Do Art Experts (Bohemians) Attract High-Skilled Professionals? Evidence from Panel Data in German Regions

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Abstract

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Introduction

The goal of this paper is to test whether the presence of art experts, or bohemians, in a region attracts high-skilled professionals. Both theoretical and empirical works, among others the works by Florida (2002a, 2002b), have been pointing out a positive relation between the presence of skilled professionals and regional prosperity. When complemented by a supportive system of institutions, high skilled professionals can foster classic district dynamics, such as diffused knowledge creation and circulation, favouring innovation and entrepreneurship (see Lundvall and Johnson, 1994; Capello, 2009 on institutional systems and spatial spillovers). These positive externalities, as repeatedly emphasized in the regional development literature, represent important locational advantages that can reinforce the attractiveness and competitiveness of places and regions.

For these reasons, regional studies have enquired on the location factors that may attract these professions. One specific hypothesis that has emerged from the work of

Florida and others is that high skilled people look for places of high quality (Fritsch and Stützer, 2009; Boschma and Fritsch, 2009), where quality is defined by welfare, environment, amenities and a climate of tolerance and openness (Florida, Mellander and Stolarick, 2008). Bohemians, in particular, is a term used to indicate the presence of amenities and openness, which can attract skilled professionals.

As in the creative class approach, the idea to use individual occupations to represent the degree of creativity built in different work activities, and to connect such element to growth, was also advocated by Markusen (2004), who established that the utility of targeting occupations is in their ability to transversally generate positive territorial externalities (cf. also Markusen et al., 2008) [1]. The counter argument comes from Glaeser (2005), who denounces the similarity between creative class and human capital conceptualisations. Based on evidence of strong association between highly educated people and regional growth, he argued that Florida (2002a, 2002b) gives the

[1] The reason is that occupations may stimulate entrepreneurship, favor talents' recruitment and serve multiple industrial sectors. In addition, over-reliance on industrial classifications, in her view, would underestimate the presence of artists tout court. Within this approach, occupational measures (i.e. Standard Occupational Codes, or SOC) are argued to be best positioned to determine the presence and nature of creative occupations, not only with respect to conventional industrial measures (Standard Industrial Code, or SIC), but also with respect to education, the other major indicator of human capital.

creative class credit for causing regional growth where growth is actually generated by human capital.

Our work goes beyond the human capital-creative class controversy, and is positioned among studies that enquire on the relation between different categories of creative employees and professionals, especially concerning the role of bohemians, whose socio-economic features and work activities can substantially differ from those of other creative categories. Of especial importance is the study of the indirect impact of the presence of bohemians on socio economic development, through their ability to attract other categories of creative professionals, who are more directly involved in industrial production and economic growth (EY, 2014). Given the substantially different educational background of bohemians (art experts) and other creative classes (high-skilled professionals) and the fact that there is limited empirical research on the relationships between these two categories, this study, which looks into the German national case, departs from Florida's contributions stating that bohemians attract high-skilled experts. Very few studies have used panel data to study the creative class in Germany, reaching different conclusions on (both in favour and against) the ability of bohemians to attract creative class people (Möller and Tubadji, 2009; Wedemeier, 2015; Heerden and Bontje, 2014). Most of these studies, besides showing contradictory results, use methodology and data that are not fully adequate to understand the relationship.

This paper contributes to highlight the dynamics of high-skilled creative professionals and art experts over the years, and their impact on the regional economy, since the analysis of the regional distribution of highly skilled professionals based on bohemians as explanatory variable has been severely under-researched to date in several countries. In doing so, the paper factors in the possible overlap between occupational and educational categories (we look at a subset of high-skilled creative professionals consisting of core creative and associate scientists). We use administrative panel data accessed at the Institute for Employment Research (IAB) in Nuremberg. Data concern the years 1998-2008 at NUTS3 disaggregation level in Germany and allowed to implement a dynamic panel analysis.[2]

The remainder of this paper is set out as follows. Section 2 addresses definitions of creative class and bohemians, and presents a review of the literature on the impact of bohemians on economic development and creative class locational choices, with especial focus on the German case. Section 3 deals with the data sources and with the main categorisations of the analysis. Section 4 illustrates panel data estimation procedure and analysis. Section 5 shows the main descriptive statistics, while Section 6

[2] Data were collected in person by the authors in Nuremberg and elaborated in the data center, since data access was granted only within the premises of the IAB for this specific time lag. To the best of our knowledge, the dataset was been updated until 2011.

presents econometric results. Discussion of results and of future research perspectives precedes the conclusions, respectively in Sections 7 and 8.

Bohemians, creative class and regional development

The creative class concept refers to people who engage in complex problem solving, in areas that involve a great deal of independent judgment and require high levels of intellectuality. These workers and professionals are primarily paid to create and have considerably more autonomy and flexibility than others (Florida, 2007). Florida divides the creative class into creative core and creative professionals. The creative core (CC) are scientists and engineers, university professors, poets and novelists, artists, entertainers, actors, designers and architects, as well as thought leaders of modern society including nonfiction writers, editors, cultural figures, think tank researchers, analysts and other opinion makers. Whether they are software programmers or engineers, architects or filmmakers, they are fully engaged in the creative process (Florida, 2005) . The outcomes produced by the CC are new forms or designs that are readily transferable and broadly useful-such as designing a product that can be widely made, sold and used; coming up with a theorem or strategy that can be applied in many cases; or composing music that can be performed again and again.

In addition to the CC, there are creative professionals (CP) who work in a wide range of knowledge-intensive industries such as in high-tech sectors, financial services, legal and healthcare professions, and business (Florida, ibid). CP are engaged in creative problem-solving, drawing on complex bodies of knowledge to solve specific problems, which typically require a high degree of formal education and, thus, a high level of human capital (Author 1, 2014)

Previous studies: High-skilled professionals flock to where bohemians live

Florida (2002b, 2007) maintains that where there are more bohemians (BOH) there will also be more high-skilled professionals (HSP)—the former attracting the latter. This is because bohemians create an atmosphere that attracts other creatives and intellectuals, who may benefit the collectivity by applying ripe talent in solving many regional social and economic problems (Florida 2002a; 2002b; 2003; 2005). This tenet was constructed based on the observations of large urban regions with a population of more than 100,000, in the United States. The approach, having been framed for large urban regions, is suited for highly populated regions, making the application of the theory in rural regions or in regions with small urban sizes difficult, if not impossible. For instance, among contributions studying the effect of creative class on regional development, Qian (2013) found a positive association between

creative class and both innovation and entrepreneurship. However, this relation is of relevance in the very largest urban centers. This further suggests that the bigger the city, the more likely it is to find a large number of high-skilled workers. This begs the question concerning the relation between creative class professionals and rural economic development for regions with small urban areas, as found in many European countries, whose towns are small when compared to the US or Canada, where Florida espoused his theory. Although smaller places with particular attributes (attractive natural setting, proximity to large urban centres) are increasingly successful in attracting the creative class, this power of attraction is not necessarily associated with employment growth or with the development of knowledge-rich industries (Polèse, 2012).

Following Florida's seminal work, the idea of boosting a regional economy through the presence of bohemians has had a certain policy appeal, against the adoption of strict sectoral logics (see Andersen et al., 2010; Asheim et al. 2011; Asheim and Hansen, 2009; Camagni and Capello 2013 for a critical stance). This idea can be traced in urban policy agendas, often in relation with specific interventions aimed at creating the conditions for bohemians' presence, which would influence the presence of other creative categories of workers. It has also been studied in relation with neo-liberal policies emphasizing highly flexible labour markets (Peck, 2005). These claims and policies have been tested for cities and regions over the past decade

with praise and criticism, the latter especially in terms of having disregarded distributional effects and generated uneven policy interventions and benefits (Barber and Hall, 2008).

Also other studies have supported the theory that the presence of bohemians (BOH) does attract and has substantial implications on the distributions of the other non-bohemian CC and CP in regions as well as in urban areas. The studies of Boschma and Fritsch (2009), which used cross-sectional data for a large number of regions in Europe, reveal that BOH attract CC and CP to a significant extent. Also Fritsch and Stützer's (2012) estimation of the effect of BOH on non-bohemian CC and CP in Germany revealed a positive and significant effect. This study, however, uses cross-sectional data and, therefore, the positive impact of BOH cannot be taken for granted, since the estimation cannot capture reverse causality or endogeneity, which is one critical methodological problem. Moreover, the estimation is underspecified.

Among the few studies that have used panel data for Germany, Möller and Tubadji (2009) indicates that bohemians do not attract high-skilled experts. In their work, the decision to move into a new place is not influenced by the presence of bohemians, but by other economic factors. They note, instead, that the labour market and other incentives play positive roles in attracting the labour force of the creative class. More recently, Heerden and Bontje (2014) take a narrower focus on Berlin's bohemian neighbourhood, and show that creative class people's locational choices are not

predominantly driven by the presence of bohemians. Wedemeier (2015) draws instead the opposite conclusions, evidencing that creative class professionals are attracted to places by the presence of bohemians. This study shows that initial and lagged creative sectors and bohemians have had positive and significant impacts on total employment growth. Moreover, the lag of the high-skilled workers and professionals appears to have positive and robust impact on employment growth. The study reveals that a unit increase in creative sectors leads to a 3.6% change in future total employment. Such quite astonishing result is explained by inter-sectoral spill-overs in business-related services, and in integrated production chains and processes. "It can further be assumed that the creative sector employment fosters creative processes, contributing to innovation, which leads to further (employment) growth processes." (Wedemeier, 2015: 2473). At the same time, the study demonstrates that employment growth is very much a function of local amenities and of bohemians, and both appear to play a crucial attraction role.

Among the critical stances, Glaeser (2005) evidences that the presence of bohemians does not have any substantial effect on the distribution of high-skilled experts in a regional or urban setup. Against Florida's popularization of creative class theory, Glaeser defended the idea that the creative class is just a surrogate of human capital. Within the extant controversy, our study is consistent with the works by Suedekum (2006, 2008), Möller and Tubadji (2009), and Wedemeier (2010), who

find that a significant effect on employment growth is due to high-skilled agents in Germany's creative sectors. However, it is at odds with the same work by Möller and Tubadji (2009), who do not support the existence of the positive bohemians to creative class nexus.

To discuss these contrasting results, our study is going to test the impact of bohemians (BOH) on high-skilled professionals, using a series of controls which include employment, inflation-adjusted GDP per capita, industry size, and population density. We also consider whether there is an overlap between occupational and educational categories.

The German case

The regional context of this research, Germany, gives unique opportunities to understand the role of art experts in attracting high-skilled professionals and, in turn, in shaping in a number of ways the economic prosperity of a region. First, Germany, compared to other European countries, has relatively well-structured and defined regional classifications, which allow an appreciation of the workings of the labour market as well as the distribution of high-skilled professionals and bohemians. Identifying the cause-effect dynamics, or reciprocity between bohemians and high-skilled professionals can provide more specific insights to policy makers when

designing regional development policies. Second, Germany provides a regional classification that accommodates the set of regional features (i.e. urban and rural, technology, talent, tolerance, and human capital) used by Florida's (2002a). It also has robust administrative panel data classified by occupation. Unlike most of the previous cross-sectional studies (including Florida, 2002a), our panel estimation contributes to extant research by addressing in a more rigorous way the impact of bohemians on other creative class groups over the years and across regions. Third, the German education system, with focus on technical education and on vocational training, produces graduates with high technical expertise, and these are eventually to be categorized as high-skilled professionals. Such educational system provides the opportunity for studying the attraction role of bohemians and, if so, to assess to what extent this affects technical experts. On the other hand, in Glaeser's (2005) perspective, the fact that Germany's educational system places great emphasis on achievement and vocational training raises the question of whether creative class categories focussing on occupational status are just another way to define human capital as educational attainment. Fourth, Germany represents a different form of capitalism with respect to the U.S., not least in terms of the stronger role of the banking system in Germany with respect to the U.S., and of the role of worker representation in the governance of large firms (co-determination system) and of unions in stabilizing the labour market (cf. Hall and Soskice, 2000, on varieties of

capitalism). Both the German educational and the industrial systems show marked differences relative to the U.S. It is therefore fundamental to test Florida's hypotheses outside the North-American regions where initial studies were undertaken. Our longitudinal analysis of creative class relationships paves the way to comparative analysis.

Data and categorisations

This study uses 11 years (1998–2008) balanced administrative data from the Sample of Integrated Labor Market Biographies IAB (SIAB 1975–2008) from the Institute for Employment Research (IAB) as well as from the Federal Statistical Office of Germany. Data from IAB contains individual panel, establishment panel, and establishment history panel. The individual panel contains employment histories of 1.6 million employees who are subject to paying social security—a 2% sample of employees over the 1975–2008 period. All data on employment are from public and private organizations. The sample includes more than 200,000 employed workers per year and provides information on daily wages, working days, and further individual characteristics for all employees.

Among the excluded are the self-employed, civil servants, part-time workers, and apprentices. Because the study is based on annual data, we use all full-time employees on June 30 of each year. In addition to detailed information on professions, the data describe the main personal characteristics of workers, including gender, age, education, as well as basic information about the employer (industry affiliation, location, and firm size). There are 132 profession/occupation categories, each with a three-digit code ranging from 011 to 996. A qualifying element of this sample is the inclusion of the regional and professional composition of employed persons. Further advantages, include the high validity and up-to-date nature of the data.

Moreover, the IAB database is organized in a manner that benefits from the ILO labour as well as creative class classification systems. As such, the creative class is classified into creative core (CC), creative professionals (CP), and art experts or bohemians (BOH) (Appendix A1). Table 1 presents the categories of the creative class constructed on the basis of creative class and human capital (HC) classification systems made by ILO (1993) as well as empirical works including that of Florida's (2002a, 2002b) and Boschma and Fritsch's (2009).

TABLE 1 ABOUT HERE

In this particular study, the creative class excludes bohemians, who are categorised in a separate group. As indicated in Table 1, in this study the CC includes experts who work in hard sciences, engineering, and technology, teaching, and research centres. These are individuals registered in the employment database as physicists, biologists, chemists, mathematicians, statisticians, geologists, computer experts, engineers, architects, faculty members, teachers, researchers, think tank workers, and information experts. The second group of employees, CP, are identified as economists, health professionals, business analysts, juries, public service administrative workers, managers, senior officials, politicians, legislators, senior officials, business professionals, police inspectors, detectives, sociologists, and anthropologists. We use the approach of Boschma and Fritsch (2009) as well as Möller and Tubadji (2009) who consider BOH as a separate groups of creative class individuals. These experts are archived in the database as creative writers, poets, performing artists, photographers and image and sound recording equipment operators, entertainers, sports associate professionals, and fashion and other models.

The classification of creative class into three categories and the comparison of this classification with human capital (HC) required a reclassification of HC into three groups. In Germany, each occupation or profession is assigned a three-digit number, which provides a unique opportunity in the analysis of the impacts of the creative class on regional economies. However, Germany's education curriculum is divided

into six levels or types: primary, intermediate, and lower secondary school graduates without vocational certificates; primary, intermediate, and lower secondary school graduates with vocational certificates; upper secondary school graduates without vocational training; upper secondary school graduates with vocational training; university of applied science degree holders; and non-applied science degree holders. The classification of the German education system into six categories, however, is not suited in our empirical analysis for the difference between some of these categories is marginal. Consequently, the six groups are regrouped into three groups as indicated in Table 2. The first education group (EDU1), consists of primary, intermediate, lower secondary, and upper secondary education graduates; but without technical and vocational training. The second education group (EDU2) includes those with primary, intermediate, lower secondary, and upper secondary graduates; and with technical and vocational training or certificate. The last education group, or tertiary education group (EDU3), refers to (technical and non-technical) college graduates.

TABLE 2 ABOUT HERE

The IAB database stores information on HC measured by educational attainment, the German unique education curriculum, and aggregation of HC (details in Table 2). We

also use establishment panel, which includes data on the median wage, on industry classification, and on the workplace. Inflation adjusted regional GDP per capita is accessed from the Federal Statistical Office of Germany while information on population size, region area, industry location (in East or West Germany) are obtained from establishment panel history (BHP). Some regions, such as in Chemnitz and Leipzig, are not represented by valid data that can be used in our study. These regions were either merged with other regions or might have become administrative regions recently. We, therefore, did not include observations that fall within these regions. We also dropped other observations coming from some other regions without valid information. After data cleaning, 394 NUTS3 regions were retained. They correspond to 95% of the country's total number of regions.

Estimation

In order to estimate the impact of bohemians (BOH) on high-skilled professionals (HSP), we adopt the insights found in Florida (2002a, 2002b), and extend our estimation to a more rigorous methodology, that is dynamic panel modelling in the following form (Arellano, 2003; Baltagi, 2013):

$$\ln HSP_{i\,t} = \beta_1 \ln HSP_{i\,t-2} + \beta_2 \ln HSP_{i\,t-1} + \beta_3 \ln BOH_{i\,t} + \beta_4 \ln x'_{i\,t} + \beta_5 \ln yr_{i\,t} * + \ln \omega_i + \ln \varepsilon_{i\,t} \quad i = 1,\ldots,N \;\; \& \; t = 1,\ldots,T \qquad (1)$$

where $\ln HSP_{i\,t}$ is the natural log of the number of high-skilled professionals (CC and CP together) in region i and year t over the 1998-2008 period. $BOH_{i\,t}$ is the number of bohemians in region i and year t, $x'_{i\,t}$ denotes sets of control variables which can have some relevant impact on high-skilled professionals in a particular region. These include the logs of total employment (EMP), inflation-adjusted GDP per capita or real GDP per capita (RGDPPC), industry size (INDS), and population density (POPD). Besides standard controls such as employment, GDP and size, the inclusion of population density is justified by the need to account for some regional factors, such as land prices and wage levels, that are associated with density, hence with a pure urban dimension and not with art activities per se (cfr. Boschma and Fritsch, 2009). ω is an unobserved, region-specific, time-invariant variable which may be correlated with any of the explanatory variables but not with the error term $\varepsilon_{i,t}$.[3] $yr*$ is a year dummy included to address unobservable shocks. We also include the lags of the dependent variable HSP as explanatory variables, for we believe that the current number of high-skilled professionals in a particular region is likely to be affected by

[3] $\varepsilon_{i,t}$ is an independent and identically distributed (iid) error term with $E(\varepsilon_{i\,t}\, x'_{i\,t}) = 0$ for all i and t.

the number of previous years' high-skill professionals in the same region. That is, high-skilled populated regions tend to attract high-skilled experts.[4] To account for different types of panel bias (endogeneity and instability of estimation) [5] we modify the model using the first difference estimation. Differencing equation (1) yields[6]:

$$\Delta \ln HSP_{i\,t} = \beta_1 \Delta \ln HSP_{i\,y-2} + \beta_2 \Delta \ln HSP_{i\,y-1} + \beta_3 \Delta \ln BOH_{i\,t} + \beta_4 \Delta \ln x'_{i\,t} + \beta_5 \Delta \ln yr_{i\,t} * + \Delta \ln \varepsilon_{i\,t} \quad i = 1,\ldots,N \quad \& \; t = 2,\ldots,T \qquad (2)$$

Under the assumption that $E(HSP_{i\,t}\ \varepsilon_{i\,t}) = 0 \; for \; i = 1,..,N \; t = 2,...,T$

[4] We determine the lag length of the dependent variable HSP using autoregressive estimation. We find that the first two lags of high-skilled professionals have a robust impact on its current value. Beyond the second lag, the effect is insignificant. Therefore, only two lags are included in the analysis: the second lag ($SHP_{i\,t-2}$ and first lag ($SHP_{i\,t-1}$), (see further technical detail in Appendix B).

[5] The potential problem that may arise in using the above dynamic panel model is that the lagged dependent variables of high-skilled professionals will correlate with the time-invariant region fixed effect error terms ω_i. This in turn, can lead $HSP_{i\,t}$ to correlate with ω_i. This inflates the coefficient of the lagged dependent variable and, hence, results in upward panel bias (Hsiao, 1986), which eventually leads to the presence of endogeneity and to instability of the estimation (cfr. Appendix B for more technical detail).

[6] Since the time-invariant variable (ω_i) is removed, the estimation is free from upward and downward bias effects (Ahn and Schmidt, 1995), this way allowing the use a generalized method of moments (GMM) estimator (cfr. Appendix B for more technical detail).

Descriptive statistics

The core creative (CC) or super-creative class represents 12% of the employed in Germany, the same figure as in the United States where CC takes nearly 12% of all the U.S. employed, as spelled out in Florida (2002a).[7] About 40% of the labour force in the United States is made of creative class professionals (the sum of creative core plus creative professionals) (Florida, 2002a). This figure does not match with our study, since in Germany CP alone amount to 55% of the workforce (Table 3), well over the sum of CC and CP in the United States. BOH take the smallest share— on average only 7% of total full-time employees. The fact that BOH are highly mobile, work privately, and are less likely to be documented as full-time employees in the employment database, would tend to cause their share to be less represented than one might expect. Still, an average of 7% represents a valuable result.

The combined CC and CP in a given region appears to be 67% (12% CC + 55% CP), a value nearly two times that of the United States. Nevertheless, if CC and CP were taken from total employment (instead of full-time employees), the share would have been lower than 67%.

[7] Recall that the creative class is made by the core creative (CC), creative professionals (CP), and bohemians. CC in Germany and the U.S. refers to the core creative, not to the total creative class.

It is also observed that the share of the primary, intermediate, lower secondary and upper secondary school graduates without vocational training (EDU1) in full-time employment is, on average, 12%. On the other hand, the proportion of primary, intermediate, lower secondary and upper secondary school graduates with vocational certificates (EDU2) in full-time employment is 48%; while the share of applied university and non-applied university graduates (EDU3) in full-time employment is 13%. It is possible to understand from these figures that a peculiar feature of Germany's education system that places great emphasis on practical training drives the share of employees with vocational certificates (nearly half of the sample). In fact, In Germany, primary, lower secondary, or upper secondary school graduates without vocational training may find serious difficulties in finding employment. In addition, even if employment is found with such a profile, this is usually on low pay and temporary (Table 3).

TABLE 3 ABOUT HERE

Table 4 reveals that the level of association between the creative core (CC) and those who hold primary, intermediate, junior, and secondary school education, but without vocational training (EDU1). is 0.935; the correlation between CC and those

who had primary, intermediate, junior, and secondary school education, and with vocational certificates (EDU2), is 0.905; the correlation between CC and technical and non-technical college graduates (EDU3) is 0.931. Similarly, Table 4 demonstrates that the association between CP and EDU1 is 0.904; between CP and EDU2 is 0.996; and between CP and EDU3 is 0.889. Moreover, there is a strong relationship between BOH and EDU1 (0.951), BOH and EDU2 (0.876), and BOH and EDU3 (0.897).

TABLE 4 ABOUT HERE

There is strong evidence that the presence of a large share of tertiary-level graduates in a region is likely to imply the presence of a large of share of creative class workers, because creative class individuals tend to have a high level of education (Glaeser, 2005). In our correlation analysis in Table 4, this is especially true in the case of creative core professionals, more than in the case of other creative professional and bohemians. Further, correlations indicate that the association between creative class and human capital is strong and that the association among the six variables (three of them referring to creative class categories, and the other three to HC indicators) is close to or higher than 0.9 (Table 4). The very strong correlation between CP and EDU2 (0.996) shows that professionals almost always come from a vocational training background. As for bohemians, the strong correlation with EDU1 implies that

a conspicuous part of this category tends to spend fewer years at school, and attend vocational training less often than the other creative class categories. On the other hand, a large share of bohemians also achieves tertiary education. That is, bohemians appears to be the category that less often uses vocational training to achieve higher educational standing. Finally, as associated, bohemians appear more strongly associated with the creative core, than with creative professionals. In more general terms, the consistently positive and robust correlations between creative class categories and HC seem to underline or prove that creative class and HC indicate different definitions of very similar socio-demographic groups.

Results

Our results indicate that bohemians (BOH) have positive and strong impact on the distribution of highly skilled professionals (HSP) across regions. Findings confirm Florida's tenet that bohemians do attract creative class professionals, or HSP. This result is consistent with Boschma and Fritsch (2009) and Wedemeier (2015), but contradicts Möller and Tubadji (2009).

The estimation results show that the first lag of high-skilled professionals (HSP=CC+CP) has positive and significant impact on current high-skilled professionals (Table 5). In particular, a 1% rise in the first lag of HSP appears to have increased HSP by about 0.64 %. However, the second lag has a negative effect on

HSP with the level of impact being robust at the 10% level of statistical significance. Further, we find that the presence of Bohemians has affected HSP positively at 1% level (Table 5). This supports Florida's (2002a, 2002b) creative class theory that BOH attract HSP. The result is consistent with the contribution by Boschma and Fritsch (2009), who found that BOH has a positive influence on the geography of other creative sector professionals.

A high proportion of BOH tends to indicate a dense local culture, lifestyle, and set of values that are different from those of the mainstream labour force. Bohemians, being artistically creative, could add a sense of liveliness to a location as well as openness to different lifestyles and values, which would then make the region attractive to professionals. Nevertheless, the current result is at odds with the contributions of Möller and Tubadji (2009), who found the influence of BOH on creative class professionals not significant. However, it is worth noting that their estimation was focused on West Germany for 323 regions, using six merged panels that span 30 years data (1975-2004).

All controls—total employment, inflation-adjusted GDP per capita, industry size, and population density—have positive effects on HSP. Increased employment and higher living standards may show a natural tendency to attract creative class professionals, as this can be considered a general feature of the labour market. These controls, in our study, allow to single out and isolate the unique impact of bohemians

on high skilled professionals. A 1% rise in total employment increases, ceteris paribus, the corresponding region's HSP by 0.50%. Similarly, regions with commendable GDP records attract a considerable number of HSP. The elasticity of HSP with respect to GDP per capita is 0.08, a figure lower than the elasticity of HSP to total employment. Overall, total employment and real GDP per capita do affect the distribution of HSP at the 1% level of significance. Industry size and population density do not appear to influence locational choices of high skilled professional.

TABLE 5 ABOUT HERE

Discussion and further research

Florida's seminal work considered specific occupations as having a high degree of creative content. The selection of creative occupations is based on whether these require an ability to identify and problematize a situation in a particular domain in a new and relevant way, thereby bringing novelty. The approach thus bridged regional development with cognitive and innovation theories. In these interpretations, creativity is exerted when framing a problem, when identifying new solutions, or combining existing knowledge in new ways, using intelligence and imagination (Dosi and Egidi, 1991; Boschma and Fritsch, 2009; Möller and Tubadji, 2009; Author 2,

2013). In Germany, these categories of people have been shown to acknowledge the presence of bohemians as one of the drivers of their location choices.

Our results also strengthen the idea that using occupational categories to study economic development leads to important theoretical, empirical and policy implications. The overlap and intersection of occupation and education effects is confirmed, in our study, by correlation coefficients in Table 4, which are extremely high and imply that related effects are complementary, rather than rival, in important respects. This supports the results achieved by other studies, which show different, but overlapping and coherent effects of human capital and creative occupations on economic development. While human capital would impact more strongly on GDP and wealth, creative occupations show a stronger relation with employment and wage growth (Mellander and Florida 2007; Authors, 2013). On the other hand, this overlap also requires critical re-examination of the creative class to education debate, though the main published results seem to play in favour of the use of occupational categories instead of educational ones. As Florida, Mellander and Stolarick (2008: 618) state: "Education measures potential talent or skill, but occupation provides a potentially more robust measure of utilized skill—that is how human talent or capability is absorbed by and used by the economy. While studies have shown that education is one way of improving the productivity of labor, other factors such as creativity, intelligence and on-the-job knowledge and accumulated experience function

interchangeably with education in affecting labor productivity (Smith, Carlsson and Danielsson, 1984). Education provides an underlying level of capability, but such capability has to be converted into productive work. Thus, occupation is the mechanism through which education is converted into skill and labor productivity". In our view, the strong interconnectedness between occupation and education measures can be best appreciated by reflecting on their 'moral' meaning. A focus on education prioritises a specific outcome,[8] which is *skill achievement*, regardless of its creative content or its actual application to production activities. Conversely, by focusing on occupations, the creative class approach directs attention to a different type of outcome, which is *creative achievement*, regardless of the actual education achievement. Occupations, from this perspective, are an indication of the *real doings* of individuals in their job positions. Education, on the other hand, measures *a potential* occupation, represents its necessary premise in most common cases and does not necessarily overlap with doings or the economic use of the skills learned, such as when educated individuals are underutilized in their occupational role. A general overlap between education and occupational indicators, as the German context shows, is unavoidable and indicates that the potential opportunities opened by education are matched by adequate occupations, or real doings.

[8] Sen's idea of functioning (to be understood as outcomes, or people "doings") may support the accomplishment of a task (Sen, 2002).

New extensions and directions for research derives from our attempt to take some grounded steps forward in the analysis of the role of bohemians in socio-economic development. Our results also envision further research on the presence of art experts as a scientifically and politically relevant issue. Our paper has not delved into the process by which bohemians' presence attracts talents from elsewhere. Alfken (2015), Alfken, Broekel, and Sternberg (2015), Montanari et al. (2016) go in this direction, by using qualitative methods to study the intrinsic motivations of talents migrating in Germany. Building on similar contributions, research could work towards the identification of organizational patterns that support creative class attraction and retention (e.g. as free lancers, within for-profit rather than non-profit organisations, and public sector organisations).

Furthermore, the analysis of Florida's categories and impacts can be further articulated with a view to studying their effects on socially just solutions, since our research has not addressed distributional issues. The effects of policies inspired by the creative class thesis are now being tested against other regional development patterns, concerning most importantly wealth distribution and inequality. Bohemians can stimulate diversity and openness as Florida suggests, but the implications should not have to be confined to the pursuit of the objectives of single classes of individuals. Research has started to address the effects of creative class policies in urban areas, and evidenced selective positive effects and feedback. Documented processes of

gentrification, with house prices and wage differentials rise can contribute to increase the gap with weaker and marginalized categories (Halle, 2013; Peck, 2005; McCann, 2007; Gibson, 2006). Despite their importance for regional development, studies have not addressed possible institutional and organizational solutions to this issue. Research may usefully aim at capturing the extent to which the work of artists is in the community and for the community, and how this may happen, for example in promoting diffused social capital and collective learning; in fostering inclusion and general well-being rather than inequality; and whether artistic occupations contribute to the production of positive externalities, social capital and other socially oriented outcomes.

Conclusion and policy implications

In studying whether bohemians attract high-skilled experts to specific places, Germany represents a unique regional case. Its cultural and artistic heritage, both in academia and in civil society, is expected to have a crucial influence on the development of its creative class, and especially of bohemians. Complementary, Germany hosts one of the largest manufacturing sector in Europe, as a percentage of national GDP. This corresponds to a consistent educational system, especially of vocational training, and to an important presence of creative professionals. Hence, the

nexus between German arts and advanced industrial production offers unique background for the study of the link between bohemians and high skilled professionals. The effects of the former category, beside the arts and cultural industry strictly speaking, are mainly recognized in the production of positive external social effects in terms of culture, social capital, civicness and tolerance, while in the latter case we would most probably observe diffused technical knowledge creation and circulation, and directly measurable economic value added. Our results show that the two effects are complementary, not rival, and apparently the former represent a premise and favours the attainment of the latter. Further, we do not exclude that there can be not only a positive linkage, but also real overlapping between the two categories of effects, for example when art experts' skills are recognized and employed in the growing Industry 4.0 sector.

The general conclusion that comes from our study concerns the confirmation of a positive relation between the presence of bohemians, creative class professionals, and regional development. These results are of special interest when creative sectors and their economy wide impact are considered. European Institutions are including similar elements in their policy initiatives. According to the report by EY (2014), more than 7 million Europeans are directly or indirectly employed in creative and cultural activities (CCI), 3.3% of the EU's active population. The biggest employers among Europe's CCIs are visual arts, performing arts and the music industry. Employment in

CCI has experienced fast growth (+3.5% per year in 2000-2007) that withstood the economic crisis (+0.7% per year in 2008-2012), and this "creative engine" also represented "indirect power" for economic development (EY, 2014: 27). The EU has acknowledged the effects of the creative sector and has placed creativity and culture among the eight areas of the EU Youth Strategy (Stano, Węziak-Białowolska and Saisana, 2017), complementing it with policies for reinforcing dedicated infrastructures and capacity building (e.g. ICT highways, dedicated secondary and tertiary education), the creation of new entrepreneurial initiatives (for example through education, finance and protection of intellectual property rights). Finally, civil society can also play a crucial role, especially by creating an appropriate ecosystem of linkages with federations, social and business incubators, non-profit organizations specialized in cultural and creative activities, and with higher education institutions (UN, 2010).

The results of this specific paper can have crucial bearing on social and educational policy, since, for example, humanities, scientific, and technical education should not be seen any more as radically different and alternative patterns, but as synergic fields that lead to different, but complementary societal and economic outcomes. Difference and positive interaction need to be conjugated. Another strong implication is that the presence of bohemians cannot be seen as detrimental to development. Its direct and indirect effects, which are indeed complex and multifaceted, need to be further

analysed. While direct effects may be weak or even negative (Author 1, 2013), indirect, mediated and external effects, when combined with the impact on creative class professionals, for example through the medium of a more tolerant culture, social capital and academia, can be powerful drivers of development (Florida et al., 2008). These elements need to be considered in the evaluation of the impact of different educational policies and initiatives. Given the indirect nature of the impact of bohemians on development, funds need to be targeted to support such effects, for example by favouring the location of education and housing facilities in areas with strong growth potential, especially because the cultural and creative industry (CCI) is a growing one in most advanced countries. Their inflence can also be crucial in social policies addressing exclusion, social regeneration and revitalization of marginalized areas, which can have nonetheless positive potentials in terms of growth and development because of the presence of a skilled workforce and other resources (e.g. cultural and historical heritage, institutional complementarities). Policy design based on our findings promises to address development problems effectively in several context.

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Table 1. Creative class by occupation

Creative people	**Experts Classified by Occupation**
Creative core: CC	Physicists, chemists, biologists, mathematicians, statisticians, geologists, computing scientists, engineers, architects, professors, faculty members, researchers, think tank experts, data, information experts.
Creative expert: CP	Economists, decision scientists, legal scientists, health professionals, high level politicians, senior officials, business experts, intelligence and detective workers, social workers, and anthropologists.
Bohemians: BOH	Photographers, image, and sound recording equipment operators, performing artists, creative writers, poets, artistic, entertainment and sports associate professionals, fashion and other models.

Source: Authors' construction using the approach of ILO (1993), Florida (2002a, 2002b), and Boschma and Fritsch (2009).

Table 2. Human capital by educational attainment in Germany

Human capital	Educational attainment
EDU1	Primary, intermediate, lower secondary, and upper secondary school graduates without vocational certificates (1 + 3)
EDU2	Primary, intermediate, lower secondary, and upper secondary graduates with vocational training (2 + 4)
EDU3	University of applied and non-applied science degree holders (5 + 6)

Source: Authors' construction based on SIAB (2013)

Table 3. Summary statistics of creative class categories and human capital categories (Obs. = 4334)

Variable	Mean	Std. Dev.	Min	Max
CC	0.123	0.098	0.001	0.761
CP	0.545	0.385	0.002	2.200
BOH	0.078	0.081	0.001	0.620
EDU1	0.117	0.107	0.002	0.789
EDU2	0.483	0.343	0.002	0.946
EDU3	0.130	0.100	0.001	0.717

Table 4. Correlation between creative class categories and human capital categories

Variable	CC	CP	BOH	EDU1	EDU2	EDU3
CC	1					
CP	0.901*	1				
BOH	0.958*	0.875*	1			
EDU1	0.935*	0.904*	0.951*	1		
EDU2	0.905*	0.996*	0.876*	0.896*	1	
EDU3	0.931*	0.889*	0.897*	0.834*	0.873*	1

Table 5. One-step SGMM estimates for High-Skilled Professionals[1]

Explanatories	β (Stan. Error)
lnL1.HSP	.644 (.085)***
lnL2.HSP	-.010 (.017)
ln BOH	.981 (.281)***
lnEMP	.494 (.097)***
lnRGDPPC	.084 (.041)**
ln INDS	.019 (.078)
lnPOPD	.143 (.221)
Year dummy	Included
Arellano-Bond test AR (1)	t = -3.53 Pr > t = 0.000
Arellano-Bond test AR (2)	t = -0.53 Pr > t = 0.593
Hansen over-identification.	χ^2 (36) = 42.76 Pr > χ^2 = 0.204
Observations	3,546
Regions	394

Standard errors in parentheses, **$p < 0.05$, ***$p < 0.01$

[1] Regarding the specification of high-skilled professionals model, the Arellano-Bond first order AR (1) test proves that there is no autocorrelation of the idiosyncratic error term as the $p = 0.000$ is well below the required threshold of 0.05. Also, the second order AR (2) $p = 0.593$, which is well above the required p > 0.05, also confirms that the estimated model does not have any serial correlation problem—which further indicates absence of endogeneity. Furthermore, the Hansen (robust) test of over-identifications, with $p = 0.204$ (which is greater than 0.05), rejects the null hypothesis that the model is over-identified and, therefore, the identified instruments are found to be valid. Overall, the estimated high-skilled professionals' model is properly specified.

Appendix A

Appendix 1**:** Creative class professionals and bohemians identification using IAB database, Germany

Occupational Category	**IAB Occupation Code**
Creative Core	
Engineers	601: Engineers of machine, vehicle & construction 602: Electrical engineers 603 Architects 604: Surveyors 605: Mining, metallurgical and foundry engineers 606: Other Manufacturing Engineers 607: Other engineers 611: Chemists, chemical engineers 612: Physicists, physics engineers, mathematicians 52: Gardening Architects
Scientists, think tank researchers	881: Social scientists and statisticians 883:Other scientists
Professors and faculty members	871: University professors, faculty members and lecturers at higher vocational schools and academies

Occupational Category	**IAB Occupation Code**
Analysts, entrepreneurs, leading administrators	751: Entrepreneurs, CEO
Head of business unit	752: Management Consultant, organizers 762: Senior administrative and decisive
Opinion makers: dispersed in other categories	774: Software programmers / engineers, data processing professionals
Creative professionals	
High-tech services sectors and technicians	621: Mechanical Engineers 622:Electric technicians 623: General technicians 624: Surveyors 625: Mining, metallurgical, foundry technicians 626: Chemical engineers, physical science 627: Other manufacturing technicians 628 :Other technicians 629: Foreman, foreman 631: Biological and special technical professionals 632: Physical and mathematical and technical

Occupational Category	IAB Occupation Code
	633: Chemical laboratory 634: Photo lab technicians 635 :Draftsmen
Financial services	691: Bankers 753: Auditors and tax advisers
Legal services	813: legal services and legal consultants
Business services	703: Business consultancy experts 822: Business analysts
Humanities	882: Humanity experts
Bohemians	
Creative writers and performing artists	821: Publicity workers, promoters and advertisers 823: Librarians, archivists, museum professionals 831: Musicians 832: Performing Artists 833: Artistic graphic makers
Photographers, image and sound recording equipment operators, and other	837: Photographers 835: Artistic and associated professions of stage, screen and sound

Occupational Category	**IAB Occupation Code**
fashion models	
Artistic, entertainment and sports associate professionals	838: artists, professional athletes, artistic paramedics

Appendix 2: AR (2) process of creative class

Variable	lnHSP			
lnHSP	AR	OLS	FE	One-step SGMM
LnL1.BOH	1.036	0.916	0.422	0.644
	(6.615)***	(7.887)***	(3.221)***	(7.51)***
lnL2.BOH	-0.047	-.013	-0.015	0-.010
	(-3.00)***	(-1.24)	(-1.83)*	(-0.60)
Sum β	0.989	0.903	0.409	0.654
Observations	3546	3546	3546	3546
Regions	394	394	394	394

*p<0.1, ***p<0.01, t-statistic in parentheses

Appendix B

Dynamic panel modelling, Difference GMM and System GMM

In dynamic panel modelling, inflated coefficients of the lagged dependent variable results in upward panel bias (Hsiao, 1986), which eventually leads to the presence of endogeneity and to instability of the estimation. This is a phenomenon attached to pooled OLS models; a condition that creates an upward panel bias, resulting in an inconsistent estimation. One way to reduce upward bias is to employ within fixed effects, or FE technique. However, the problem of the within estimator is that the sum of the parameters of lagged dependent variables has a tendency toward downward panel bias (Nickell, 1981), even if these variables are not serially correlated with . If the spell of , then the downward bias of the within estimator will be minimized; yet, evidence shows that even for T = 30, FE the estimator undergoes a downward bias.

In the first difference estimation the time-invariant variable (ω_i) is removed, freeing the estimation from upward and downward bias effects (Ahn and Schmidt, 1995). This allows the use a generalized method of moments (GMM) estimator. Two GMM models are defined: difference GMM (DGMM) (Anderson and Hsiao, 1981; Arellano and Bond, 1991; Holtz-Eakin, Newey, and Rosen, 1988) and system GMM (SGMM) (Arellano and Bover, 1995; Blundell and Bond, 1998). DGMM suffers from large finite sample bias when available instruments are weak. In case of persistent series, the value of autoregressive order coefficient β_1 is close to unity and

the variance of the fixed effect (ω_i) increases relative to the variance of the disturbances (ε_{it}). In this case the instruments (the lagged values for subsequent first differences) are weak. However, SGMM works well because it subtracts averages of future values instead of lags. Furthermore, SGMM reduces the problem of finite sample biases associated with weak instruments, and estimates a system of equations both in first differences and in levels (Arellano and Bover, 1995; Blundell and Bond, 1998; Hsiao, 2003). Therefore, we adopt SGMM in our estimation.

Whether to use DGMM or SGMM in dynamic panel model depends on which model better fulfils the requirements of serial correlations and over-identification. Whereas the Arellano-Bond AR (1) and AR (2) test identifies the existence of serial correlation, the Sargan or Hansen test detects the existence or absence of over-identification. The GMM estimator is consistent if there is no second-order AR (2) serial correlation in the error terms of the first-difference equation. The null hypothesis that the errors are serially uncorrelated is tested against the alternative; and not rejecting the null hypothesis shows the validity of the assumption of no second-order serial correlation. The Sargan or Hansen diagnosis, therefore, informs whether the sets of instruments used are properly identified and valid. The set of instruments used are valid if there is no correlation between the instruments used and the error terms. The null hypothesis that instruments and error terms are independent is tested against an alternative, and failure to reject the null hypothesis suggests that the instruments used are valid. The choice of the Sargan or Hansen differs in the use or non-use of the robust option. If the robust option is used the Hansen test can be used.

The choice of the SGMM estimator is based on the results obtained, which are unbiased and consistent.