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Factors explaining the spatial agglomeration of the Creative Class – Empirical evidence for German artists

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Abstract:

The paper contributes to the on-going debate about the relative importance of economic and amenity-related location factors for attracting talents or members of the creative class. While Florida highlights the role of amenities, openness, and tolerance, others instead emphasize the role of regional production systems, local labour markets and externalities.

The paper sheds light on this issue by analysing changes in the spatial distribution of four groups of artists over time: visual artists, performing artists, musicians, and writers. Little evidence is found for amenity-related factors influencing the growth rates of regional artist populations. Moreover, artists are shown to be a heterogeneous group inasmuch as the relative importance of regional factors significantly differs between artist branches.

Keywords: Artists, bohemians, creative class, spatial dynamics, amenities, agglomeration.

JEL Classifications: O31, O18, R12

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1 Introduction

There is an on-going debate about the creative class, creative industries, and creative regions. These notions are indivisibly connected to Richard Florida's work. Florida (and followers) highlight amenities, openness, and tolerance as key factors behind the geographic mobility and regional agglomeration of creative people (Florida et al. 2008; Florida & Mellander, 2010; Florida, 2002a, 2002b). The role of amenities is thereby of particular interest to us because recently they have been used to explain increasing urban economic and population growth (Clark, et al. 2002; Glaeser et al. 2001). This stimulated investments into amenities, which then became a fashionable policy tool which was to attract talented and creative people. Florida's concept of the creative class is frequently criticised, however (Glaeser, 2005; Markusen, 2006; Peck, 2005; Scott, 2010; Storper & Scott, 2008), and the very broad, one may even say 'fuzzy', definition of the creative class in particular has raised criticism.

While there is considerable empirical evidence backing Florida's hypotheses, it primarily relates to U.S. metropolitan areas (Florida et al., 2008; Florida & Mellander, 2010; Florida, 2002a). Some empirical studies focus on regions outside the U.S. For instance, Fritsch & Stuetzer (2009); Krätke (2010); Mossig (2011); Möller & Tubadji (2004) and Wedemeier (2010) investigated these issues for Germany.

In order to test Florida's hypotheses, most existing studies closely follow his approach in the empirical assessment. However, this implies that the broadness of Florida's theory frequently blurs the empirical findings as well (Marrocu & Paci, 2012). In addition, in the empirical investigations many studies apply static approaches and ignore the inherently dynamic nature of spatial agglomeration processes.

The present study aims at overcoming some of these shortcomings. Firstly, in contrast to most existing studies we adopt an occupational approach to Florida's concept of the creative class and focus on subgroups. This allows for sounder theoretical discussions and empirical investigations. In accordance with this, the spatial distribution and the spatial dynamics of four groups of artists are analysed: visual artists, performing artists, musicians, and writers.

Secondly, in addition to factors put forward by Florida (e.g., amenities, openness, and tolerance), we consider a broad array of economic factors that are known to influence the mobility and growth of human capital. In this sense, Florida's hypotheses are confronted with concepts emphasising regional productions systems, local labour markets and externalities (see Storper & Scott, 2008; Storper & Manville, 2006).

The paper focuses on the following four questions:

1. How are artists distributed across German regions?
2. How does their distribution change over time?
3. What factors explain the variation in the regional growth rates of artist populations?
4. To what extent can sub-groups of artists explain why their distribution, growth rates, and other factors differ?

We seek to answer these questions using quantile regressions and a unique data set covering 412 German regions for the years 2007 to 2010.

The results show that population growth, universities, crime rates and externalities explain the agglomeration of artists in regions. More precisely, population growth and localization externalities are found to be two central determinants which influence the growth of regional artistic populations. It is also shown that some branches of artists (e.g., visual artists and writers) experience negative growth effects when these artists are over-proportionally present with respect to their share on the total regional population. Accordingly, our study identifies considerable heterogeneity within the group of artists when it comes to factors explaining their regional agglomeration over time.

The paper is structured as follows. The next section lays out the theoretical background on the agglomeration of the creative class in space. Section 3 introduces the data and the empirical approach. The results are presented and discussed in Section 4. Section 5 concludes the study.

2 Theoretical considerations

The debate about the creative class has received considerable attention in the Economic Geography literature. Florida (2002a, 2005, 2006, 2008) prominently argues that the agglomeration of members of the creative class in particular regions can stimulate its economic development and prosperity. He puts forward the concept of the *3 Ts* to describe the relationship between tolerance, talents, and technology. The starting point of the chain of arguments is an open and tolerant climate in urban and amenity-rich places. This climate then attracts members of the creative class which are highly mobile and react to this stimulus by migrating. Subsequently, the resulting geographical agglomeration of members of the creative class draws high-tech-companies seeking human capital to the region, which in turn leads to higher start-up rates of technology-based companies. Members of the creative class might even begin the latter themselves. As a result, a cumulative process of knowledge and technology-based growth is induced (Florida, 2002a).

Consequently, researchers try to understand the reasons behind variations in the agglomeration of members of the creative class across regions. Studies dealing with this issue

can broadly be attributed to two different streams of literature. On the one hand, there are the studies building on the ideas of Richard Florida, and these particularly emphasise the role of certain amenity-related factors. In contrast, there is a more traditional view which sees economic factors relating to the structure of regions' economies and population as the primary driving forces for the agglomeration of the creative class (Asheim & Hansen, 2009; Storper & Manville, 2006; Storper & Scott, 2008). We will first present Florida's arguments in more detail before coming back to this literature. Some of the arguments relate to the creative class in general, while others are related to artists – which are subject to our empirical analyses – in particular.

2.1 *Amenity-related and tolerance factors*

Florida argues that members of the creative class prefer to live in regions showing a number of characteristics, which means these regions are more likely to be subject to an agglomeration of creative people over time. In particular, this includes an open and tolerant climate and amenities. In Florida's view, tolerance reflects "*low barriers to entry for human capital*" (Florida, 2002b, p. 750). A tolerant environment is open to new ideas and entrepreneurs, and this means that it attracts human capital in general, but especially creative people who need such an environment to constantly develop new and unconventional ideas. In addition, Florida claims that creative people are eccentric people who may have faced discrimination themselves. They seek communities with people that share their values, or that are at least open-minded. The values include self-expression, sexual norms, gender roles, and ecological awareness, which are all characteristics of tolerant societies (Florida, 2002a). He argues that tolerance helps to attract human capital, accelerates spill-overs and human capital externalities and reflects an environment that is risk oriented and associated with self-expression (Florida et al., 2008).

Another dimension is the tolerance towards foreigners. Florida (2002a) generally finds a positive correlation between the concentrations of foreign-born population members and creative class members, but negative correlations with respect to the share of the non-white population. However, research by Putnam (2007) shows that ethnic diversity does not necessarily indicate tolerance. In the short run, ethnic diversity even fosters intolerance and lowers trust, altruism, and community cooperation. Only in the long run can societies benefit from social integration. Navarro et al. (2012) confirm this by identifying a negative effect of the share of foreigners on the concentration of the creative class in Spanish municipals.

Another factor that is particularly important and conducive for a creative milieu is social capital. Artists heavily rely on (local) social interaction and trust to exploit their creativity

economically (Banks et al. 2000; Currid, 2010; Eikhof & Haunschild, 2006), making social capital an attractive regional characteristic.

Amenities matter in a similar fashion. “ ‘Amenity’ can mean many things, including good weather, a shore-line, ethnic diversity (or its absence), options for dining and entertainment, cultural offerings and aesthetically beautiful architecture.” (Storper & Manville, 2006, p. 1252). Florida argues that these amenities have a crucial influence on the location decision of creative people. They desire self-fulfilment economically, but at the same time appreciate leisure (Florida 2002a).

2.2 Economic factors

Contrasting these amenity-related factors are economic location factors that influence the spatial distribution of the creative class and its dynamics. For some time these have been highlighted in concepts of regional productions systems, local labour markets, and externalities (see Storper & Scott, 2008; Storper & Manville, 2006).

The first, and somewhat, trivial reason for variations in the distribution of the creative class is the none-uniform distribution of the population. Naturally, highly populated cities are, all things being equal, home to more members of the creative class in absolute terms than smaller cities. What is more important is that the relationship between the population size and the presence of the creative class can induce different types of localization externalities. This may cause the spatial distribution of the creative class to differ from that of the general population.

The most important effects in this respect are related to localization / Marshal externalities (see Beaudry & Schiffauerova, 2009). These externalities may be subject to a critical mass effect: if and only if the absolute number of the creative class exceeds a certain threshold positive localization externalities may unfold. One may think of potential knowledge spill-over, shared institutions, shared supplier and customer pools, and the benefits of local competition in this respect.

Related but not identical to this are localization externalities induced by the relative number of members of the creative class, meaning the relationship between the absolute number and a region’s population matters¹. Diametrical effects are possible in this case. On the one hand, a high relative agglomeration can foster knowledge spill-over effects, the awareness of creative communities and their political power (Currid, 2010). On the other hand, competition and rivalry for customers, suppliers and resources (e.g. public funding of arts) may rise as a consequence of an increasing relative agglomeration (Hauge & Hracs, 2010). Since some

¹ Following Brenner (2006) we call the relative number of members of the creative class in relation to the overall population ‘relative agglomeration’.

members of the creative class (e.g. artists) tend to be less prosperous in terms of resources they may be highly sensitive to increasing factor prices – e.g. affordable spaces for galleries – as a consequence of high relative agglomeration (Peck, 2005).

In addition to localization, the creative class may also be subject to urbanization & Jacobs externalities (Jacobs, 1969). For instance, a larger absolute number of the creative class may go hand in hand with higher diversity. This in turn increases the creative potential of knowledge spill-over.

Another relevant demographic characteristic is the age structure of a region's population. For instance, Bader & Scharenberg (2010) highlight that younger populations are generally more open to new ideas and are potentially more interested in cultural and artistic activities. For this reason, a young population may offer a more attractive consumer structure for artists.

Another characteristic of the regional economic structure is the relevance of tourism. Tourism is associated with artists, who in general are known to attract tourists from outside the region (Currid, 2009). Many artists provide products and services which are consumed by tourists. These products and services can relate to high culture like opera, museums, and ballet or to popular culture like musicals, festivals and street culture. Accordingly, the higher demand for artists' products by tourists makes regions more attractive for some artists. The same applies to the general economic situation in a region, as regional income may determine the demand for the products and services of artists. However, artists seem to attach less importance to material aspects as they are more spatially mobile (Florida, 2002a; Markusen, 2006; Menger, 1999).

2.3 Research gaps

Both literature streams provide good arguments for certain regional characteristics to influence the spatial distribution of the creative class. We therefore simultaneously consider factors put forward in both streams. Given the existing empirical evidence on Florida's amenity-related factors, we expect these to be generally more relevant than the economic factors. This motivates the first hypothesis.

H1: Amenity-related location factors have a stronger relative importance for the spatial agglomeration of artists than traditional factors.

Section 2.2 highlights the idea that, from a theoretical point of view, localization externalities are either related to the absolute number of the creative class living in a region or to their relative agglomeration. Most existing studies model these externalities as being related to the

agglomeration of general economic activities – e.g. population density – in a region however (cf. Clifton et al. 2012; Lorenzen & Andersen, 2009).² Accordingly, there is still little empirical evidence on the source of localization externalities in this context, though we suspect it to be the most important factor among the economic factors. Hypothesis 2 takes this issue up:

H2: Localization externalities are the most important economic factor explaining the agglomeration of artists. These externalities emerge from the agglomeration of artists and not from the agglomeration of economic activity in a region.

When empirically testing the hypotheses, we also seek to overcome a number of weaknesses limiting many existing studies. The most important one relates to the definition of the creative class. Florida puts forward that members of the creative class “...engage in complex problem solving that involves a great deal of independent judgment and requires high levels of education of human capital” (Florida, 2002a, p. 8). In contrast to common approaches in the human capital literature, his definition is not based on individuals’ educational attainment, and instead he refers to the individuals’ occupation. Therefore the definition is based on what people do instead of what they know. Moreover, Florida divides the creative class into two groups. Members of the *Super-Creative Core* belong to professions like scientists, engineers, university professors, artists, designer etc. They are “...producing new forms or designs that are readily transferable and widely useful...” (Florida, 2002a, p. 69). The second group consists of workers in knowledge-intensive industries, financial services, legal services, health care, and business management. This group is called *creative professionals*. Their creativity shows in their ability to solve specific problems in everyday business (Florida, 2002a).

This straightforward conception is especially appealing to practitioners from economic or urban development agencies. However, it is subject to severe criticism within the scientific community. These critics in particular refer to the ‘fuzzy’ definition of who belongs to the creative class.

For instance, Markusen (2006) argues that Florida conflates creativity with high levels of education. In addition, Glaeser (2005), using simple regression models, shows that a variable for education attainment outperforms the creative core variable in explaining regional economic growth.

² A potential reason for this might be the lack of longitudinal data, which is a requirement for such analyses.

Florida's definition of the creative class is also problematic from an occupational point of view. It includes occupational subgroups that are arguably creative like dental hygienists, but it does not consider marine engineers. Moreover, the creative class is very heterogeneous, making common spatial behaviours or similar economic effects unlikely. Due to this heterogeneity, Markusen (2006) even refuses to call it 'class' in the sociological or political conception. *"Corporate lawyers are conservative while trial lawyers are liberal; engineers tend to be moderate to conservative, and artists more liberal."* (Markusen, 2006, p. 1924). Using Florida's definition of 'creative class' consequently makes it difficult to *"...disentangle which effects on local performances are due to their creativeness and which to their education."* (Marrocu & Paci, 2012, p. 371).

In the empirical investigation we therefore focus on just one particular subgroup of the creative class, namely artists. Artists are undoubtedly creative and members of Florida's creative class: *"... the presence of a significant bohemian concentration signals a regional environment or milieu that reflects an underlying openness to innovation and creativity. This milieu is both open to and attractive to other talented and creative individuals"* (Florida, 2002b, p. 56).

One may even say that (artists or bohemians) pioneer the preferences of the whole (however being defined) creative class (Lorenzen & Andersen, 2009).

Despite being a subgroup of the creative class, artists are still heterogeneous from an occupational point of view. They are subject to a variety of production and consumption schemes. For instance, visual artists and writers can easily transport their work over distance, whereas for musicians and performing artists – at least partly – co-location to their consumer (i.e. their audience) is a necessity. Writers and visual artists frequently work on their own. In contrast, performing artists and musicians usually need to cooperate and build teams in order to become successful (Markusen, 2006). Such differences in production and consumption schemes are likely to have severe implications for artists' spatial behaviour. For instance, it seems reasonable that visual artists and writers are most free in their location decisions, while musicians and performing artists are more likely to prefer to be close to other artists.

In summary, we follow Florida in that the creative class has a specific economic value that is primarily related to what they actually do and less related to its members' formal education, however, at least in the empirical analyses, it is essential to consider the specifics of the production and consumption schemes that artists are subject to. This is because these schemes define incentives and boundaries to individuals' spatial behaviour. Artists are no exception in this respect. This motivates the third hypothesis of the paper.

H3: Specifics of production and consumption schemes shape the spatial agglomeration processes of artists. In the case of artists, these schemes particularly alter the influence of localization externalities.

3 Empirical approach and data

3.1 Dependent variables

Missing longitudinal data frequently constrains researchers to cross-sectional investigations, and these dominate the existing empirical research on the spatial agglomeration of the creative class (e.g., see, Boschma & Fritsch, 2009; Clifton, 2008; Florida et al., 2008; Fritsch & Stuetzer, 2009; Hansen, 2007). However, agglomeration processes are dynamic in their very nature, so cross-sectional analysis delivers only limited insights into these processes. Thanks to the availability of panel data, we follow the few existing studies that apply a dynamic approach (cf. Wenting, 2008; Wedemeier, 2010).

Econometrically, we seek to identify regional factors correlating to the growth of regional artist populations. We first estimate the growth rate of an artist population in region r on the basis of its relative annual (t) growth for each year between 2007 and 2010:

$$\Delta Artists_{t,r} = \frac{Artists_{t,r} - Artists_{t-1,r}}{Artists_{t-1,r}}$$

In order to reduce the effect of stochastic noise in the growth rates, we focus on the (normalized) mean growth rate from 2007 to 2010.

$$\Delta Artists_r = \frac{\sum_{p=1}^P (\Delta Artists_{p,r} - \Delta Artists_p)}{P}$$

with p indicating the period (2007-2008, 2009-2009, 2009-2010), P the number of periods, and $\Delta Artists_p$ as average growth of artists in Germany.

Information on the annual growth of artists is derived from data of the Social Security Insurance for Artists and Writers (*Künstlersozialkasse*). This organization was introduced in West Germany in 1983 and the new federal states in 1992. Its purpose is to integrate freelance artists and writers into the social insurance system by contributing to the members' premium for compulsory statutory pension, health, and long-term nursing care insurance. Members are visual and performing artists, musicians, journalists, and people teaching in these fields. Their activities have to be profit-oriented and they have to be recognized as an artist/writer in their professional community (Künstlersozialkasse, 2011).

Following Fritsch and Stuetzer (2009), we use German districts (Kreise) as units of observation. These regions represent the smallest spatial units for which such data is available. There are 412 of these administrative units in Germany in the year 2010.

For these 412 districts, we know the numbers of residing artists for each year between 2007 and 2010. The numbers can be disaggregated into four branches: visual arts, performing arts, musicians, and writers. Our data covers only a subsample of all German artists and writers, as we observe only self-employed artists, leaving all artists in dependent employment unobserved. By looking at those freelancers, we capture the (potentially) most mobile group of artists because their geographic mobility is not constrained by job-availability. Or, in the words of Markusen (2006): “*High levels of self-employment make plausible some of the claims made for creative class members – that they are more footloose and apt to choose a place to live before committing to employment or marketing efforts.*” (Markusen, 2006, p. 1926) Moreover, if these artists expand their businesses they are likely to hire other artists as dependent employees, and this makes them a pull-factor for the mobility of other artists. Nevertheless, caution is needed when generalizing our findings to artists working in dependent employment.

3.2 Independent variables

3.2.1 Economic factors explaining migration

For the 412 regions, we seek to identify characteristics that explain growth or decline in regional artist populations. In the following section a number of regional characteristics are presented that are most likely to play a role in this context.

The first block of regional characteristics represents economic factors or variables, which are central in traditional theories on spatial human capital accumulation and concentration.

The first and probably most important factor in this respect is *the absolute agglomeration of artists* (**ART07**) in the year 2007. It is an indicator of a critical mass of artists being present in a region. As discussed in Section 2, such a critical mass is needed to unfold localization externalities which can stimulate the regional growth of the number of artists.

Contrasting these are localization externalities related to the *relative number of artists per inhabitant* (**ARTPC07**), or artists’ spatial agglomeration. These effects are not related to the absolute number of artists of regions, but are instead related to their relative importance in the local economy. The two factors approximating localization externalities are constructed from the same data as the dependent variable.

Factor **UNI** encompasses the *number of graduates from artistic* and those from *cultural disciplines* (per inhabitants), *the number of students* (per 1,000 inhabitants) and the *share of*

inhabitants between 18 and 30. Therefore we capture artists that are endogenously ‘created’ within a region. The share of young population and students indicates, at least in innovation driven economies, an open and vibrant environment which is open to new ideas and interested in cultural and artistic activities, and therefore might be particularly important for artists (Bader & Scharenberg, 2010).

Information about the numbers of university graduates for the two disciplines are obtained from the Federal Statistics Office of Germany. Statistics about the number of students and the share of young population is obtained from the INKAR dataset.

The factor **TOUR** is foremost related to the *number of beds per tourist enterprise* and the *number of overnight stays per tourist enterprise* in 2007. It controls for touristic activities in a region. Natural amenities like the forest area, water area and recreation area per inhabitant are associated with this factor as well.

We further consider the factor **EAST**. Due to the different social, economical and political developments of West Germany and the former GDR after World War II there are still significant structural differences between the two parts of Germany. These differences manifest in high regional *unemployment rate* and financial support by the state or related organisations in East German regions (*support of urban development, KfW support of infrastructure development, GRW support of infrastructure development (€ per inhab)*).

Two additional factors are population growth (**ΔPOP**) and GDP per capita growth (**ΔGDP**). They are primarily used as control variables. The first, population growth, is particularly important, because given a stable share of artists in a population, the population growth will also induce an increase in the number of artists in a region.

Information on the variables used to construct the regional factors (**TOUR, UNI, EAST, ΔPOP, ΔGDP**) are taken from the INKAR (*Indikatoren und Karten zur Raum- und Stadtentwicklung*) dataset which is published by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR, 2012) or from the Federal Statistics Office of Germany.

3.2.2 Amenity and tolerance factors

The second block summarizes factors that are particularly emphasized by Florida to make regions attractive for the creative class, i.e. artists.

The German Weather Service (DWD) provides data for the first factor in this set (*30 yearly mean of temperature, number of sunshine hours and precipitation*). The variable *mean temperature per year over 30 years* for a region shows the highest loadings and serves as a proxy for natural amenities. Research from Glaeser et al (2001) provides evidence for the

effect of the climate on the distribution of human capital. Moreover, Florida (2002a) claims that the creative class are more attracted by amenities than overall human capital in general.

We consider crime as a disamenity impacting regions' attractiveness for movers. There exists considerable evidence that crime or the change of crime levels influences the population growth of cities and neighbourhoods (Cullen & Levitt, 1999; Ellen & O'Regan, 2009). However, we argue that artists are particularly sensitive to high crime rates. Lloyd (2002) shows with a case study of Wicker Park, Chicago and Pratt (2009) on Hoxton, London that artists occupy run-down neighbourhoods and help to transform them (Lloyd, 2002; Pratt, 2009). Accordingly, the factor **CRIME**, is likely to influence the spatial distribution of artists. The variables *street crime offences per inhabitant* and the *robberies per inhabitant* are most associated with this factor. Information on these two variables is taken from the so-called *Deutscher Lernatlas 2011* (German learning atlas 2011), which is published by the Bertelsmann foundation (Bertelsmann Stiftung, 2011).

Lorenzen and Andersen (2009) empirically investigate the rank size rule of the creative class compared to that of the rest of the population. They show that the slope for the creative class is steeper. Their explanation is that members of the creative class are attracted to central places because of specialized consumer preferences (e.g. restaurants, cafés, entertainment, museums) and specialized job preferences (employees who work in high-technology industries) (Lorenzen & Andersen, 2009). According to Florida (2002a), this especially applies to artists, who will therefore be overrepresented in urban areas. We take this argument into consideration with the factor **URBAN**. It is mainly loaded to the variables *population density* and *price of construction land (€ per m²)*. Information for these variables is again taken from the INKAR database. In addition, the factor **URBAN** comprises the variables *share of foreigners* and *share of unemployed foreigners*. These two variables relate to the importance of openness and tolerance to attract creative class members (Florida, 2002a). They do not only account for tolerance, they also capture the quality of foreigner integration into the regional society or regional labour market respectively. Both are obtained from the *Lernatlas* as well.

One might argue that urbanity and tolerance towards foreigners might play different roles in attracting creative class members, but they cannot be statistically disintegrated in our analysis. Social capital is also considered because it is an important pull-factor for artists. The factor **SOCIAL** is strongly correlated with the *share of inhabitants committed to churches and religion, committed to youth* and *committed to elderly*. The *Lernatlas* serves as a data source here.

Lastly, the factor **CUL_AMENITY** can be identified. The variables *visitors of museums (per 100 inhab.)* and *visitors of theatres and concerts (per household)* are loading high on this factor, whereas, *the number of cinema screens (per 100,000 inhab.)* are only weakly associated with this factor. Therefore **CUL_AMENITY** mainly represents the consumption of high culture in a region. The variables are derived from the INKAR dataset.

3.2.3 Reducing the dimensionality

For the construction of the variables, we generally use the average of their annual values over the four years 2007 to 2010. However, this is not possible for all variables because the time series is not available or is unreliable due to reforms in the district delineations. In these instances we use the corresponding values of 2008 or 2009 (see Table 10 in the Appendix).

The previously presented regional characteristics are empirically strongly correlated, and many of them are likely to approximate the same (underlying) regional factor. We take this into account and reduce the dimensionality by means of a factor analysis. The factor analysis groups variables based on their common statistical variance in order to extract a smaller number of factors. The number of factors is determined using the Kaiser criterion. It suggests extracting as many factors as there are eigenvalues larger than one in the variables' correlation matrix (see Figure 9 in the Appendix). According to this criterion, we extract eight factors from the 33 regional characteristics. The eight factors are then interpreted according to the rotated factor matrix providing information on the variables' loading (see Figure 10 in the Appendix).

However, not all regional characteristics enter the factor analysis. We excluded those variables that are of a different kind and those that are of special interest from a theoretical point of view. The factor analysis condenses only level variables. In light of their dynamic nature, population growth and GDP per capita growth are not included, but instead they remain as independent control variables. The relative and absolute numbers of artists per region play an outstanding role (see theoretical discussion in Section 2) and therefore these factors are also kept independent.

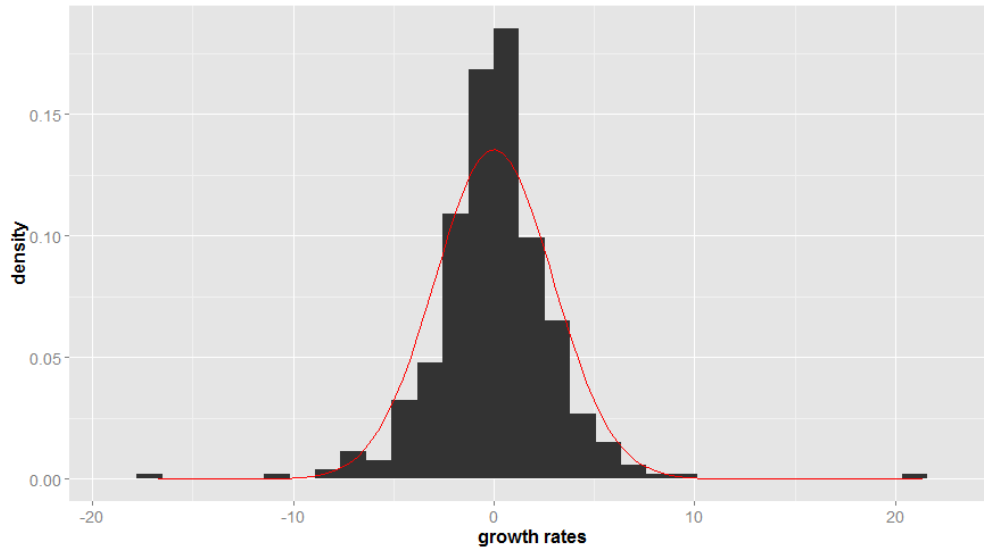
The extracted factors and the four independent variables are summarized in Table 10 in the Appendix.

4 Model

Figure 1 visualizes the non-normal distribution of the mean annual (trend-corrected) growth rates. We rely on quantile regressions (also known as least-absolute deviation regression),

because they are less impacted by outliers and more appropriate when the dependent variable is not Gaussian (see for a discussion Koenker & Hallock 2001; Coad & Rao 2006). To further increase the reliability of the results, we employ bootstrapped standard errors allowing for robust and reliable statistical inference (Elfron, 1979).

Figure 1: Distribution of growth rates



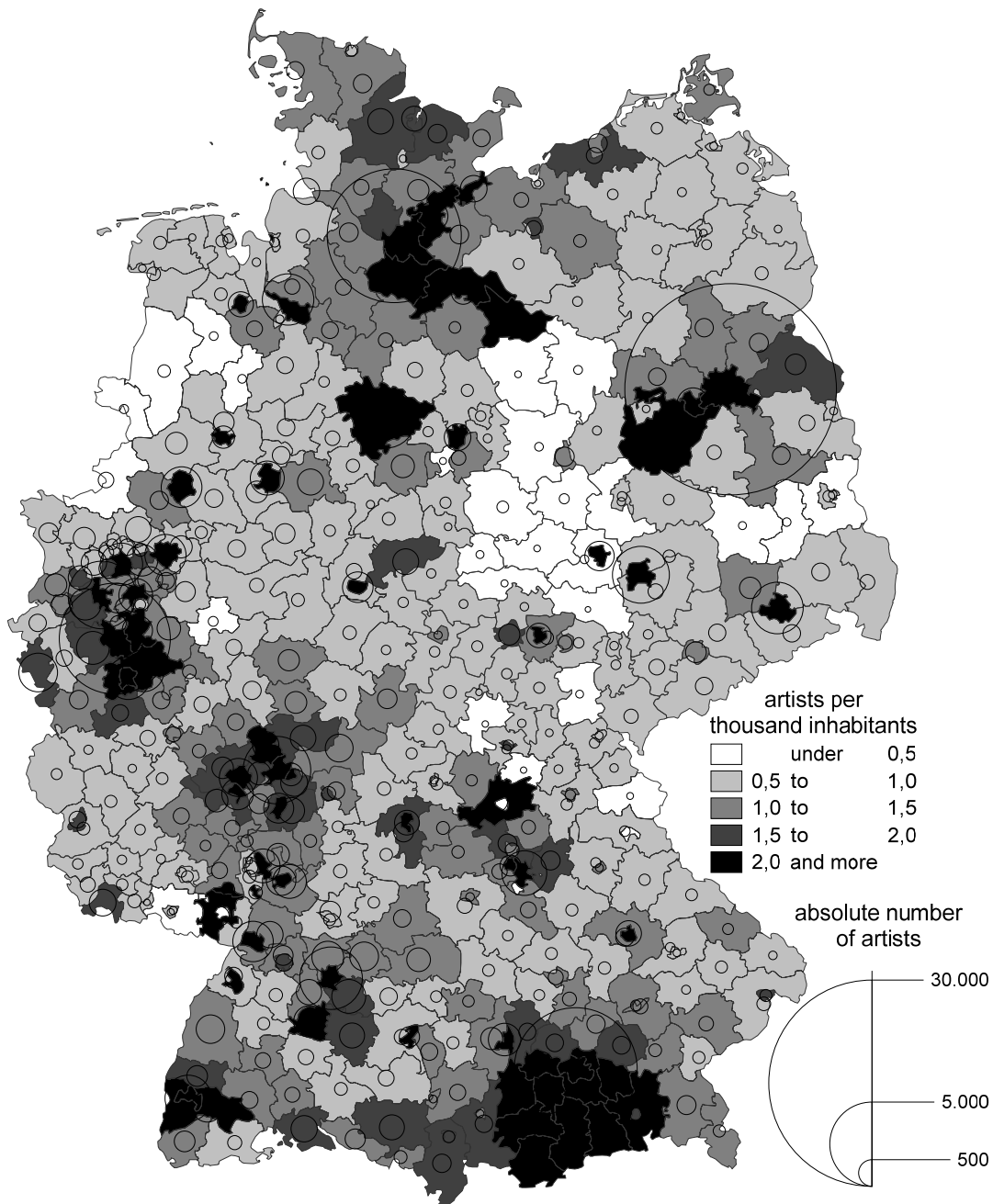
Source: KSK, own calculation

In addition, our statistical analysis shows that the growth rates are not spatially auto-correlated (Moran's $I = 0.04$, sig. = 0.08) and the residuals of the quantile regression analysis (Moran's $I = 0.04$, sig. = 0.10). As a result we do not need to account for geographic dependencies in the estimations.

5 Empirical results

5.1 Spatial distribution of bohemians in Germany

Figure 2: Distribution of artists 2010 by districts



Source: KSK, own calculation

Before presenting the results of our analyses, we provide some brief impressions on artists' spatial distribution and its change over time. The map in Figure 2 illustrates artists' relative and absolute spatial distribution in Germany in the year 2010. The mean is about 422 artists per district ($sd = 1819.2$).³ Not surprisingly, the largest number of artists is found in Berlin (31,525). Next is Hamburg with 12,642 artists, which is followed by Munich (10,646),

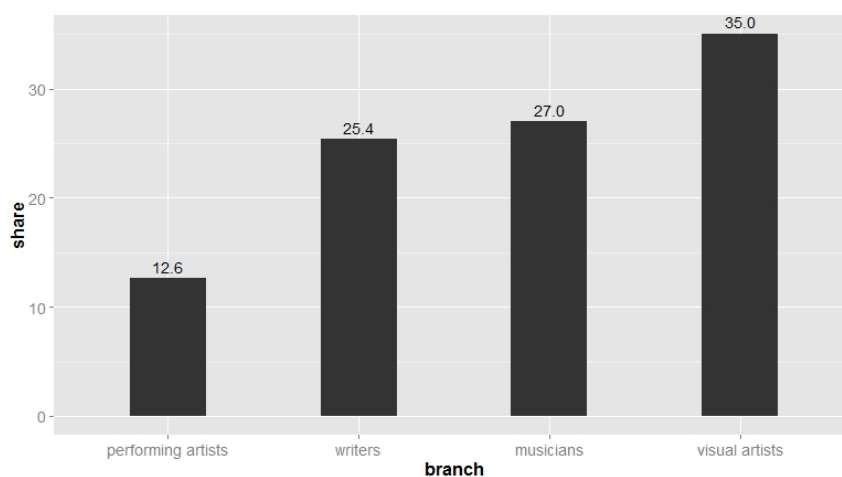
³ sd = standard deviation.

Cologne (8,665), and Düsseldorf (3,220). A correlation test confirms that the absolute number of artists and the size of the regional population strongly correlate ($r = 0.9***$)⁴.

Interesting insights are also obtained by looking at the distribution of the relative artist numbers. The mean of all regions is 1.36 artists per inhabitant ($sd = 1.16$). While Berlin still ranks first with 9.1 artists per thousand inhabitants, Cologne (8.6) now ranks second, and Munich third (7.9). The two cities are followed by Hamburg (7.1) and Freiburg im Breisgau (6.7). These patterns suggest that artists do indeed prefer living in urban regions, which is further substantiated by the correlation of $r=0.6***$ between the share of artists and population density.

Figure 2 reveals some surprising agglomerations of artists. For instance, significant agglomerations of artists are observed in regions on the coast of the Baltic Sea, in the Alpine foreland, and in a number of other rather remote regions. Since these regions are known as very touristic places, it may hint at this factor being relevant.

Figure 3: Share of branches 2010



Source: KSK, own calculation

Some further interesting insights are gained when disaggregating the numbers of artists into different branches. Figure 3 depicts the share of artists from four different branches in 2010. The largest branch is visual artists, next are musicians, writers, and performing artists. The spatial distribution of the four branches somewhat diverges from that of the aggregated one (see Table 1). While the absolute rankings are still dominated by large cities (Berlin, Hamburg, etc.), some comparatively smaller cities such as Hanover and Stuttgart appear as important locations for artists of particular branches.

⁴ *** indicates significance at the level of 0.001, **: 0.05, and *: 0.1.

Table 1: Ranking of the distribution of artists per branch

rank	all artists		visual artists		performing artists		musicians		writers	
	absolute	per inhabitants	absolute	per inhabitants	absolute	per inhabitants	absolute	per inhabitants	absolute	per inhabitants
1	Berlin	Berlin	Berlin	Berlin	Berlin	Berlin	Berlin	Weimar	Berlin	Cologne
2	Hamburg	Cologne	Hamburg	Düsseldorf	Hamburg	Cologne	Hamburg	Freiburg i. B.	Hamburg	Munich
3	Munich	Munich	Munich	Munich	Cologne	Munich	Munich	Berlin	Munich	Berlin
4	Cologne	Hamburg	Cologne	Hamburg	Munich	Freiburg i. B.	Cologne	Cologne	Cologne	Hamburg
5	Düsseldorf	Freiburg i. B.	Düsseldorf	Cologne	Stuttgart	Hamburg	Hanover	Karlsruhe	Frankfurt a. M.	Starnberg
6	Frankfurt a. M.	Weimar	Frankfurt a. M.	Starnberg	Frankfurt a. M.	Potsdam	Frankfurt a. M.	Hamburg	Düsseldorf	Bonn
7	Stuttgart	Starnberg	Stuttgart	Darmstadt	Düsseldorf	Weimar	Stuttgart	Würzburg	Leipzig	Freiburg i. B.
8	Hanover	Düsseldorf	Hanover	Weimar	Hanover	Stuttgart	Leipzig	Munich	Stuttgart	Frankfurt a. M.
9	Leipzig	Frankfurt a. M.	Leipzig	Freiburg i. B.	Leipzig	Düsseldorf	Dresden	Starnberg	Hanover	Heidelberg
10	Dresden	Potsdam	Dresden	Stuttgart	Dresden	Starnberg	Bremen	Leipzig	Bonn	Düsseldorf
11	Bremen	Stuttgart	Bremen	Landsberg a. L.	Bremen	Frankfurt a. M.	Freiburg i. B.	Dresden	Bremen	Landsberg a. L.
12	Freiburg i. B.	Darmstadt	Nuremberg	Frankfurt a. M.	Freiburg i. B.	Leipzig	Düsseldorf	Heidelberg	Rhein-Sieg-Kreis	Potsdam
13	Nuremberg	Landsberg a. L.	Münster	Münster	Nuremberg	Münster	Karlsruhe	Stuttgart	Freiburg i. B.	Leipzig
14	Bonn	Leipzig	Karlsruhe	Potsdam	Essen	Darmstadt	Nuremberg	Regensburg	Munich, Land	Mainz
15	Essen	Münster	Freiburg i. B.	Karlsruhe	Bonn	Baden-Baden	Essen	Mainz	Dresden	Munich, Land

Source: KSK, own calculation

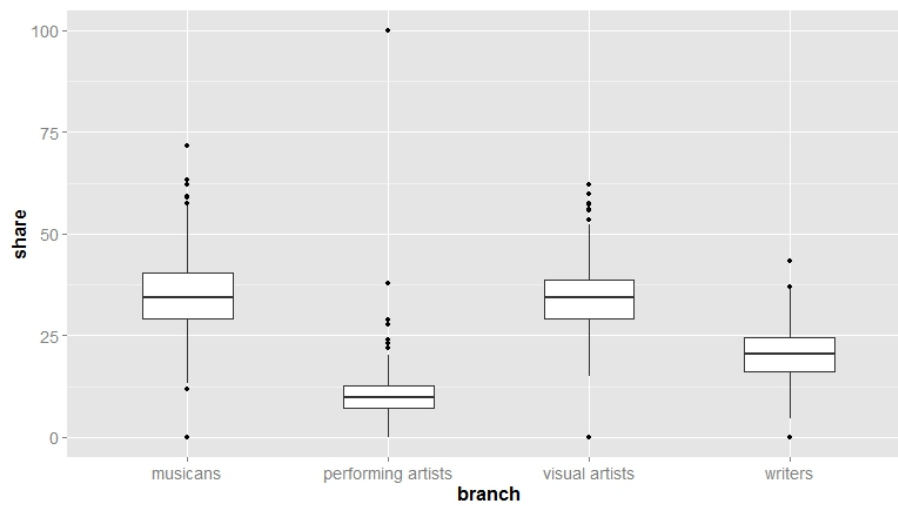
The importance of smaller cities becomes even more evident when the numbers of artists are set into a relationship with the regional population size. For instance, relative to its population, Düsseldorf has the second highest agglomeration of visual artists. Freiburg im Breisgau is (in relative terms), an important region for performing artists, and even more important for musicians. Musicians in particular turn out to be less concentrated in big cities – Weimar and Freiburg im Breisgau ranking first and second – as compared to the other branches. The ranking for writers suggests that these have a preference for an urban environment, because cities like Cologne, Munich, Berlin, and Hamburg are ranked high, however an attractive landscape (Starnberg⁵) seems to be a valid substitute.

To get a better understanding of the extent to which artists are spatially concentrated we estimate the coefficient of variation (CV)⁶. Accordingly, performing artists are most concentrated (CV = 5.85), followed by writers (CV = 4.95), visual artists (CV = 4.23), and musicians (CV = 3.16). Compared to the overall population (CV = 1.16), the spatial concentration of artists proves to be very high. We also find a very skewed distribution of the share of artists in certain branches per region (Figure 4). The share of musicians varies most strongly, with values between 0.0 - 100.0% (sd= 8.8).

⁵ Starnberg is located between Munich and the Alps with the beautiful landscape of Lake Starnberg.

⁶ The variation coefficient is the ratio of a variable's standard deviation and mean.

Figure 4: Share of branches per region



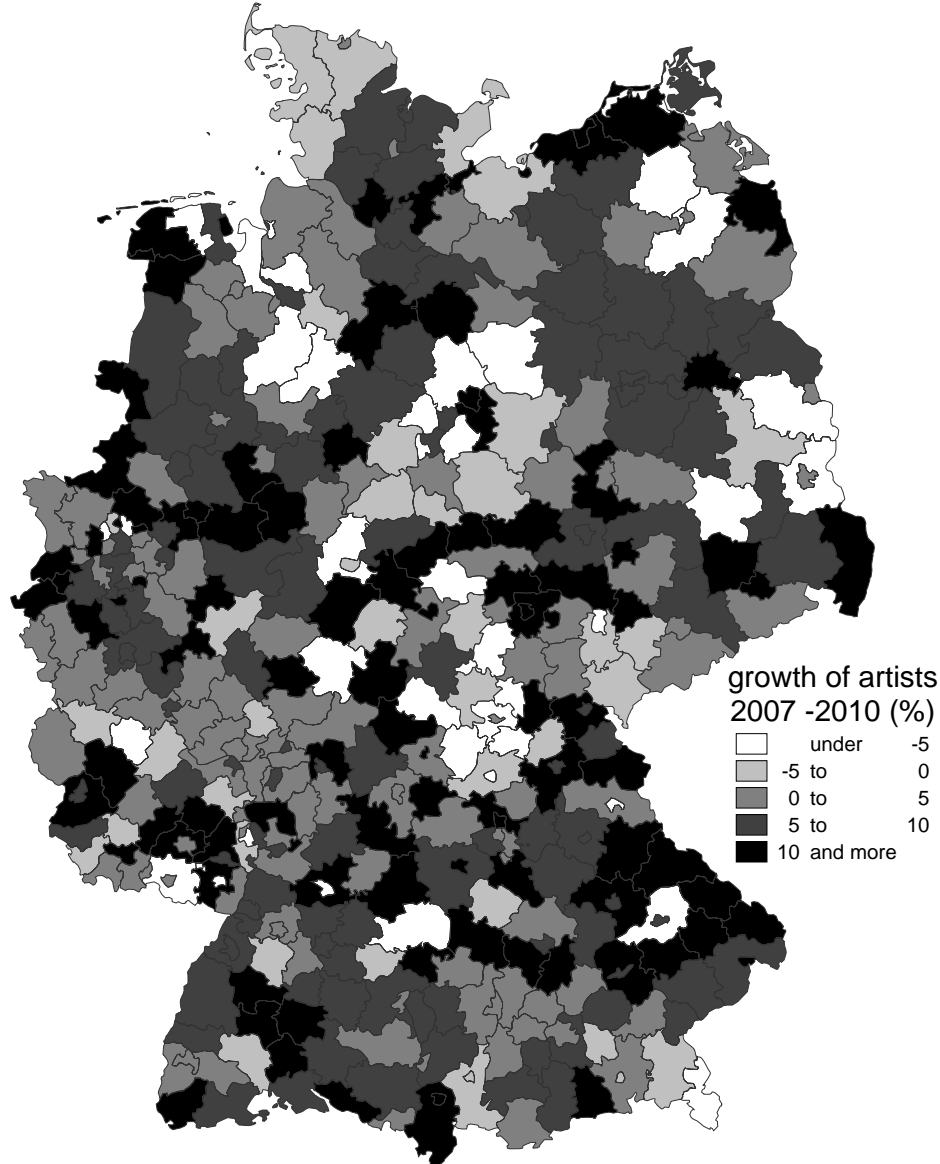
Source: KSK, own calculation

This implies that there are regions without any registered self-employed musicians and there are other regions that exclusively host this type of artist. The share of the other branches varies much less (sd: 6.3-7.8). In general, most regions show a mix of artistic branches.

5.2 Change of the distribution over time

The number of artists in German regions increased by 7.5% from 161,958 in the year 2007 to 174,086 artists in 2010.

Figure 5: Growth rates of artists 2007-2010 by districts



Source: KSK, own calculation

Regional growth rates between 2007 and 2010 range from -38.5 to 80.0 percent. The mean growth is 5.6 %, with the standard deviation being 9.1 %. Accordingly, we find considerable variation in regional growth. This is visualized in Figure 2, showing the growth of artists per region between 2007 and 2010. Interestingly, we observe a quite ambiguous pattern: regions with fast growing artist populations are large core regions like Hamburg, Berlin, and Dresden and remote regions with low population counts such as Weimar, some regions on the Baltic Coast and some regions near the Alpine Foreland. A similar picture is obtained for negative growth rates that characterize regions with substantial agglomerations (share of artists in total

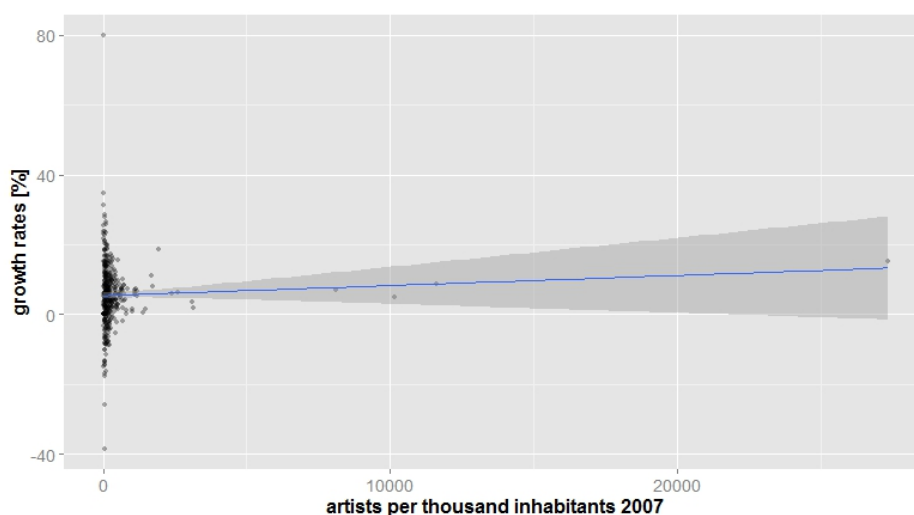
population) of artists (e.g. Freiburg im Breisgau) and regions with low artist agglomerations (e.g. Bamberg). However, Table 2 reveals that the most extreme growth between 2007 and 2010 is observed for regions with low absolute numbers of artists. However, it is not a size effect that explains the magnitude of growth, as the correlation between growth and the number of artists in a region is insignificant (see also Figure 7).

Table 2 Ranking of growth rates 2007-2010

rank	name	absolut	percentage
1	Burgenlandkreis	10	80.0
2	Kroch	11	34.9
3	Tirschenreuth	8	31.4
4	Nordvorpommern	21	28.6
5	Remscheid	18	27.9
...			
44	Berlin	4,203	15.4
...			
121	Hamburg	1,015	8.7
...			
181	Cologne	568	7.0
...			
211	Munich	490	4.8
...			
267	Düsseldorf	61	1.9
...			
408	Peine	-14	-16.2
409	Cochem-Zell	-10	-17.1
410	Straubing-Bogen	-14	-17.6
411	Suhl	-11	-25.9
412	Altmarkkreis Salzwedel	-21	-38.5

Source: KSK, own calculation

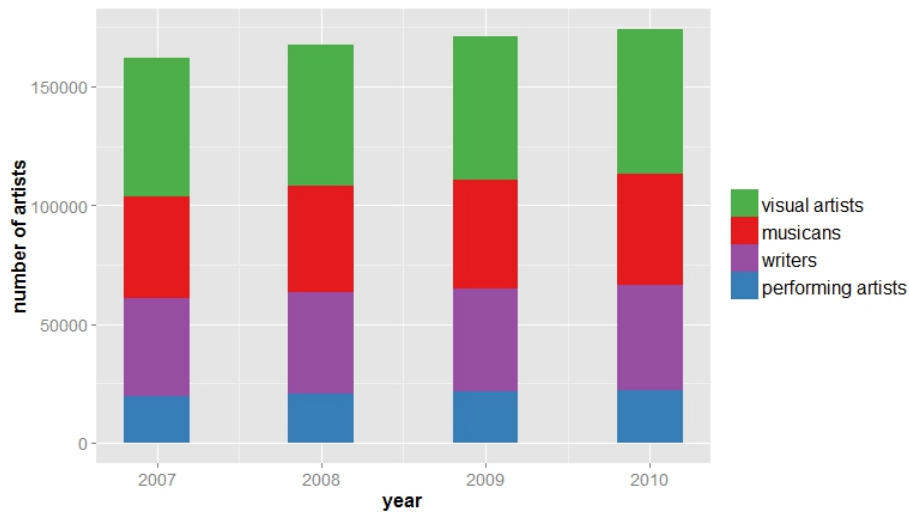
Figure 6: Correlation of growth rates and number of artists



Source: KSK, own calculation

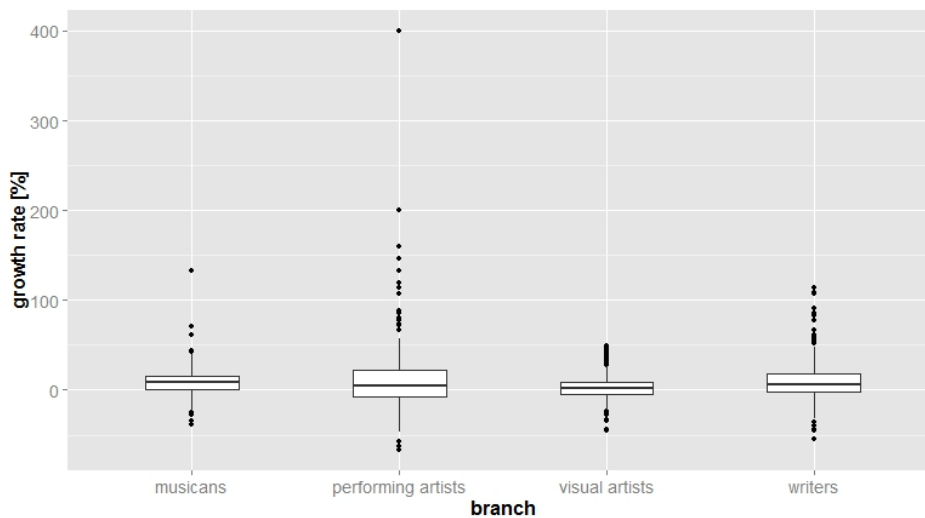
The growth patterns of the four branches differ considerably: The number of performing artists grew fastest, with 11.8% from 2007 to 2010. They are followed by musicians with 10.0%, writers with 6.6%, and visual artists with a 4.8% growth.

Figure 7: Development of artists in Germany



Source: KSK, own calculation

Figure 8: Regional growth rates of branches



Source: KSK, own calculation

5.3 Factors explaining the variation in regional growth rates of artists

5.3.1 Determinants of artists' total population growth

The previous section highlighted the existence of significant variations in the growth of regional artist populations. In the following section we will explore to what extent these relate to regions' endowments with Florida's amenity-related theory and with other economic factors.

Table 3: Quantile Regressions

Variables	All	Musicians	Writers	Visual	Performing
ART07	0				
ARTPC07	-0.208				
ΔPOP	0.462 **	0.420	0.402	0.470 **	0.242
ΔGDP	-0.016	0.015	-0.058	-0.018	-0.120
EAST	0.322	-0.665	0.548	0.700 **	0.559
URBAN	-0.404 **	-0.082	0.155	-0.308	-0.705
UNI	-0.065	0.007	0.264	-0.187	1.547 ***
TOUR	0.047	0.239	0.085	-0.088	0.196
CRIME	0.129	0.009	-0.093	0.607 **	0.152
SOCIAL	0.071	-0.297	0.042	0.082	0.170
TEMP	-0.153	-0.087	0.130	-0.135	0.560
CUL_AMENIT	-0.205	-0.374	-0.291	0.073	-0.202
MUSIC07		0.001			
MUSICPC07		-1.033			
PERF07					0.007
PERFPC07					-11.888
VIS07				0.001	
VISPC07				-1.010 *	
WRIT07			0.002		
WRITPC07			-5.426 **		
(Intercept)	0.703	0.874	0.851	0.841 *	0.074

Source: KSK, own calculation

The results of the quantile regressions are shown in Table 3. The first model (**All**) is estimated with respect to the growth in artists' total regional populations, i.e. no differentiations are made between branches of artists. The other models represent the results for the four branches (musicians, writers, visual, and performing artists).

The model for the growth of artists' total populations (**All**) reveals that population growth (**ΔPOP**) and urbanization (**URBAN**) are the best predictors for growth of regional artist populations. There might be two reasons for population growth to become significant. Firstly, increasing populations may 'automatically' imply increasing numbers of artists if they represent a more or less fixed share of the population. In addition, population growth makes regions more attractive for artists as it implies an increasing demand for artistic products and services.

In contrast to Florida's argumentation, we do not find artist populations to grow stronger in urban regions. On the contrary, the factor **URBAN** is negatively related to the growth rates. This factor is strongly associated with an urban environment (higher population density and prices of construction land), and with the presence of foreigners and their participation in the labour market (see factor loadings in Table 10 in the Appendix). Higher cost of living in cities can explain the negative effects. Artists are less prosperous in economic terms than the rest of the creative class, therefore they are more sensible to increasing factor prices – e.g. affordable spaces for galleries – as a consequence of high relative agglomeration (Peck, 2005).

Putnam (2007) delivers insight about the negative effects of the presence of foreigners. His research reveals that in the short run ethnic diversity fosters intolerance and lowers trust,

altruism, and community cooperation, and only in the long run can societies benefit from social integration.

Another explanation is that in the observed period there is tendency of convergence of the concentration of regional artists'. Urban regions with a relatively high level of artists' concentration did not grow as fast as none urban regions with a comparatively low level of artists' concentration.

No other factors show significance in the model, and therefore we can evaluate our first two hypotheses with respect to the factors driving the growth of artists' populations in regions. According to hypotheses **H1**, Florida's amenity-related factors are expected to be more relevant than the economic factors. We clearly reject this hypothesis with respect to natural or cultural amenities. None of these factors are significantly related to artists' growth rates. Nevertheless, urbanity and tolerance – two other factors put forward by Florida – seem to have effects on artists, but diametrical to his argumentation. Moreover, we have to reject hypothesis **H2**. There is no statistical evidence that agglomeration effects related to the size of regional artists populations impact the latters' growth.

5.3.2 Differences between the branches

The models for the four artist branches reveal the existence of significant differences between the branches. Population growth positively relates to the growth of regional communities of visual artists. A similar effect is not observable for the other three branches. This finding might hint at the relevance of variations of production and consumption schemes among the branches. Visual artists are more strongly dependent on local demand and cannot advertise their products and services as easily as artists of other branches. In particular, for writers it seems very reasonable to assume that they are able to transmit their products (i.e. written text) easily across large geographical distances. Similarly, the products and services offered by performing artists and musicians are relatively unaffected by geographical distance as these artists frequently go on tours outside their home region.

We observe positive and significant coefficients for **CRIME** and **EAST** in the model of visual artists' population growth, though the results are somewhat counter-intuitive. Why would visual artists in particular be attracted to regions showing above average crime rates? The same applies to **EAST**, which suggests that these artists' populations grow more in regions belonging to the former GDR. A potential explanation for both coefficients might be that visual artists seek regions offering abundant and cheap space to set up art galleries and studios. This is particularly the case for regions in the former GDR, with low property prices

and available space in abandoned industrial properties. The radical break with the past not only freed space literally, but also figuratively by providing opportunities to transform cultural and social norms by artistic means. However, this explanation remains speculative at the moment and calls for more research on the individual level.

In contrast to the overall model, localization externalities matter in explaining the growth of visual artist and writer populations. According to our results, the two branches are subject to negative localization effects that come into effect when these artists are over-represented in the regional population (negative coefficient of **VISPC07** and **WRITPC07**). Visual artists are particularly dependent on the public support of cultural infrastructure such as museums and galleries, and as a result negative externalities may arise when public expenditures for this infrastructure, which constitute supply and demand, do not rise proportionally to their numbers. In contrast to visual artists, we lack a persuasive explanation in the case of writers. As argued above, the local surroundings of writers impact their supply and demand conditions only to a limited extent. We also expected that these individuals particularly benefit from intensive interaction and exchange with other writers. Accordingly, this finding clearly contradicts our expectations and deserves more research in the future.

Performing artists populations increase more in regions characterized by a student milieu (positive coefficient **UNI**). There are three probable explanations. Firstly, performing artists are comparatively immobile, and therefore they frequently remain in the region they obtain their university degree. Secondly, university students represent an important demand group for their products and services. Thirdly, university regions are usually characterized by the presence of highly educated individuals, i.e. people who work in the high tech industries which also strongly demand the performances of these artists.

The results for the models on the disaggregated artists' growth rates clearly suggest that hypothesis **H3** has to be confirmed. Specific production and consumption schemes of artist branches alter the effect of regional factors on the agglomeration of artists. In this sense, artists are a heterogeneous group, implying that we can confirm hypothesis **H2** exclusively for visual artists and writers. We do not find an effect of localization externalities for the branches of musicians and performing artists. This heterogeneity among artists is confirmed by Faggian et al. (2012). These authors also find pronounced differences within the group of bohemian graduates regarding their spatial behaviour and careers (location choice, starting a job, full vs. part time work, income and self-employment).

However, we do not find convincing evidence for the relevance of amenity-related factors emphasized by Florida and followers. With the exception of universities, no empirical

evidence is found for factors highlighted in this literature stream such as amenities, openness and, urbanity. Accordingly, we have to reject hypothesis **H1** for models on the basis of the disaggregated artist growth rates as well.

6 Conclusion

The paper contributes to the on-going debate on what regional factors make regions attractive for the creative class. In order to avoid the problematic definition of the creative class, we focused on the spatial distribution of artists and its temporal change. Using quantile regression and panel data on 412 German districts, it was shown that amenity-related factors put forward by Florida and followers fail to explain the agglomeration processes of artists. In contrast, the results clearly confirm the relevance of economic factors which are central in the literature on regional productions systems, local labour markets and externalities. Next to population growth, urbanity, crime, and localization externalities in particular play a big role. Such externalities are related to negative effects which come into existence when the number of regional artists becomes too large in comparison to the population.

The paper delivers two more advancements to the existing literature. Firstly, by disaggregating the group of artists into four branches, the paper identifies branch-specific production and consumption schemes altering the importance of regional factors. Accordingly, even this comparatively small group of artists is significantly heterogeneous when it comes to factors explaining their regional agglomeration.

Secondly, the study advances existing empirical approaches on this topic. This particularly concerns its focus on artist population growth instead of the more common empirical analysis of the absolute artist population size. In addition, it clearly concentrates on a subgroup of well-identifiable members of the creative class and models branch-specific localization externalities as a function of the number of artists in a region.

Nevertheless, there are a number of shortcomings that need to be pointed out. First and most importantly, the data does not allow for differentiating between endogenous growth and migration. The change in the number of artists in a region, i.e., migration, depends only to a certain extent on regionally exogenous factors. Despite the above-average spatial mobility of artists postulated (but not empirically backed up) by Florida, the change in the number of artists in any given region should depend more on the behaviour of the endogenous artists than on migration to and from that region. In terms of the stock (the endogenous stock of artists in a region), the question arises of whether it is growing or declining (independently of migration). In general, characteristics of the region itself are likely to be more important as

factors in the changes in the number of endogenous artists than those of other regions. When investigating the importance of particular regional factors, many studies – including the present study – just look at the net change in the number of members of the creative class in that region. However, this number is subject to inter-regional migration of members and changes in the endogenous stock of members. Regional factors of the kind investigated in the present study may play completely different roles in the two processes. For instance, universities provide degrees of artistic or cultural disciplines and thereby ‘transform’ inhabitants into artists. They also attract young people interested in a career in a creative job or sector from outside the region. When they graduate those students stay in their university’s region and enlarge its population of the creative class (Florida et al., 2008). These two different roles remain unobserved when investigating the net change in the number of regional creative class. Accordingly, future studies need to disaggregate the net change into the net result of migration and the net change due to regional endogenous processes. Regional characteristics then need to be evaluated to see whether they have an impact on migration decisions or if they stimulate a region’s endogenous potential of the creative class.

The second shortcoming of the present study is the potential underestimation of the role of amenities, because our indicators predominantly focus on cultural and natural amenities. Other amenities might be relevant as well. For instance, we did not test for the *coolness* of German regions, which Florida claims to matter in this respect (Florida 2002a).

Thirdly, our analyses made use of regionally aggregated data. Accordingly, we missed processes at the micro (individual) level (e.g. gender, age, income etc.), which might be unrelated to regional characteristics. Future research therefore needs to employ data at the individual level, including information on artists’ spatial mobility.

Despite these shortcomings, our findings have crucial implications for policy-makers in general, and particularly for those who are potentially inspired by Florida’s ideas to support the regional agglomeration of the creative class. Firstly, this concerns the questionable importance of amenities, because we did not find them to be associated to any empirical effect on the agglomeration of artists. Secondly, support programs need to seriously consider the significant differences among the groups of artists. Given the severe heterogeneity within this relatively small sub-group of the creative class, it can be doubted whether suitable policies can be designed for the creative class as a whole (for a detailed discussion see Sternberg, forthcoming).

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Appendix

Figure 9: Screeplot

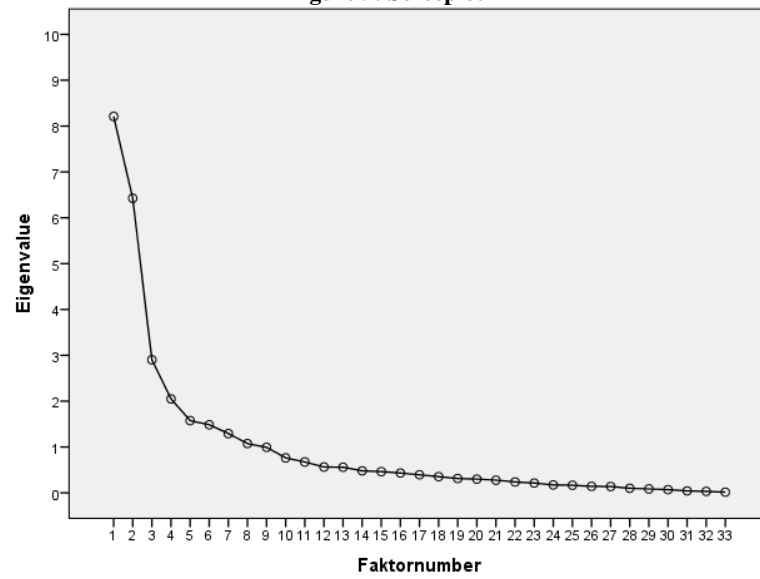


Table 10: rotated factor matrix

Variables	EAST	URBAN	UNI	TOUR	CRIME	SOCIAL	TEMP	CUL	AMENITIES
GDP per capita 2007	-0.248	0.568	0.329	-0.054	0.306	0.137	-0.071		0.007
share of employees in manufacturing 2007	-0.070	-0.398	-0.325	-0.07	-0.267	0.133	-0.452		-0.301
unemployment rate 2007	0.851	-0.038	0.115	-0.043	0.273	-0.220	0.15		0.004
share of unemployed foreigners 2007	-0.460	0.800	0.049	-0.149	0.077	0.037	0.053		0.013
share of foreigners 2007	-0.396	0.818	0.139	-0.104	0.146	0.011	0.043		0.008
population density 2007	-0.163	0.741	0.350	-0.214	0.288	-0.123	0.023		0.203
price of construction land (€ per m²)	-0.336	0.767	0.185	0.030	-0.017	0.035	0.085		0.277
support of urban development (€ per inhab.) 2000-2009	0.808	0.212	0.171	0.116	0.198	0.057	0.181		0.235
KfW support of infrastructure development (€ per inhab.) 2000-2009	0.806	-0.286	0.089	0.137	0.085	-0.091	-0.094		0.180
GRW support of infrastructure development (€ per inhab.) 2000-2009	0.692	-0.201	0.103	0.074	0.186	-0.058	-0.055		0.226
beds per tourist enterprise 2007	0.031	-0.095	-0.065	0.943	0.021	0.012	-0.105		0.086
over night stays per tourist: enterprise 2007	0.030	-0.070	-0.029	0.939	0.046	0.039	-0.087		0.109
street crime offences (per inhab.) 2009	0.268	0.317	0.362	-0.055	0.658	-0.145	0.34		-0.027
criminal property damage (per inhab.) 2009	0.279	-0.017	0.076	-0.006	0.670	-0.051	0.175		-0.014
visitors of museums (per 100 inhab.) 2009	0.173	-0.010	0.127	0.305	0.030	0.050	-0.179		0.494
visitors of theatres and concerts (per household) 2009	0.071	0.095	-0.043	-0.143	-0.085	-0.058	0.213		0.435
number of cinema screens (per 100.000 inhab.) 2009	0.011	0.202	0.214	0.132	0.550	0.154	0.167		0.015
net migration (per 1.000 inhab.) 2007	-0.646	0.237	0.243	0.032	0.156	0.033	0.145		0.322
mean size of households 2007	-0.358	-0.371	-0.428	0.058	-0.437	0.171	-0.085		-0.110
share of inhab. between 25 and 30 years old 2007	0.018	0.276	0.867	-0.097	0.243	0.020	-0.021		0.189
share of inhab. between 18 and 25 years old 2007	0.286	-0.175	0.731	-0.067	0.232	0.054	-0.085		0.112
graduates of artistic disciplines (per inhab.) 2007	-0.024	0.502	0.548	0.036	-0.099	-0.077	0.205		-0.039
graduates of cultural disciplines (per inhab.) 2007	-0.055	0.396	0.752	0.042	-0.104	-0.051	0.185		-0.119
students (per 1.000 inhab.)	-0.040	0.175	0.804	-0.066	0.275	-0.018	0.055		0.038
30 years mean of temperature (year)	-0.094	0.241	0.092	-0.262	0.152	-0.158	0.575		-0.068
30 years mean of number of sunshine hours (year)	0.068	0.094	0.047	0.149	0.038	0.120	0.052		0.403
30 years mean of precipitation (year)	-0.441	0.196	-0.151	0.257	-0.104	0.024	-0.435		-0.057
recreation area (m² per inhab.) 2009	0.566	-0.227	-0.081	0.220	-0.059	0.029	0.314		-0.076
forest area (m² per inhab.) 2009	0.282	-0.349	-0.176	0.337	-0.380	0.135	-0.165		-0.185
water area (m² per inhab.) 2009	0.417	-0.169	-0.108	0.305	-0.105	0.020	0.143		0.064
share of inhab. committed to churches and religion	-0.502	0.077	-0.005	-0.007	-0.062	0.532	-0.185		-0.171
share of inhab. committed to youth	-0.303	0.115	-0.071	0.007	-0.022	0.828	-0.013		0.109
share of inhab. committed to elderly	0.104	-0.139	0.022	0.042	0.022	0.720	-0.061		0.085