highly educated and skilled people have intimate interactions, thereby increasing their own knowledge as well as each other's knowledge (Lucas 1988). A key hypothesis drawn from this approach is that a certain level of human capital concentrated in one place generates more spillover benefits than the same level of human capital spread over different locations (Martin and Sunley, 1998). Accordingly,

Knudsen, Florida, and Stolarick (2007) assume that the effect of the creative class on innovation should be relatively pronounced in high-density areas, as cities elicit the creative class to be more productive and more innovative. In regressions with the number of patents per 100,000 inhabitants as the dependent variable, they find a highly significant positive impact for an interaction variable of the share of the creative class and regional density.

Florida's ideas as summarized in his book "The Rise of the Creative Class" have evoked considerable controversy. A major part of the debate questions to what extent the creative class is different from educated and skilled people. According to Glaeser (2004), creative capital closely corresponds to human capital, as it is conventionally measured by educational attainments, since most members of the creative class are skilled and highly educated. As a result, Glaeser claims that it is no use to include creative capital in a growth model that already accounts for the effect of human capital in terms of education. Running regressions using Florida's data, Glaeser shows that human capital takes away the positive effect of the creative class on urban growth in the US in the 1990s. In fact, the creative class variables become negative and statistically insignificant in his regressions when an indicator for the qualification level of the regional population is included.

There have been other critiques on Florida's work. These critiques mainly concern empirical issues that will be dealt with in the following sections.

3. How to measure the creative class

One interesting idea in Florida's approach is that his classification of the creative class is based on professions, not qualification levels or industries. According to Florida, the creative class is a category of people who are engaged in creative and innovative jobs. Hence, members of the creative class may be found in every industry, and it is the task of empirical research to identify and to isolate these people from workers who are engaged in non-creative tasks. Information on professions may

provide a better description of what people actually do, rather than their educational level or their industry affiliation (Markusen et al. 2006). This means that, although creative and cultural industries may have peculiar characteristics (Power and Scott 2004), the creative class is not solely confined to those industries.

While the concept behind the measurement of the creative class may sound plausible and appealing, it is not at all unproblematic. One objection against such an approach is that professions in data sets are categorized on the basis of skill content and characteristics of the work process (Markusen et al. 2006). As a consequence, professions assigned to the creative class tend to be biased towards the highly educated, excluding creative workers with a lower level of education. A main problem to be solved is to define criteria that distinguish creative from non-creative occupations. Florida has been criticized because it is almost impossible to clearly distinguish which occupations are creative and which are not (Markusen 2006). Florida (2004) defines creative people as workers who are engaged in identifying problems, figuring out new solutions, and combining pieces of knowledge in new and innovative ways. It is fair to say that Florida adopted a rather pragmatic approach both at the conceptual level (what can be regarded as creative?) and the empirical level (how to measure creativity?). Many critics have pointed to this profound weakness in his analyses (Markusen 2006).

Therefore, we stand by Florida's categories of the creative class not because we necessarily agree with his definitions of the creative class, but for a purely pragmatic reason. One of the objectives of the European project was to conduct a comparative analysis of European regions similar to Florida's study for the US. Using comparable definitions and data sets (based on professions), this allows us to detect similarities and differences between the US and the European cases. In our analyses, we have taken three steps to define and measure the creative class.

- As a starting point we adopted the definitions of creative occupations as defined by Florida (2004). We followed his idea to distinguish between the creative core, creative professionals, and bohemians.

Creative core members are those "whose economic function is to create new ideas, new technology and/or new creative content" (Florida 2004, 8). They basically are composed of occupations "in science and engineering, architecture and design, education, arts, music and entertainment" (ibid.). Creative professionals are working in "business and finance, law, health care and related fields" (ibid.). They "engage in complex problem solving that involves a great deal of independent judgment and requires high levels of education" (ibid.)[5]. Bohemians are individuals in cultural and artistic occupations. Bohemians fulfill two roles: they are both part of the creative class, and they reflect an urban culture of tolerance; thus, they play a key role in attracting the two other categories of the creative class.

- In order to secure an international comparison, we used the International Standard Classification of Occupations (ISCO 88) to select professions that belong to the creative class at the 3-digit level. This classification scheme was developed by the International Labour Office (ILO) and is based on the types of skills that are necessary to conduct a specific profession. The selected ISCO categories are presented in table 1.
- Each country team assigned these classifications to their national data sources attempting to make the European data as comparable as possible. However, due to data availability and different ways of measurement, the probability of country-specific effects in the data that result in limited comparability between countries is unavoidable. In our analyses, we will account for this problem by including country dummies into the multivariate estimation models.

[5] "… all members of the Creative Class … share a common creative ethos that values creativity, individuality, difference and merit. For the members of the Creative Class, every aspect and every manifestation of creativity – technological, cultural and economic – is interlinked and inseparable" (Florida 2004, 8).

Table 1: The creative occupations

Groups of creative people	*Occupations (ISCO-Code)*
Creative core	Physicists, chemists, and related professionals (211); Mathematicians, statisticians, and related professionals (212); Computing professionals (213); Architects, engineers, and related professionals (214); Life science professionals (221); Health professionals (except nursing) (222); College, university, and higher education teaching professionals (231); Secondary education teaching professionals (232); Primary and pre-primary education teaching professionals (233); Special education teaching professionals (234); Other teaching professionals (235); Archivists, librarians, and related information professionals (243); Social sciences and related professionals (244); Public service administrative professionals (247).
Creative professionals	Legislators, senior officials, and managers (1); Nursing and midwifery professionals (223); Business professionals (241); Legal professionals (242); Physical and engineering science associate professionals (31); Life science and health associate professionals (32); Finance and sales associate professionals (341); Business services agents and trade brokers (342); Administrative associate professionals (343); Police inspectors and detectives (345); Social work associate professionals (346).
Bohemians	Writers and creative or performing artists (245); Photographers and image and sound recording equipment operators (3131); Artistic, entertainment, and sports associate professionals (347); Fashion and other models (521).

Because of the special character of the bohemian occupations, we do not follow Florida's approach (2004), whereby bohemians are included in the creative core. Instead, we create a separate category specifically for them. Accordingly, we use two different definitions of the creative class. In a narrow sense (creative class A), it is the sum of the creative core and the creative professionals. The creative class B also includes the bohemians. After identifying the professional categories of the creative class, we are able to calculate their numbers in each country and region, thereby making use of national employment data that are provided by profession and by region around the year 2002[6]. Our results show that the creative class (including the bohemians) consists of about 26,327,588 persons in 2002, which comprises about 38 percent of the total work force in the eight European countries and about 16 percent of the total population. The total work force has been calculated in each country as the total number of workers who work at least half of the regular full-time employment hours per week. The creative professionals form the largest category (18,438,626 persons), followed by the creative core (6,764,318 persons). The size of the bohemians is comparatively small and amounts to 1,124,644 employees.

4. The regional distribution of the creative class in Europe[7]

As previously mentioned, Florida does not expect the creative class to be evenly distributed among cities and regions. In this section, we describe the spatial pattern of the creative class in the regions of the eight European countries[8]. First, we look at the spatial distribution for Europe as

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[6] The creative class data for Denmark refer to the year 1999, for Finland to 2000, for Switzerland and the UK to the year 2001, and for Norway to 2004. The work force data are for 2002, with the exception of Switzerland (2001).

[7] We are indebted to Florian Noseleit for his support in preparing the data and the figures.

[8] The total number of regions included in our analysis was 471. For the Netherlands (40 regions) and the UK (106 regions), data at the NUTS3 level were used. Because the NUTS3 regions for Germany are not always functional units, the analysis for this country is at the level of 93 planning regions, which are functional regions in the sense of travel to work areas and comprise at least one city and its surroundings (see Fritsch, 2007, for details). In Sweden, 70 city-regions were included in our analyses, which are defined as labor market regions (A-Regioner) based on travel to work patterns. The 25 Swiss

a whole. The descriptive statistics of the regional share of the creative class in overall employment (table 2) clearly indicate that the creative class is indeed highly unevenly distributed among European regions. For example, the lowest share of the creative class including the bohemians (creative class B) is 2.85 percent, while the maximum value amounts to more than 33 percent. The share of bohemians varies between about zero and four percent.

Table 2: Descriptive statistics for the distribution of the creative class among European regions in 2002, as percentage of overall employment

	Mean	Median	Minimum	Maximum	Standard deviation
Creative core	3.43	3.50	0.22	8.69	1.58
Creative professionals	9.15	8.57	2,59	20.58	3.44
Creative class A	12.58	12.18	2.84	29.27	4.80
Bohemians	0.46	0.36	0.0	4.09	0.39
Creative class B	13.03	12.67	2.85	33.36	5.09

Looking at the Gini coefficients[9] for the spatial distribution of population and different categories of employment (table 2), we observe that all creative class categories are more unevenly distributed among the European regions than population and employment. It is remarkable that

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regions (so-called agglomerations as defined by the Federal Swiss Statistical Office) are partly functional, partly structural in character. The data for Finland are at the level of 25 labor market regions that are combinations of NUTS4 regions. This regional level is provided for the purposes of regional planning and policy. The 77 Norwegian regions are so-called city-regions, which are NUTS4 regions or combinations of several NUTS4 for the larger cities. The 35 Danish regions are functional city-regions.

[9] The Gini-coefficient is a common measure to describe the degree of spatial concentration. It can assume values between 0 (even distribution) and 1 (concentration in one of the regions); cf. Krugman (1991).

employees with a bachelor's degree (or higher) and employment in high-tech industries[10] show an even higher degree of spatial concentration than the creative core and the creative professionals. The highest level of spatial concentration is, however, found for the bohemians. This result corresponds to similar findings for the US and Canada.

Table 3: Gini coefficients for the regional concentration of various employment categories in 2002

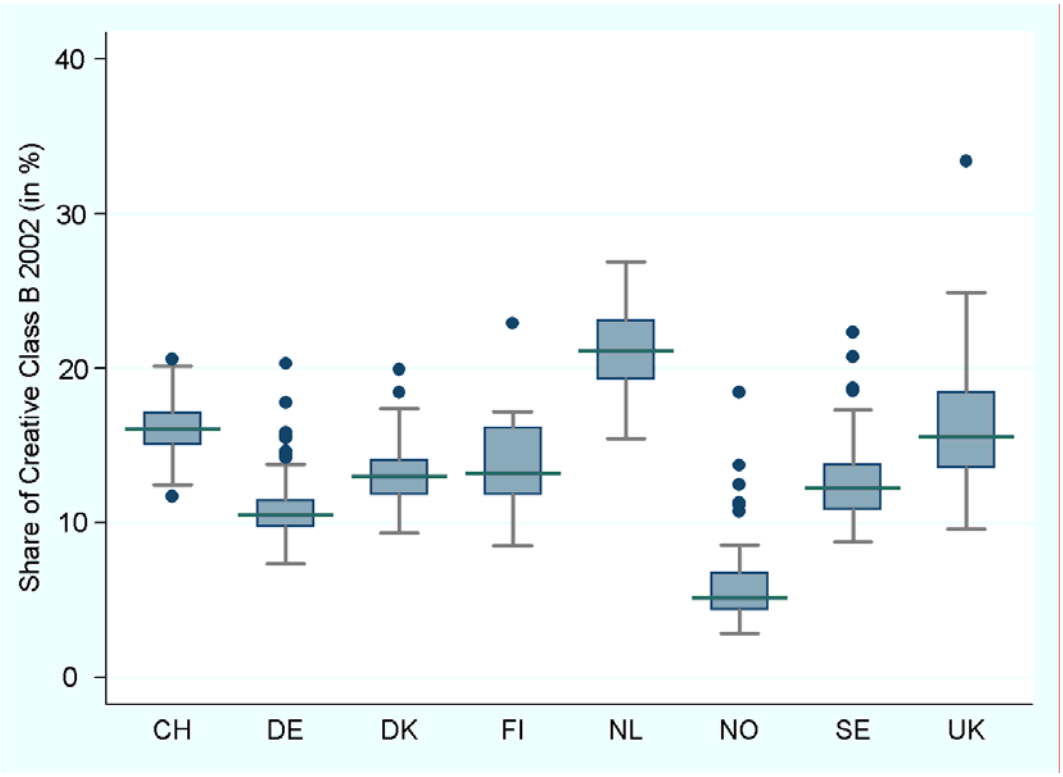
Creative core	0.6328
Creative professionals	0.6250
Creative class A	0.6257
Bohemians	0.7179
Creative class B	0.6291
Population	0.5904
Employment in private sector	0.5919
Employees with bachelor's or master's degree	0.6872
Employees in high-tech industries	0.6913

Another way of analyzing the spatial distribution of the creative class is to compare the shares of people in creative occupations in the total population. Figure 1 shows the spread of these shares within each of the European countries included in the database. The line in the middle of the shaded box indicates the median value. The shaded box indicates the values of the second and the third quartile (i.e., between the 25th and 75th percentile of the distribution). The lines extended from the boxes (whiskers) indicate the adjacent values. The adjacent values are calculated by utilizing the interquartile range (IQR), which is the difference between the first and third quartile values (Q3-Q1). The upper adjacent

[10] Following the definition of the Milken Institute (used by Florida as well), the NACE categories 244, 300, 321-323, 331-335, 341-343, 353, 642, 721-726, 731, 732, 742 and 743 have been classified as high-tech industries. NACE (*Nomenclature générale des ACtivités Economique*) is an international industry classification system.

value is the highest data value that is less than or equal to the third quartile plus 1.5 * IQR, while the lower adjacent value is the smallest data value that is greater than or equal to the first quartile minus 1.5 * IQR. Values exceeding the upper and lower adjacent values are termed outside values and are displayed as markers.

Figure 1: Spatial distribution of the share of the creative class (creative class B) occupations in total population in the European countries in 2002



As far as the overall creative class (defined as creative class B) is concerned, we observe in figure 1 some remarkable differences between the eight European countries. Broadly speaking, the Netherlands is well endowed with a creative class, while Norway is lagging behind. In the UK, one can observe the greatest differences between regions as far as the creative class is concerned, with the city of London as a major outlier. These results are confirmed in table 4, which presents the ten regions with the highest shares and the ten regions with the lowest shares of creative employment in the sample. The regions with the highest shares of creative

employment are found in the Netherlands and the UK, while the regions with the lowest shares are all located in Norway.[11]

Table 4: The ten regions with the highest share and the ten regions with the lowest share of the creative class occupations (creative class B) in total population in 2002

Regions with highest shares		*Regions with lowest shares*	
London Inner (UK)	33.36	Nord-Troms (N)	2.85
Gooi en Vechtstreek (NL)	26.85	Grong (N)	2.91
Aggl. Haarlem (NL)	26.84	Setesdal (N)	3.00
Utrecht (NL)	25.95	Høyanger (N)	3.33
Aggl. Leiden/Bollestreek (NL)	25.43	Nord-Gudbrandsdalen (N)	3.37
Surrey (UK)	24.87	Oppdal (N)	3.55
Groot-Amsterdam (NL)	24.86	Midt-Gudbrandsdalen (N)	3.55
Buckinghamshire (UK)	24.60	Brekstad (N)	3.56
Delft en Westland (NL)	24.54	Frøya/Hitra (N)	3.60
Berkshire (UK)	24.31	Surnadal (N)	3.69

If we take a closer look at the sub-categories of the creative class, a somewhat different picture emerges. With respect to the creative core (figure 2 and table 5), the Netherlands and Finland tend to have relatively high shares, followed by Denmark and regions in Sweden and the UK. By contrast, again Norway and, to a lesser extent Germany, are outperformed by the other countries.

Figure 2: Spatial distribution of the share of creative core occupations in population in the European countries in 2002

[11] The Norwegian regions with relatively low shares of employment in creative occupations are rather peripheral and smaller than peripheral regions in Finland or Sweden.

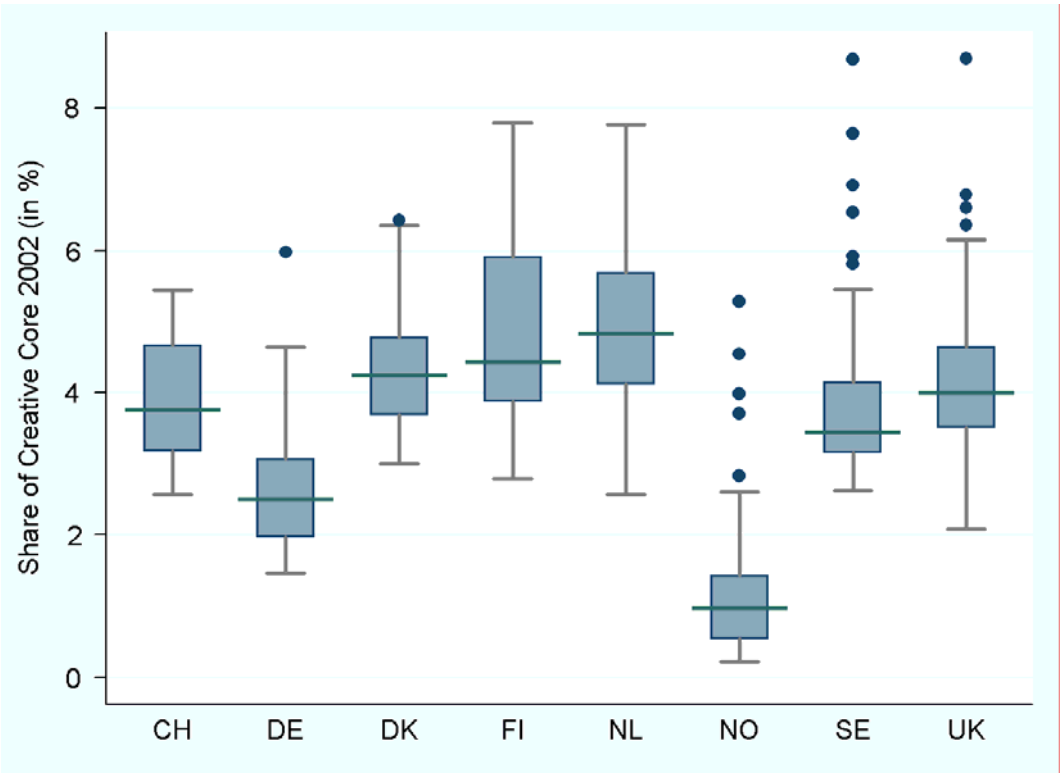


Table 5: The ten regions with the highest share and the ten regions with the lowest share of creative core occupations in population in 2002

Regions with highest shares		*Regions with lowest shares*	
London Inner (UK)	8.69	Nord-Troms (N)	0.22
Uppsala (S)	8.68	Surnadal (N)	0.23
Helsinki (F)	7.79	Brekstad (N)	0.29
Utrecht (NL)	7.77	Grong (N)	0.30
Linköping (S)	7.64	Midt-Gudbrandsdalen (N)	0.32
Aggl. 's-Gravenhage (NL)	7.49	Nord-Gudbrandsdalen (N)	0.34
Overig Groningen (NL)	7.18	Frøya/Hitra (N)	0.34
Oulu (F)	7.15	Setesdal (N)	0.36
Delft en Westland (NL)	7.08	Oppdal (N)	0.36
Jyväskylä (F)	6.93	Risør (N)	0.38

With respect to the share of bohemians, there are not drastic differences between the countries. As figure 3 shows, there is, however,

an immense difference between a limited number of top leading regions in various countries on the one hand, and the remaining part of the regions that score poorly on this indicator on the other hand. Seven out of the ten regions with the highest shares of bohemians are located in the UK, mainly in the London area and its surroundings (table 6). As with regards to other types of creative class occupations, Norwegian regions are lagging behind.

Figure 3: Spatial distribution of the share of bohemian occupations in population in the European countries in 2002

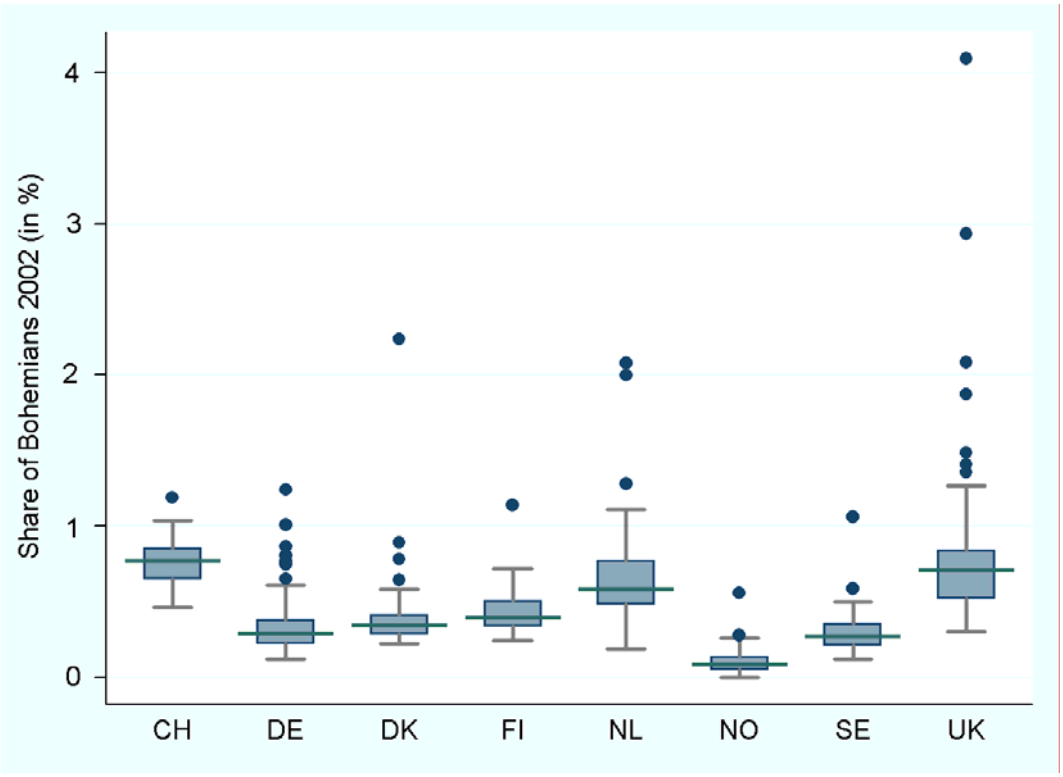


Table 6: The ten regions with the highest share and the ten regions with the lowest share of bohemian occupations in population in 2002

Regions with highest shares		*Regions with lowest shares*	
London Inner (UK)	4.09	Grong (N)	0.00
London Inner-East (UK)	2.93	Sandnessjøen (N)	0.01
Samsø (D)	2.23	Nord-Troms (N)	0.01
Brighton and Hove (UK)	2.08	Surnadal (N)	0.01
Aggl. Haarlem (NL)	2.08	Brønnøysund (N)	0.01
Groot-Amsterdam (NL)	2.00	Odda (N)	0.02
London-Outer West(UK)	1.87	Rørvik (N)	0.02
London-Outer South (UK)	1.48	Høyanger (N)	0.02
Oxfordshire (UK)	1.41	Frøya/Hitra (N)	0.02
Surrey (UK)	1.35	Florø (N)	0.03

5. What is the explanation for the uneven distribution of the creative class among European regions

The previous section has demonstrated that some regions in Europe have considerably higher shares of the creative class employment than other regions. For analyzing the reasons of this uneven distribution, we conduct multiple regressions that will allow us to asses the relative importance of the different factors[12].The dependent variable in these regressions is the regional population share of employees in creative occupations in the year 2002. Again, we divide the creative class into three categories, i.e., the creative core, creative professionals, and the bohemians because different explanations may be significant for these different types of creative occupations. Hence, we run various regressions separately explaining the European spatial pattern for each of these categories.

[12] Some authors have criticized Florida in that his argument would rest on suggestive correlations rather than causality (e.g., Peck 2005; Markusen and Schrock 2006). We believe that this is only partly true. There are a number of publications in which Florida conducted multivariate analyses to test a number of his theses, e.g., Florida (2002a, 2002), Lee, Florida, and Acs (2004), Knudsen, Florida, and Stolarick 2007).

Following Florida's (2004) hypothesis on the locational choice of creative people (section 2), we tested three types of influences on the share of creative occupations in each region. The first type of influence is *regional culture*, which is closely associated with particular cultural qualities of regions such as tolerance and openness[13]. Following Florida, we calculated two different indicators to account for this effect[14]. The first is the *share of the regional population that is in bohemian occupations* which, according to Florida (2004), should have a positive effect on the presence of other creative occupations. The idea behind this indicator is that a high proportion of bohemians indicates a kind of local culture, lifestyle, and set of values that are different from the mainstream. Being artistically creative, according to Florida (2004), bohemians add a meaning of liveliness to a location ('the place to be') and tolerance (openness to different lifestyles and values), which makes the region attractive for the two other types of categories of the creative class. The second measure is the share of foreign born people, which is expected to have a positive effect on the presence of creative occupations[15]. Following Florida (2004), this *openness index* is used as a proxy for the degree of open-mindedness, tolerance, cultural diversity, and openness to newcomers.

The second type of explanatory factors can be labeled *regional facilities.* It comprises two indicators that measure the regional provision of different kind of facilities, which can be expected to have a positive impact on the share of creative people in a region. Firstly, the *public provision*

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[13] It is fair to say that Florida (2004) was quite unclear on what he exactly meant by a climate of tolerance, and how that might be transformed into regional growth.

[14] Another indicator of a tolerant and open urban climate that has been applied by Florida in his analysis for the United States is the so-called Gay-index which measures "the over- or under-representation of coupled gay people in a region relative to the United States as a whole" (Florida 2004, 333). This type of index could not be calculated for the European countries due to a lack of data at the NUTS 3 level.

[15] This indicator is not without controversy. Especially in the current cultural and political climate in many European countries, a high degree of foreign born people in cities may be accompanied by a lack of tolerance. A better indicator might have been the rate of labour market participation of immigrants, because, among other things, it reflects how open the region is to absorb and integrate people of different descent and different cultures into the regional labor market. However, such an indicator was not available in the European countries at the regional level.

index has been measured by the share of the labor force working in public health care and public education (NACE codes 80 and 85). Secondly, the so-called *cultural opportunity index* is given by the share of workforce active in cultural and recreational activities. We have assigned these types of activities to the NACE codes 553 (restaurants), 554 (bars), 921 (activities in the field of film and video), 922 (radio and television), 923 (entertainment), 925 (libraries, public archives, museums, and other cultural activities) and 926 (sports). Following Florida, we expect that both kinds of facilities are highly appreciated by the creative class. For analytical reasons, we have excluded those professions from the creative class that could be associated with these two indicators in order to empirically disentangle the dependent from the independent variables.

The third factor that might explain the share of creative occupations in a region is its economic condition, particularly the employment opportunities in the regional economy. We measure the economic condition of a region by its *annual employment growth rate* in the preceding ten years (1993-2002), indicating job opportunities in a region. We expect to find a positive sign for this variable because job growth may attract creative people to a region ('people follow jobs'). However, if the locational decisions of the creative class are mainly governed by other regional characteristics, the effect of the preceding employment growth should be relatively small.

Population density is included as a 'catch-all' variable for all kinds of regional factors such as land prices, wage levels etc., which tend to be associated with this indicator. In particular, the results for this variable will show the effect of an urban atmosphere *per se* as compared to a cultural climate on the presence of creative people in a region.

To control for country-specific differences (e.g., with regard to the measurement of creative occupations), we included *country dummies* into

the models.[16] With the exception of these country dummies and the variable regional employment growth, all variables have been entered in logarithmic form (ln) due to a better fit with distributional assumptions of the linear regression model. Table 7 provides some descriptive statistics for the variables included in the analysis.

Table 7: Descriptive statistics for variables

Variable	*Mean*	*Median*	*Minimum*	*Maximum*	*Standard Deviation*
Share of creative core(ln)	1.074	1.252	-1.529	2.163	0.659
Share of creative professionals (ln)	2.137	2.149	0.953	3.024	0.407
Share of the creative class (ln)	2.446	2.500	1.045	3.377	0.443
Share of bohemians (ln)	-1.112	-1.032	-5.048	1.409	0.907
Openness index (ln)	1.674	1.674	-0.724	4.018	0.770
Public provision index (ln)	2.144	2.248	1.155	3.000	0.414
Cultural opportunity Index (ln)	0.276	0.256	-1.061	2.637	0.561
Employment growth 1993-2002	1.076	0.875	-2.780	8.232	1.531

Table 8 shows the results of the regression analyses. We give the standardized regression coefficients (beta coefficients) here that allow a

[16] The results for these country-dummies are not reported here due to space-limitations. To account for the differences that still exist between East and West Germany (Fritsch 2004), we included separate dummies for the two parts of the country.

direct comparison of the relative importance of the different variables (Greene 2003). A key finding of these analyses is that the share of bohemians in a region has a considerably positive impact on the share of creative core and creative professional employment. We have, however, to be cautious in interpreting this result because the share of bohemians shows a high correlation (0.66) with the other indices of the creative class (see correlation matrix in table A1 in the Appendix)[17]. Moreover, there is also a high correlation between the share of bohemians and the cultural opportunity index (0.63). Because the presence of bohemians could be a result of rich employment opportunities in cultural industries as indicated by the cultural opportunity index, all regressions have been run in three versions. While model I contains all variables, the share of bohemians is omitted in model II, while model III includes the bohemians but leaves out the cultural opportunity index. The differences between the coefficients in the three models indicate that there is, indeed, an effect of this statistical relationship resulting in a considerably higher coefficient for the cultural opportunity index if the share of bohemians is omitted (model II). Comparing the results of the different models indicates, however, that the impact of the share of bohemians is considerably stronger than that of cultural opportunity.

The results of the regression analyses tend to confirm almost all of our expectations. First, the outcomes clearly show that there is a close relationship between the presence of bohemians and the other categories of the creative class at the regional level in Europe. Even if the cultural opportunity index is included, the beta coefficients for the share of bohemians assume the by far largest value of all coefficients in the model. The openness index has the expected positive impact on the presence of the creative class, but the effect is relatively small. We can, therefore,

[17] Due to differences between the countries with regard to the definition and measurement of indicators, we calculate partial correlations with the county dummies as control variables.

Table 8: Regressions for explaining the share of creative population

	Creative core (ln)			*Creative professionals (ln)*		
	I	II	III	I	II	III
Share of bohemians (ln)	.5378** (7.95)	–	.5485** (9.05)	.4118** (6.51)	–	.4516** (8.40)
Openness index (ln)	.0817 (1.89)	.1815** (4.09)	.0267 (0.61)	.0889* (2.57)	.1675** (4.38)	.1115** (2.93)
Public provision index (ln)	.2226** (3.85)	.2075** (3.02)	.2991** (6.06)	-.1117* (2.50)	-.1195* (2.17)	-.0958* (2.53)
Cultural opportunity index (ln)	.0078 (0.15)	.2742** (4.86)	–	.0828 (1.86)	.2862** (6.97)	–
Employment growth 1993-2002	.0931** (2.90)	.1681** (4.67)	.1238** (4.18)	.2170** (5.97)	.2731** (6.45)	.2218** (6.22)
Population density (ln)	.0050 (0.10)	.0984 (1.61)	.00099 (0.19)	.0613 (1.41)	.1294** (2.58)	.0690 (1.61)
R^{2adj}	0.8447	0.7946	0.8404	0.8961	0.8671	0.8941
F-value	129.86**	103.93**	134.81**	213.49**	198.26**	230.26**
No. of observations	443[a]	444[a]	468	443[a]	444[a]	468

Notes: Beta coefficients, robust estimates (t-values in parentheses); country dummies included; a: Switzerland missing; * statistically significant at the 5%-level; ** statistically significant at the 1%-level.

conclude that a regional climate of culture and openness tends to attract members of the creative class. Quite surprisingly, the public provision index that indicates the level of supply in health care and education only has a significantly positive effect on the regional share of creative core employment. For creative professionals, it is significantly negative, while for the creative class (A) as a whole, it is insignificant. Thus, the provision of public facilities in health care and education appears to have only a minor, if any, impact on the presence of the creative class.

Table 8 (continued)

	Creative class A (ln)			*Bohemians (ln)*	
	I	II	III	I	II
Share of bohemians (ln)	.4613** (7.70)	–	.4949** (9.64)	–	–
Openness index (ln)	.0938** (2.88)	.1812** (4.95)	.0874* (2.51)	.2102** (5.75)	.3432** (9.23)
Public provision index (ln)	.0096 (0.23)	-.0005 (0.01)	.0516 (1.49)	-.0143 (0.27)	.2109** (4.40)
Cultural opportunity index(ln)	.0647 (1.52)	.2926** (6.77)	–	.4944** (10.19)	–
Employment growth 1993-2002	.1929** (6.21)	.2560** (6.74)	.2091** (6.84)	.1377** (3.49)	.2158** (5.44)
Population density (ln)	.0375 (0.91)	.1447* (2.29)	.0447 (1.08)	.1369** (2.81)	.1337** (2.52)
R^{2adj}	0.9009	0.8641	0.8994	0.8245	0.7757
F-value	226.08**	195.78**	238.48**	117.32**	102.97**
No of observations	443[a]	444[a]	468	443[a]	468

Notes: Beta coefficients, robust estimates (t-values in parentheses); country-dummies included; a: Switzerland missing; * statistically significant at the 5%-level; ** statistically significant at the 1%-level.

According to the beta coefficients, the annual employment growth in the preceding years in a region has the second largest impact on the regional share of creative occupations. This effect is relatively low for the creative core and the bohemians, but quite pronounced for the creative professionals and the overall creative class (A). This result indicates that a location's atmosphere that is characterized by factors such as openness, cultural opportunity, and presence of bohemians is of higher importance.

Finally, population density seems to only have a positive impact on the presence of bohemians. By contrast, it shows no effect on the other

indicators of the creative class. This result suggests that the creative core and the creative professionals are not attracted to highly urbanized regions *per se*, but to those regions that can provide a particular cultural climate.

6. The effect of talent and creative class on regional growth in Europe

Our analyses have shown that the creative class tends to concentrate in certain regions in Europe, while it comprises only a rather small share in many other regions. To what extent does this matter economically? We assess the effect of the creative class on regional growth in Europe, controlling for other factors. In particular, we control for the effect of the educational level of the population to account for Glaeser's (2004) critique as explained in section 2. We test whether education (or the Talent index, as stated by Florida) reduces the positive impact of the creative class on regional growth (Glaeser 2004)[18]. We cannot present an extended regional growth model due to missing data for many of the European countries at the regional level. Therefore, we have to restrict ourselves to simple regressions.

An analysis of the effects of the creative class on regional growth requires data for distant preceding time periods, which have to be related to indicators of economic development of regions over the subsequent years. Unfortunately, such information is not available for most of the European countries; thus, this type of analysis has to be restricted to Germany and the Netherlands, covering 133 regions. These two countries provide indicators for the qualification of the regional workforce, the creative class in the year 1996 as well as for regional employment change over the 1996-2002 period. The talent indicator has been constructed on the basis of the International Standard Classification of Education (ISCED

[18] We did not account for the economic effects of consumption behavior of the creative class members due to a lack of data. This could, however, be an extremely important effect, as creative class members do not only have more than average incomes, but also they are more likely to spend most of their income in their place of residence as a result of their life styles.

1997). Group 5A and 6 of this classification can be associated with the level of bachelor's degree or higher, and we have assigned these categories to the national statistics in Germany and the Netherlands. The talent indicator measures the share of people in a region with a bachelor's degree or higher. In these regressions, we include separate dummy-variables for East and for West Germany in order to account for the obviously different growth regimes in the two parts of the country. Population density is included as a control variable for all kinds of regional effects.

The results are summarized in table 9. If no indicator for creative class is included in the regression (model I in table 9), the effect of talent (measured as the share of employees with a tertiary degree or higher) on subsequent employment growth is positive. In a model that contains the creative class but not talent, the positive impact of creative people is, however, much stronger than that of the qualified workforce (model II). Including talent as well as indicators of the creative class clearly show a highly significant impact of creativity, while the talent indicator remains largely insignificant (models III – VII). Although there is some considerable correlation between talent and the various creative class indicators (see table A1 in the Appendix), the results of the regression analysis clearly suggest that creativity is more significant than education[19]. The type of profession in which people acquire and apply their knowledge obviously plays a significant role for economic development. This holds for all sub-categories of the creative class. Finally, it is interesting that the economic effect of population density remains negative, suggesting that employment

[19] This result is quite similar to what was found in a study of 50 Dutch cities (Marlet and Van Woerkens 2004). Employment growth in those cities for the 1993-2004 period could be attributed to both the level of education and the share of the creative class, but especially to the latter. Partly based on these results, Marlet and Van Woerkens (2004) conclude that Florida just proposed a better indicator for human capital because creative capital accounts for what people do (i.e., using their skills and knowledge in a creative manner), rather than what people just know (as proxied by educational level). Coupling human capital with creativity in such a way, creativity and human capital become more closely connected to regional growth.

growth in the more urbanized regions has been rather poor during the period of analysis.

Table 9: The effect of the creative class and talent on regional development 1996 – 2002 in the Netherlands and Germany

	I	II	III	IV	V	VI	VII
Talent 1996 (ln)	6.961** (3.80)	–	1.532 (0.61)	1.366 (0.51)	4.393* (2.04)	3.546 (1.85)	0.848 (0.34)
Creative class A 1996 (ln)	–	19.553** (4.95)	17.138** (3.06)	–	–	–	–
Creative core 1996 (ln)	–	–	–	9.277** (2.78)	–	–	–
Creative Professionals 1996 (ln)	–	–	–	–	10.900* (2.17)	–	–
Bohemians 1996 (ln)	–	–	–	–	–	4.696** (4.09)	–
Creative class B 1996 (ln)	–	–	–	–	–	–	18.665** (3.38)
Population density 1996 (ln)	-2.138** (2.91)	-1.527* (2.42)	-1.743* (2.41)	-2.484** (3.41)	-1.704* (2.27)	-3.147** (4.27)	-1.836* (3.58)
Constant	7.399 (1.26)	-46.966** (3.17)	-41.869* (2.46)	7.586 (1.33)	-25.398 (1.57)	24.334** (3.53)	-45.377** (2.74)
R^2	0.835	0.8459	0.845	0.843	0.840	0.853	0.847
F value	167.93**	182.08**	145.02**	142.96**	139.18**	154.25**	147.59**
No. of observations	133	133	133	133	133	133	133

Notes: * statistically significant at the 5%-level; ** statistically significant at the 1%-level. Coefficients of dummies for location in East and West Germany have been omitted.

Having shown the importance of the creative class for regional growth, the causation of this effect remains unknown. Florida (2003, 40; 2004, 8) argues that artistic/cultural creativity, technological creativity (= innovation), and economic (= entrepreneurship) creativity are interlinked

and reinforce each other. This suggests that there should be a positive relationship between creativity, new business formation, and innovation.

In order to test this conjecture, we first examine four European countries at the regional level to find out whether there is a statistical relationship between talent (share of employees with tertiary degree), creative class (share of employees in creative occupations), and new business formation (Lee et al. 2004). Data for this type of analysis were available for Finland, Germany, Norway, and Sweden. We made a distinction between new business formation in general and new business formation in high-tech industries. Start-up rates have been measured as the number of start-ups per 1,000 inhabitants in the year 2002. As expected, we found a significantly positive correlation between talent, creative class, and start-up rates at the regional level in the four European countries (table 10). This correlation is particularly close for start-ups in high-tech industries. Broadly speaking, the rank correlations between the creative class indicators and new business formation are higher than for the relationship between start-up activity and the talent indicator. Exceptions are Germany, where we basically found no difference, and Sweden, where talent shows a higher correlation with the overall start-up rate, as compared to the creative class indicators.

Finally, in order to test the relationship between talent, creative class, and innovation, we used patent data that were available at a regional level only for the German regions in the 1996-2000 period. Table 11 shows a positive relationship between the level of qualification, creative occupations, and the number of patents per 10,000 inhabitants.[20] Talent seems to matter slightly more than the creative class indicators, but the difference is not very large. A plausible explanation is that patent data are probably not the best indicator for measuring innovation in regard to the

[20] Because it is implausible to assume that creativity immediately leads to inventions, a time lag of three years was assumed between the creativity indicator and the patent application. The data on patents have been taken from Greif and Schmiedl (2002). Patents have been assigned to the residence of the inventor.

Table 10: Rank-correlations between the share of employees with tertiary degree, in creative occupation, and the regional start-up rate in 2002 in four European countries

	Share of employees with tertiary degree	Share of creative core	Share of creative professionals	Share of the creative class A	Share of bohemi-ans
Finland (25 regions)					
Start-up rate, overall	0.4162*	0.4638*	0.7400**	0.6238**	0.5985**
Start-up rate, high-tech	0.7866**	0.8005**	0.8941**	0.8945**	0.7762**
Germany (92 regions)					
Start-up rate, overall	0.4470**	0.4447**	0.2857**	0.3725**	0.4140**
Start-up rate, high-tech	0.5213**	0.5511**	0.5818**	0.6019**	0.5491**
Norway (77 regions)					
Start-up rate, overall	0.3651**	0.2848*	0.3981**	0.3773**	0.5342**
Start-up rate, high-tech	0.4220**	0.5005**	0.6396**	0.6162**	0.5283**
Sweden (70 regions)					
Start-up rate, overall	0.3411**	0.1180	-0.0156	-0.0048	0.1393
Start-up rate, high-tech	0.5909**	0.7242**	0.6381**	0.6927**	0.7362**

Notes: Spearman rank-correlation coefficients. * statistically significant at the 5%-level; ** statistically significant at the 1%-level.

creative class because many members of the creative class are active in sectors (such as services and low-tech sectors) that do not have a high

patent intensity. Remarkably, the correlation coefficient for the relationship between the share of bohemians and the number of patents per 10,000 inhabitants is not statistically significant; i.e., the link between the presence of artistic occupations and patenting is rather weak.

Table 11: Rank-correlations between the share of employees with a tertiary degree, in creative occupation, and the number of patents per 10,000 inhabitants in German regions during the 1996-2000 period

	Share of employees with a tertiary degree	Share of creative core	Share of creative professionals	Share of the creative class A	Share of bohemians
Number of patents per 10,000 inhabitants	0.1981**	0.1133*	0.1434**	0.1353**	0.0691

Notes: Spearman rank-correlation coefficients. * statistically significant at the 5%-level; ** statistically significant at the 1%-level. Pooled data set over five years (474 observations).

7. Conclusion

The results of our analysis based on a unique data set of more than 450 regions in eight European countries tend to confirm most of the hypotheses suggested by Florida in regard to the creative class and its effects on regional development. There is strong empirical evidence that the creative class is highly unevenly distributed across Europe. The regression analyses clearly showed that a regional climate of tolerance and openness has a positive effect on the regional share of the creative class. The creative class is not attracted to highly urbanized regions *per se*. The provision of public facilities in health care and education has only a minor, if any, impact on the presence of the creative class. The effect of regional job growth on the creative class is quite large, though. We also found in a number of European countries that the creative class has a significantly positive effect on regional employment growth and on new firm formation. Furthermore, creativity was more significant than educational level in regard to regional employment growth.

Overall, our data suggest that a high share of the creative class in a region is associated with regional growth. However, we need a more careful analysis in order to obtain a better understanding of the relevant relationships. It is no question that that better indicators to measure creativity are a prerequisite for accomplishing such a task (Rantisi and Leslie 2006). Particularly, studies are needed that account for all three types of creativity as mentioned by Florida (2004): creativity in the artistic, technological (innovation), and economic (entrepreneurship) sphere. We need to define more precisely, for instance, which workers are really creative, in order to link them more directly to the other variables in the analysis.

Such studies should also try to better understand the relationship between creativity and education, as well as the role of knowledge spillovers. As mentioned before, human capital (including the role of knowledge spillovers) and creative capital are two different explanations for regional growth that have to be disentangled in empirical analyses. The question whether the local presence of highly educated and creative people *per se* contributes to regional growth, or whether their presence generates localized knowledge spillovers, with an additional effect on regional growth needs to be clarified in empirical analyses. Conducting a patent analysis, Bettencourt et al. (2004) conclude that cities in the US are more innovative because they happen to house a disproportionately large number of inventors, causing them to be more productive due to the mere presence of local knowledge spillovers. Another possible extension of the analytical framework is to include the effect of the sectoral composition of regions in addition to population characteristics, such as their educational and creativity level. This would afford the control for the effects of localization economies and Jacobs' externalities.

Another important field for further research is to provide more evidence for the relationship between a climate of tolerance, the presence of the creative class, and regional growth. First of all, we need better indicators to measure a climate of tolerance or culture of openness. For instance, regional unemployment rates among foreign-born or non-

Western people could provide an indication of the extent to which the regional community is open to newcomers and how well they are integrated in the local labor market. Secondly, we need to better specify through which mechanisms a regional climate of tolerance may affect regional growth and in what ways such a climate could be created by public policy (Peck 2005). Thirdly, a more dynamic perspective to this topic should be taken instead of assuming that creativity is just imported by members of the creative class (Scott 2006). Therefore, we need to explore how creativity and cultural openness are further developed and enhanced in particular places through the evolving relationships between creative workers at their place of work and during social events.

In conclusion, there is a strong need to take up these research challenges in the future before we can draw final conclusions concerning the relationship between creativity and regional growth.

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Appendix

Table A.1: Correlation matrix of variables – partial correlations controlling for country-specific effects

	Creative professionals (ln)	Creative class (ln)	Bohemians (ln)	Talent index (ln)	Public provision index (ln)	Cultural opportunity index (ln)	Openness index (ln)	Yearly employment change 1993-2002	Population
Creative core(ln)	0.6497**	0.9863**	0.6595**	0.8334**	0.3835**	0.4504**	0.3788**	0.2774**	0.3416
Creative professionals (ln)	1	0.9533**	0.5829**	0.6906**	0.0485	0.4012**	0.3693**	0.3990**	0.3727**
Creative class (ln)		1	0.6290**	0.7816**	0.1742**	0.4367**	0.3873**	0.3799**	0.3652**
Bohemians (ln)			1	0.8135**	0.2667**	0.6258**	0.4654**	0.3000**	0.4117**
Talent index (ln)[a]				1	0.3887**	0.2214**	0.3135**	0.1325**	0.3216**
Public provision Index					1	0.2566**	0.0701*	-0.0364	0.0790*
Cultural opportunity index (ln)[b]						1	0.2423**	0.1851**	0.2013**
Openness index							1	0.1916**	0.6214**
Yearly employment change 1993-2002								1	0.2168**

Partial correlations controlling for county-specific effects (country dummies). [a] Data for UK and Switzerland are missing. [b] Data for Switzerland are missing.