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Location Determinants of the Portuguese Creative Class

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Resumo

A última década tem sido palco de debate académico e político sobre a importância do capital humano como responsável pelo desenvolvimento regional, assim como sobre os fatores que o mesmo considera para determinar a sua localização. Estes fatores são principalmente conhecidos na literatura empírica como 'determinantes de localização' do capital humano.

Diversos estudos teóricos e empíricos têm surgido, referenciando principalmente a 'classe criativa' de Richard Florida por diferentes razões, evidenciando a importância da criatividade contida no capital humano, assim como de conhecer os determinantes de localização do capital humano devido à conexão dos mesmos com a prosperidade urbana e com o desenvolvimento económico regional.

Deste modo, a servir de extensão aos mais recentes artigos relacionados com a criatividade, capital humano, distribuição espacial do mesmo e desenvolvimento regional, este estudo propõe uma metodologia atualizada para precisamente analisar uma classe específica do capital humano presente na força laboral Portuguesa, enquanto também apresenta os principais fatores influenciadores da sua distribuição espacial por todo o território nacional, baseada nos principais argumentos que a literatura contemporânea considera como relevantes.

São encontradas correspondências positivas e estatisticamente significantes entre a distribuição de participantes da classe criativa na força laboral Portuguesa e as variáveis explicativas relacionadas com o nível de educação do capital humano assim como do nível de Tolerância da região onde se encontram, como as principais fontes de literatura empírica sobre o tema – principalmente de Richard Florida e Edward Glaeser – indicam.

Palavras-chave: Capital humano; Classe criativa; Distribuição espacial; Determinantes de localização; Modelo de corte transversal; Portugal.

Abstract

The past decade has been a stage to academic and political debate on human capital importance as driver of regional growth as well as for the factors that human capital considers when setting its preferred location. These factors are fundamentally known in empirical literature as 'location determinants' of human capital.

Many theoretical and empirical studies have arisen, most referencing Richard Florida's 'creative class' in some manner, putting forward evidence regarding the importance of creativity in human capital as well as the importance of understanding human capital location determinants due to linkages to urban prosperity and regional economic development.

Hence, serving as an extension to the most recent studies concerning creativity, human capital and its spatial distribution and regional development, this research proposes an updated methodology to accurately analyze a specific class of human capital present inside the Portuguese employment, while also presenting the drivers of its spatial distribution throughout the national territory, supported by the main arguments that contemporary literature considers to be relevant.

It is found a positive statistically significant between the share of creative class participants in the Portuguese workforce and explanatory variables related with the educational level of human capital and the tolerance in the region they belong, as the main empirical literature regarding this subject – mainly from Richard Florida and Edward Glaeser – argue.

Keywords: Human capital; Creative class; Spatial distribution; Location determinants; Cross sectional Model; Portugal.

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List of Abbreviations

CAE – *Classificação Portuguesa de Atividades Económicas*

CNP – *Classificação Portuguesa das Profissões 94*

CPP – *Classificação Portuguesa das Profissões 2010*

DCMS - Department for Digital, Culture, Media and Sport (UK Government Agency)

INE – *Instituto Nacional de Estatística*

ISIC – International Standard Industrial Classification

LAU – Local Administrative Unit

NUTS – *Nomenclature des Unités Territoriales Statistiques*

QP – *Quadros de Pessoal*

SIC – Standard Industrial Classification

SOC – Standard Occupation Classification

VIF - Variance Inflation Factor

1 Introduction

In this first chapter, a contextualization of the subject will be introduced, followed by the motivation and objectives for the study.

1.1. Contextualization and Motivation

Regions are actively seeking to improve their growth, through economic development, enabling a fair environment across all enterprises, fostering creativity, openness and innovation. Development models need to have a sustainable basis, promoting social, cultural and economic aspects of the region, caring not only on the short-term growth of the same but also for the long-term needs, enabling that region to thrive in the future (Directorate-General for International Cooperation and Development, 2018).

The underlying driver for a region's economic development is the presence of highly skilled and educated people, or human capital. Its constructive and persistent relationship with a regions' development has been documented in several studies and regions throughout the globe (Simon, 1998). Traditionally, the standard measure for human capital has been educational attainment, however, contemporary lines of thought will be discussed, arguing that education is not capable of capturing the entire skillset that an individual might possess. More recently discussed has been the role of creativity in individuals, working as a source of innovation and growth, a fundamental part of human capital, and, not measured by the traditional standards of educational attainment (Florida, 2004).

Because of the link between human capital and regional development, there has been an increasing interest over the past decade regarding the spatial distribution of human capital, with political and academic debate that gradually highlights the importance of understanding the geography of knowledge-intensive and skill-rich industries and its employees, since they act as drivers of regional growth. Uneven levels of human capital have been verified across many territories, further increasing gaps of regional growth (Berry & Glaeser, 2005). It has also been found throughout literature that human capital tends to co-locate, further contributing to uneven spatial patterns that still require the explanation of several territorial, sociological and economic determinants (Jacobs, 1969; Florida, 2002; Lazzeretti et al., 2008; Cruz and Teixeira, 2015).

In the current globalized economy where the time span from innovation to imitation is declining in growing rates, enterprises, governments and key decision-makers are required to better understand what factors determine the location of skilled and creative human capital, to best manage its distribution and thus successfully facilitating social and economic development. In that sense, previous statements constitute the motivation for the development of this study, that will follow a methodology centered in an econometric model to provide useful insights on what factors influence the location of a specialized form of human capital, the creative class, in the Portuguese territory.

1.2. Objectives

This work intends to identify the current state of the Portuguese creative class and shed light on the location determinant factors that drive such class. The first objective of this study, after an extensive literature review has been conducted – where the most basic related topics to this study's scope of work, from the intrinsic concepts of human capital to some more abstract as the creative class, industry and occupational measures, as well as the factors that explain the clustering and distribution of highly skilled individuals, will be presented and discussed considering prior literature regarding both international and Portuguese regions – is to characterize the Portuguese creative class, relying on the most recent data available, performing a detailed descriptive analysis.

Subsequently, when this objective is completed and the Portuguese creative employment – both creative workers and creative firms – is fully characterized, the second objective is to develop an econometric model to shed light on some of the intricate drivers that literature finds crucial to attractiveness and permanence of creative class participants in specific regions over other regions, contributing to future research and subject understanding. The following chapters will present how this socio-economic class is unevenly distributed across many regions, presenting as well specific factors that influence said distribution throughout various areas.

Using a longitudinal dataset that matches employer with employee data at the national level, called *Quadros de Pessoal*, referred to as *QP* from this point onwards, this work and the following dissertation aim to present a comprehensive descriptive analysis, detailing the most recent data sample of the Portuguese workforce, effectively characterizing the Portuguese creative employment. Furthermore, relying on the same dataset, an econometric model to evaluate the influence of particular indicators that the empirical literature finds as determinant drivers for the creative class and creative industries location will be developed and its results will be analyzed as well.

Prior empirical literature considering the both international and the Portuguese creative class, its industries and activities will be presented, as well as the review of different methodological approaches to estimate and measure the class that enable this study. The dissertation that follows this work proposes to apply such notions and methodologies to contribute in increasing the robustness of the empirical data available for the Portuguese territory and aid future research in related topics such as labor dynamics, creativity, human capital and regional development.

1.3. Document Structure

This document is divided in six chapters, structured as the following:

The first chapter consist on an introductory contextualization of the topic in study, where the motivation and objectives for this work are presented as well.

The second chapter contains the entire literature review performed on the subject, where all relevant concepts, ideas, theories and empirical models are presented. To provide a stronger structure to the study, the literature review will follow an approach consisting on presenting concepts from the most basic and intrinsic to the scope of work, to the most comprehensive and though-gathering ideas. This chapter will also include a review on empirical literature and methodological approaches used previously to study the international and Portuguese context in related subjects.

The third chapter is related to the methodology framework that will be developed and used in the consequent dissertation. The chapter consists on characterizing the dataset to be used, along with a definition of its variables and parameters, concluding with the explanation on the type of analysis hoped to achieve empirically. It will also include several referrals to previous models that used the same longitudinal database to study similar subjects.

The forth chapter contains the entire descriptive analysis of the dataset at study in its multitude of dimensions, providing both visual insights through tables and graphs and textual insight through the description of the same tables and graphs, regarding the distribution of the Portuguese creative class in segments such as region distribution, educational level or wage distribution.

The fifth chapter holds the results for the estimated regressions on the developed econometric model based on the entire previous literary review performed, as well as considerations about those very same results in light of empirical literature.

The sixth chapter contains the final remarks regarding the dissertation, what limitations have been encountered throughout this study as well as notes for future research in related topics.

2 Literature Review

The following chapter presents an extensive literature review on concepts, methodological approaches and indicators for the measurement of human capital, the clustering of the same and drivers of its distribution.

2.1. Human Capital and the Creative Class

In earlier theoretical stages, economists grasped that the income growth in most countries was not solely explained by the growth of physical capital (Becker, 1964). Theoretical economists suggested that great amounts of natural resources were required to develop a modern economy. Nevertheless, post-World War II, Japan rose as a world economic leader despite its lack of natural resources, demonstrating that resourceful territories and abundance of physical capital are insufficient to explain modern economic growth (Schultz, 1971).

Becker (1994), popularized the human capital theory, as the author argued that differently from a bank account or shares of a public listed company, schooling, education and training can be a form of capital as well, in the sense that they improve wages or other earnings and can add to a person's ability to perform labor and produce economic value. These, however, are investments in human capital instead of physical or financial capital, since one cannot separate a person from his or her knowledge, skills or values in the way that one is able to do with physical or financial assets. Through an extensive analysis performed with data from over one hundred countries with different cultures and economic systems, the earnings of more educated people were almost always well above the national average, leading the author to his statement regarding human capital analysis, that schooling will raise earnings and productivity in an individual by enlarging his knowledge, skills and way of analyzing problems. The author states examples such as Japan, Taiwan and other Asian economies that "grew rapidly by relying on a well-trained, educated, hard-working and conscientious labor force" (1994, p. 24).

Known opponent of the previous theory, author Richard Florida (2002) argues that there are missing elements in the traditional human capital theory. The main one being creativity, working as a source from which new technologies, new industries, new wealth, and most positive economic things flow. Florida's approach and concepts are not meant to replace the human capital theory but to provide an improved standard for measuring actual skills and human capital (Marlet & Woerkens, 2007).

Although Florida's take on the role of creativity towards social and economic development is currently one of the most cited and referenced in contemporary empirical research, the author was not the first to point out the importance of creativity to regional development:

Andersson (1985) defined creativity as a concept of highest order, functioning as a process that has the capacity to order and reorder information with the aid of knowledge and competence, through

an intensive interaction with each other, attributing the key to understanding the fundamental role of the creative process to diversity and close communication[1].

Boden (1990) stated that unlike intelligence, creativity requires the ability to take risks and requires self-assurance as the author further explains that to pursue new ideas and make mistakes despite criticism of other parties, a person needs a mix of confidence and healthy self-respect. Mokyr (1990) mentioned that technological creativity tends to rise and fade dramatically at various times and places throughout history when social and economic institutions turn rigid and act against it as this technological creativity is highly sensitive to the social and economic environment and can easily be held back[2]. Accordingly, Simonton (1999) argued that to flourish, creativity required a stable social environment, allowing for the continuity of the creative process but also diverse and broad-minded enough to enable creativity in all its forms. It was Howkins (2001) who introduced the concept of creative economy, referring to the part of the economy that had origin on the returns of the effect of creativity in fifteen industry sectors the author found as creative such as software, design, R&D, and creative-content industries such as film and music.

The effects of creativity in the workforce began to have an impact as well as the traditionally known service class in the US, from 2002 to 2012, grew from 55 million people (43 percent of US workforce) to around 60 million workers (47 percent of the US workforce); opposingly, the working class, which consisted of above 40 percent of the US working force in 1970, accounted for just 21 percent of the same, in 2012 (Florida, 2012). These trends were not limited to the US since many other countries verified the same employment shift (see Marlet & Woerkens, 2007; Bernardi & Garrido, 2008; Boschma & Fritsch, 2009).

A new class was appearing in the midst of these two traditional classes, being described initially in a more rudimentary fashion as professional-managerial class (Wright, 1990) with its individuals being referred to as symbolic analysts (Reich, 1991). Barley (1996) began to map and chart the rise of these new knowledge workers, realizing that for example in US territory, professional, technical and managerial occupations increased from less than 10 percent of the workforce in 1900 to 30 percent by 1991, while as presented previously, both blue-collar work and agricultural work had fallen precipitously.

The driving force behind this disruption in the contemporary workforce is evidently creativity, in its many forms, as it is esteemed and refined like it has never been. Creativity has become a decisive source of competitive advantage in our existing knowledge economy, crucial in innovation and R&D and ultimately in obtaining economic growth (Solow, 1988). Merging the creativity that some individuals possess and their formal occupation, Florida (2002) introduced the concept of creative class – a class that runs much deeper than a set of changing job categories but goes all the way to the place it occupies

[1] The author provides the example of Vienna post-World war I where a wave of creativity through social network was propagated. This metropolitan region was the center of “international, cultural, political and scientific communications; paralleled only by Paris” (Andersson, 1985, p. 22) being also overcrowded and rich with public life enabling citizen to be at walking distances from most relevant institutions.

[2] Namely in late medieval times in the Islamic culture and China that were once home for leaders in mathematics and mechanical inventions and then proceeded to fall far behind Western Europe economically due to religious conviction and social constrains.

socially and economically – as the author argues that the peoples' social identities as well as their cultural preferences, values, lifestyles, consumption and buying habits are all connected to their class.

Florida (2002) argued that differently from the working and service class, these individuals are paid to use the entire scope of their social and cognitive skills instead of mainly physical work, treasuring values of individuality, meritocracy and diversity. Truly creative individuals are driven principally by internal motivations, by the intrinsic rewards and satisfactions of their pursuits. Subsequently, our workplaces, schedules, rules and dress codes are becoming more flexible over time not only to not constrain, but also to capture this entire creative process. Florida's creative class is divided in two main occupation-based categories described as follows:

The first subset, the super creative core, acts as producer of new concepts or designs that can be widely transferable, useful, representing the highest order of creative work. Florida proceeds to give examples such as designing a consumer product that can be idealized, produced and sold, coming up with a theorem or a strategy that can be applied in many diverse cases; or composing music that can be performed time and time again. People in the super creative core of the creative class are involved regularly in this sort of work as they engage not only on problem solving but also problem finding. The super creative core also considers a very specific part of set of creatives which are the Bohemians, having mainly cultural and artistic occupations. They account for two specific roles which are one, being a sign of an urban culture of diversity and tolerance, and two, attracting the two other categories of the creative class to the region leading to positive regional development outcomes (Boschma & Fritsch, 2009; Florida, 2012).

The second subset, the creative professionals, also engage in creative problem solving applying complex knowledge to solve specific problems but not always as a principal function. As these professionals are growingly involved throughout their careers in problem finding and solving type of work, they can sometimes move to the super creative core. Florida (2002, 2012) argues that this is not an exception as technicians, for example, who might not be considered in the creative class initially can also move onto subsets inside the creative class as their work progresses to functions that involve greater levels of creative problem solving.

Using detailed information on the mix and level of skills required for more than 800 occupations from a US database[3], Florida (2012) charted the economic returns of core skills identified in those occupations to find that occupations associated with the creative class were dominant in terms of wages and income comparatively to the other two traditional classes, accounting for more than half of total wages and salaries in the US. Regarding the distribution of those previously mentioned occupations across the US landscape, the author also found that jobs that need physical skill mostly associated with the working class, tend to agglomerate in smaller and medium-sized metro areas, while jobs featuring analytic and cognitive skills, regularly associated to the creative class, are heavily concentrated in the

[3] Information from the Occupational Information Network (O*NET) database – developed by the Bureau of Labor Statistics.

largest metro areas and the ones with higher requirements of social skill are the most concentrated in the very largest metro areas.

Creative class individuals make demands of workplace flexibility – in terms of job role, working hours – demands of peer recognition – meaning meritocracy, reputation and working with other talented peers – and also location demands – such as diverse and tolerant communities and low commuting times. All these demands culminate in an agglomeration of well-educated, highly intelligent, cognitive and socially able people in very specific regions that can accommodate these requirements. Ultimately this means increased benefits and growth for cities that enable the clustering of these individuals, who prefer a tolerant and diverse environment, to the regular city paradigm which focus more towards maintaining an engaging business climate (Florida, 2002, 2012).

In his review of Florida's 2002, *The Rise of The Creative Class*, Glaeser (2005) states that although Florida is fundamentally right in his statements that creativity is becoming a very important part of the economy and that the market value of creative people has risen, its ideas are not particularly new as other authors' had previously stated the same: Jane Jacobs (1961) had done very comprehensive studies linking creativity to urban areas; Paul Romer (1990) mentions technology as driver of new growth economies; David Brooks (2000) highlighted the rise of social freedom and bohemianism; Glaeser et. al (2001) had already presented that to succeed, urban areas needed to be attractive consumer cities for high skilled people, providing lifestyle, consumption amenities and advantages for the residents; and Glaeser (2003) had argued that human capital predicts the success of urban regions due to new ideas generated by highly skilled people in high skilled industries.

Glaeser critiques Florida's creative class arguing that it was just another way of measuring people with college degrees, and, to test Florida's thesis on the importance of diversity, bohemianism and tolerance, the author ran regressions of population growth, relying on the same data used by Florida, only to find no compelling evidence to suggest that diversity and bohemianism are the main conductors of skilled people and ultimately urban growth. Regarding the concern for urban policy making, Glaeser concludes the review of Florida's book by stating that decision makers "are better served by focusing on the basic commodities desired by those with skills, than by thinking that there is a quick fix involved in creating a funky, hip, Bohemian downtown" (2005, p. 596).

Edward Glaeser (1994, 2003), supporter of the traditional human capital theory, argues accordingly by mentioning that measuring the educational level is still the best way to assess the skill of human capital. The author states that despite being an imperfect measure at the individual level, in the US, the share of the population with a college degree not only is used to estimate the skill level of a place as it is also the measure that best explains recent urban prosperity.

When faced with the growing popularity of this new class presented by Florida and its close relationship to a people's occupations, recent empirical studies argued if educational measures, closely related to the traditional human capital theory where sufficient to analyze a country's' workforce. Marlet and Woerkens (2004) empirically found that using occupations as a measure for the human capital skill outperformed conventional educational measures in accounting for regional development. and had

additional advantages specially when it comes to detailed observation, providing capacity to isolate specific occupations and observe their contribution on labor productivity in specific regions. Accordingly, Markusen (2004) demonstrates quantitatively the potential of identifying and targeting occupations to help community development planners and decision makers to effectively strategize towards regional and economic development.

Marlet and Woerkens (2007) empirically verified that coefficients and levels of significance are both significantly lower for education levels than for the creative class. A one-percentage point increase in the share of people with college degrees in Dutch territory means an average increase in employment growth rates of 0.66 percent while for the occupational measures, considered as proxy to the creative class in their models, for the same point increase the coefficients account on average 0.90 leading the authors to conclude that for the Dutch cities and towns considered, occupational measures are a better predictor of employment growth than education. Nevertheless, the authors also mentioned that such positive correlation between higher levels of human capital and employment growth arguably have anything related to Florida's 'creative ethos' or bohemianism, other than social interaction as meant in traditional human capital theory.

Empirical findings in some regions could be unsupportive of Florida's theories: Hansen (2007) shows, presenting data regarding Swedish individuals, that demonstrate a strong correlation of 0.935 when educational level is correlated with the creative class. The high correlation found is not an isolated case as Finland presents a value of 0.96 for the same correlation, and, Denmark and Norway present 0.84 and 0.85, respectively (Andersen et al., 2010).

Florida et al. (2008) also state that while educational attainment can unarguably be a measure for human capital since education is still seen as the most important investment in human capital, this measure sometimes leaves out small but very influential groups of entrepreneurs like Bill Gates, Steve Jobs or Michael Dell who for some reason did not go or did not finish college but still add immense value to several regions or nations' economies.

The educational attainment measure by itself is sometimes broad and fails to identify and capture specific types of human capital or talent – argued Florida et al. (2008) – as their main findings mention that both education and occupational channels affect regional development but through different conducts regardless the sample size. Education-related human capital remains more closely associated with income or wealth, while the occupational-related is more closely associated with regional wages. Wages indicate the ability that a region holds, to generate labor productivity, which in turn is directly linked to regional development (Florida et al., 2008, p. 645). As occupational measures act more closely to this channel, the authors can argue that these are better measures for regional productivity, suggesting the replacement of purely educational attainment measures by occupational measures, as well as considering people's accumulated experience, creativity, intelligence, innovativeness and entrepreneurial capabilities. Despite educational measures assessing knowledge and potential skill of labor, a person occupation provides a more robust measure of the usage of skill since it reflects how the human talent is absorbed and used by the economy.

Florida's characterization of occupations that definition of the Creative Class – showed in Table 1 – has been a topic of discussion since it was first presented. Marlet & Woerkens (2007) devised a Dutch creative class, arguing that a critical analysis of Florida's broad definition was required, formulated a narrower definition of the same, precisely selecting what they consider to be really creative occupations, leaving out several government jobs, teachers in basic and secondary schools and many managerial occupations in sectors where no intensive innovation was anticipated as well.

Table 1. Defining the Creative Class

Super-Creative Core
Computer and mathematical occupations
Architecture and engineering occupations
Life, physical, and social occupations
Education, training, and library occupations
Arts, design, entertainment, sports and media occupations
Creative Professionals
Management occupations
Business and financial operations occupations
Legal occupations
Health-care practitioners and technical occupations
High-end sales and sales management

Source: Florida (2012, p.401)

McGranahan & Wojan (2007) pointed out as well that Florida's definitions only led to ambiguous categories and excessive aggregation when using summarized occupations codes, such as the SOC[4] codes. The authors state that many of the occupations that made up a large share of Florida's creative class had low creativity requirements, and, similarly to the previously mentioned Marlet and Woerkens study, the authors recast the creative class for their study, purging out several occupation such as healthcare practitioners, primary and secondary school teachers and aides, as well as many occupations in the 'life, physical, and social occupations' group (see Table 1).

Accordingly, Boschma and Fritsch (2009) mention that distinguishing between creative and noncreative occupations is a rather difficult practical task when solely relying on Florida's vague definitions, arguing that it is required to more precisely define which workers are indeed creative to more directly and correctly link to the relevant variables in the studies performed. Despite the immense literature produced on the topic, numerous challenges still exist in the path to empirically and quantitatively study creative activities such as broad and confusing definitions of which occupations

[4] Standard Occupation Classification

should the creative class consider (Markusen et al., 2008) or the lack of objectivity in the selection criteria of what is creative and what is not (Boschma & Fritsch, 2009).

Consequently, related concepts such as creative employment and creative industries also find a generalized lack of clear definitions and estimations due to the ongoing discussion of what is creative and what is not. Cruz (2014a) reviewed empirical literature on several approaches to measure creative employment. The study assessed the magnitude of creative employment in Portugal by estimating its weight from the total Portuguese workforce using all the existing relevant methodologies. Such methodologies are distinguishable in three main perspectives being one, the conventional industrially-based such as the DCMS[5] approach – making use of the SIC[6] system to define and evaluate creative industries – and the other following Florida's occupation-based definitions, a more sociological-driven approach– making use of the SOC[7] system to empirically evaluate creative occupations. Limitations on both approaches presented, such as the neglect of self-employed workers[8], lead to the development of the third approach: a combined industry and occupational based approach – the 'creative trident' – proposed by Higgs et al. (2008), that more accurately accounted for the creativity in both occupations and industries. In spite of being a hybrid of the first two approaches, this third approach was not unfettered of limitations as it was also subject to restrictions of source information, high aggregations of non-overlapping data in many industries, long time intervals between the upgrade of datasets, very limited official knowledge on self-employment and difficulties in matching SIC with SOC codes to fully capture the creative components (Cruz, 2014a).

Cruz (2014) then mapped the Portuguese creative employment[9] using the different approaches presented: regarding the conventional DCMS approach, the author merged the ISIC[10] Rev.4 codes used by DCMS with the Portuguese SIC system, CAE[11] – Rev.3 codes at a 4- and 5-digit level of detail to yield 2.5 percent of creative employment from the total Portuguese workforce. The second approach, based on Florida's original proposal and refinements of the same by Boschma and Fritsch (2009), considered occupational/SOC categories, adding Administrative professionals (Florida, 2002) taxonomy of the creative class, yielded a 30 percent share of creative employment from the total Portuguese workforce. The third approach, making use of the merged industry-based and occupational-based approaches yielded values of around 20 percent. Figure A 1 shows the summary of all approaches used in the study.

Notwithstanding, when considering only the 'super creative core' subset of the creative class, instead of the entire creative class, the results when mapping different methodological approaches

[5] Government agency: Department for Digital, Culture, Media and Sport.
[6] Standard Industrial Classification.
[7] Standard Occupation Classification.
[8] Due to the fact that most databases used for the empirical studies only accounting for firms employing creative workers, not accounting for the self-employed, as their contribution to the economy appear to be also significant (Cruz & Teixeira, 2014).
[9] The database used for the study excluded self-employed workers that account for about 20% of the total Portuguese workforce. However, as the estimations performed were for one single country, such exclusion of individuals does not bias the analysis (Cruz & Teixeira, 2014).
[10] International Standard Industrial Classification.
[11] Classificação Portuguesa de Atividades Económicas.

yielded a mean value of about 6 percent as share of the total Portuguese workforce, suggesting that at both theoretical and empirical levels, much more agreement exists on what defined the core of creative employment. The huge disparities when considering different measuring approaches and the operationalization issues regarding which industries and occupations should be considered as creative and/or included in the creative class led to conclude that the results are strongly dependent on the country studied – as some approaches are particularly designed to capture the creative employment of specific countries – and the methodology followed – since all approaches provided different empirical results in measuring the core creative industries in Portugal.

2.2. Influencing factors of the creative class distribution

The second objective proposed in this study is to identify determinant factors for the location of creative class participants at a regional level, thus, following similar methodologies evidenced by literature (cf. Fritsch, 2007) this chapter will present three hypothesis containing the diverse indicators that empirical literature holds as explicative of the share of creative class individuals in different regions.

2.2.1. Agglomeration economies

Throughout the vast empirical literature on the subject of innovation and regional growth some of the most referred determinants for the location of creative industries and individuals are associated with agglomeration economies (see Jacobs, 1969). Drops in transportation and communication costs enabled greater proximity between economic agents that needed to be located near one another (Glaeser, 1994; Fujita & Thisse, 2002). Hence, creative individuals were enabled to work in clustered proximity – leveraging a wide range of skills – ultimately improved regional economy and development, influencing the local levels of wages and income (Florida, 2005).

Working as engines of economic growth in today's knowledge-driven economies and attracting human capital, cities are our species greatest invention as they play a major role in facilitating the accumulation of knowledge spillovers, being immense contributors to human capital development (Lucas, 1988; Knudsen et al. 2007), and removing physical space between people and companies, representing proximity, density and closeness (Glaeser, 2011).

Large and bonded metropolitan areas are fertile ground for the development of new businesses, which are contributors to positive development outcomes (Baptista & Preto, 2011; Florida, 2012).

More empirical research on the location of manufacturing and industrial establishments found significant and positive effects of the different sources of agglomeration economies as determinants of firms' location (Cruz, 2014a). The geographical clustering of industries and firms allows for industry

specialization, augmented accessibility and sharing of intermediate goods and services – known as localization economies due to industrial concentration and/or local employment density – consequently increasing the internal economies of scale of clustered firms and the sharing of knowledge via spatial proximity (Harris, 2011).

Urbanization externalities such as population density, industrial/services employment share and diversity of industries are also determinants with statistically significant and positive impact on firms' location decisions (Cruz, 2014a) as the co-location of interdependent economic activities in urban clusters promotes synergies between sectors, ultimately leading to the propagation of knowledge and innovation (Jacobs, 1969).

Both, innovation and the creative process are deeply interlinked with metropolitan environment, leveraging on the geographic concentration of people, rapid diffusion of new trends and ideas (Jacobs, 1969; Florida, 2005) leading to the hypothesis that agglomeration economies – such as localization and urbanization economies – are positively related to the location of firms involved in creative activities/industries (Cruz, 2014a).

Hypothesis 1: Agglomeration economies attract and are therefore positively related with the presence of creative individuals.

2.2.2. Regional Facilities

Glaeser et al. (2001) argued that cities required the capability to function as consumption centers, in order to attract highly educated and productive workers who searched for a variety of services and consumer goods, aesthetics and physical setting as architecture or the weather, good public services in health and education areas, and ease in moving around, mentioning the important role of urban density in facilitating this consumption process. Empirically demonstrating that high amenity cities grew faster than others with low amenities, the authors argued that amenities are the main drivers of clustering in cities. Accordingly, traditional structured cities would only succeed when they provide amenities that attract high human capital residents[12] and future cities will mostly depend on the ability of urban areas to provide attractive amenities for workers as well as higher wages.

Correspondingly, Lloyd and Clark (2001) argue how the models used to explain the growth of cities during the industrial, Fordism capitalism are outdated and how modern cities were not meant to be locations of industrial production but for cultural production and consumption. Cities became an 'Entertainment Machine', as the authors mention, leveraging culture to improve its economic outcomes. Entertainment, tourism, restaurants, museums, hotels, aesthetic and cultural activities became the main

[12] The authors further add that "attract high human capital workers" means among other things to provide safe streets and good public schools (2001, p. 29).

industry that attracts workers making “quality of life” (2001, p. 2) demands, in recent urban growth sectors like information technology, finance, insurance and real state.

Clark (2003), agreeing, identifies that subpopulations of people differ in the amenities preferred: college graduates for example are more abundant where there are fewer natural[13] but more constructed amenities; the elderly, on the other hand, increase where natural amenities are more abundant but are less present in regions with more constructed amenities.

Shapiro (2006) found that while around 60 percent of the employment growth effect of college graduates is due to enhanced productivity growth, the remainder was caused by the growth in quality of life, presenting preliminary findings of an existing relationship between “consumer city” (2006, p. 24) amenities in the region and employment growth. Shapiro’s conclusions also contrast with the common and previously referred argument that human capital generates employment growth exclusively through productivity changes.

The presence of major research universities, education related amenities, is also a key factor in setting initial advantages for the region, not only on the production but also on the distribution of human capital (Glaeser et al., 2001). Geographical proximity of a knowledge-intensive industry to an academic institution may be a source of positive knowledge externalities since mutually beneficial partnerships can be established, allowing for knowledge spillovers and the exchange of tacit knowledge (Audretsch & Feldman, 2004).

New knowledge-based firms, are driven not only by traditional regional characteristics but also by the opportunity to access the talent pool of human capital generated by universities, argue Audretsch et al. (2005), as the authors empirically demonstrate that these firms have a high propensity to locate close to universities to leverage knowledge spillovers, as the presence of institutions conducting R&D activities and alongside with the presence of specialized human capital significantly influenced their location decisions.

Accordingly, Baptista et al. (2011) empirically demonstrate that the establishment of new higher education institutions in Portuguese municipalities has a positive impact on the share of new firm entry in knowledge-intensive sectors, strongly suggesting that universities contribute to the regional development of new knowledge related businesses. This influencing factor is of great importance since empirical research suggests that knowledge-based firms are the entrepreneurial efforts more likely to impact on economic development and employment growth.

Hypothesis 2: Regional facilities explain the location decisions of creative individuals and therefore are positively related with the presence of the same in that region.

[13] Considering that natural amenities are for example the climate temperature or presence of natural bodies of water and constructed amenities might be theaters, museums and bars (Clark, 2003).

2.2.3. Regional Culture

Literature on the distribution of the creative industries also emphasizes the importance of tolerance-related indicators when analyzing industries location behavior (e.g. Hansen, 2007; Florida et al., 2008; Cruz & Teixeira, 2015). These indicators are not new related literature as Jacobs (1961) indicates that tolerance – mostly in the sense of firm-based diversity – is associated with economic growth without forgetting the importance of diversity in individuals as well. The more tolerant a region is, the more favorable it will be to an open business climate, positively influencing firms' location decisions (Jacobs, 1969).

Lazear (1998) links tolerance to cultural diversity, in the sense that enabling it may contribute to greater creativity, generating potential benefits as it increases the variety of services, goods and skills available for consumption and production.

Florida (2002), following his creative class thesis, argues that creative people move in search for urban centers characterized by openness towards racial and sexual minorities as well as individuals with other nationalities and cultures.

Ottaviano and Peri's (2005) study, using data from 160 US-metropolitan areas for three census years, 1970, 1980 and 1990 empirically demonstrated that wages and employment density of US-born workers were systematically higher in cities with richer linguistic diversity, linking social diversity to higher employment. Noland (2005), accordingly, demonstrates how tolerant attitudes towards gay and lesbians are associated with positive financial outcomes as the author states that more tolerant regions are more appealing to foreign direct investment, better ratings and demonstrate more entrepreneurship.

Florida et al. (2008) disregard amenities (see chapter 2.2.2) as principal driver for attracting creative human capital, but instead argue that among other factors, openness to diversity affects the level and geographic distribution of education and skill, as well as firms' location decisions. This argument is in line with Florida's (2002) three interconnected parameters that the author finds are the cornerstones, crucial to drive the creative class: technology, talent and tolerance. The author affirms that "each is a necessary but by itself insufficient condition for prosperity; for real innovation and sustained economic growth a place must offer all three" (2012, p. 228) therefore the 3T's, as they are referred to, require coexistence for the optimization of this influence since only their synergetic effect will stimulate economic growth.

Technology is a known driving force of growth[14], as Florida (2002; 2012) denotes correlations between the creative class and the several technology indicators, given the role of localized and closely shared knowledge in the development of innovative and creative activities/industries, between creative individuals and technological/R&D firms. Talent, measured by Florida as a combination of the creative

[14] MIT's Robert Solow won a Nobel Prize for his work relating technology to economic growth models (Solow, 1956; Florida, 2012).

class occupations and the number of college graduates[15], is agreed by many economists (using the term human capital) as a vital force in economic improvement. Tolerance is defined by Florida (2002) as the openness to new cultural ideas, to immigrants, artists, gays, bohemians and racial integration. Florida et al. (2008) argue that it is important for a place to have low entry barriers for people, stating that a region with such ability will attract talented and creative people from everywhere.

Hypothesis 3: Tolerance, talent and technology endowments of a region attract creative individuals and are therefore positively related with their presence in a region.

2.2.4. Empirical models on the Creative Class

As geographers and other researchers began to point out the importance of the spatially-related factors in understanding innovation and knowledge creation, a growing interest has rose in understanding not only geographic but the remainder region-specific factors that influence regional innovation and growth (Knudsen et al., 2007). With the interest in the creative class and associated industries growing simultaneously, many were the studies that linked the tendency of creative employees and creative industries to co-locate grographically (Lazzeretti et al., 2008), and the importance of this unevenly distributed and co-located creative class in determining a region's economic and social development (Florida, 2002).

Empirical studies regarding creative industries and creative employment location is still not able to accurately determine if jobs follow (creative) people or it is people that follows jobs, however, it is widely known that specific drivers and determinant factors, such as the ones presented in the previous subchapters, act both on creative industries and individuals, influencing their distribution throughout regions (e.g. Alamá-Sabater et al., 2011; Gabriel & Vale, 2012; Cruz & Teixeira, 2015).

Following Florida's (2002, 2005) creativity theory that presents human talent not as stock but has a flow, dependent of several regional mechanisms such as the intricate interplay between openness and tolerance, talent and innovation, while also linking this flow human talent with the regional and economic growth, Knudsen et al. (2007) present their study focused on the effect of geographic concentration, or density, stating that this spatial element has key role in the black box of innovation. The authors study builds up on the topical attention on the determinants of regional innovation, by focusing on the relationship between the outputs of the innovation process and the close interaction of highly skilled individuals. They estimate a cross-sectional linear model over 240 metropolitan areas in the US that considers a constructed index of innovation that divides patents registered per 100,000 habitants as a dependent variable, and its interactions with different other predictors such as population density and creative class employment.

[15] Conventional measure of human capital.

Knudsen et al. (2007) predict that the increase of metropolitan area density will increase the impact of creative capital on innovation, meaning that growth of creative capital is expected to be greater in environments where high population density is also present. In empirical terms, the authors model consists on an equation, presented below (1), where innovation is a dependent variable of many other linked variables presented theoretically and empirically by literature[16]. Their research indeed showed that creative-density is positive and significant in the model's regression, containing registered patents as dependent variable, supporting their analysis that through several relevant indicators, density of creative workers promotes regional innovation.

$$Innovation = \beta_1 + \beta_2 density + \beta_3 creativity + \beta_4 creativity * density + \beta_5 R\&D + \frac{\beta_6 scientists}{engineers} + \beta_7 bohemians + \beta_8 gays + \varepsilon \quad (1)$$

Hansen & Niedomysl (2009) defined the Swedish creative class in their study that anticipated to answer if creative class members were more selective in their destination choices of migration, favoring regions with what Florida (2002) called 'people's climate'[17]. Due to the high correlation[18] between degree holders and the creative class in Sweden, instead doing a segmentation of the population based on the creative class, the authors used the education level as proxy. Opposite from the creative class theory, the authors study empirically showed that only the lower education group of under 25-year old segment – without higher education – moved towards regions with higher ranking people climate.

Their explanation was that this group would move away, presumably to larger cities where more universities would be present and there would be more job opportunities as these are also the regions where the highest rankings of peoples' climate are found. In the highly educated group, most migration activities occurred in their mid to late twenties, regularly when university studies are completed, and individuals enter the labor market, moving to regions with lower rankings of people climate and more significant business climate. In other words, the authors argued that migration towards regions with better people climate happen before people enter the creative class and when people do enter this class, a migration on the opposite direction tends to occur. Two large cities, Stockholm and Gothenburg – first and fifth ranked in peoples' climate ranking by the authors, respectively – are interesting exceptions since both show positive net migration flows of highly educated people, presenting large universities and an immense and diverse labor market.

Literature presents similar studies, whereas Boschma and Fritsch (2009) also follow Florida's definitions to design a creative class in seven European countries – Denmark, Netherlands, Finland,

[16] Presented in the previous chapters.
[17] Alongside many other ideas, Florida's (2002) argued that the creative class was attracted to a people's climate of tolerance and diversity instead of solely a business climate.
[18] The authors argue in their study that there is a 0.94 correlation between the Florida's defined creative class and highly educated individuals in Sweden.

Germany, Norway, Sweden, England and Wales – in an attempt to verify Florida's ideas if this class is indeed unevenly distribute and attracted to a people's climate of tolerance and diversity instead of a business climate. Their descriptive statistics results of the regional share of creative class in the total population[19] undoubtedly indicate that the creative class is indeed very unequally dispersed in the regions considered as the main metros are much more populated with people with creative occupations.

Through a series of regressions, Boschma and Fritsch (2009) found that regional employment growth in preceding years had a statistically significant impact on the share of creative core employment, however, while employment opportunities play a significant role in explaining the share of creative professionals, they seemed to be less relevant regarding occupations considered in the bohemians' subclass. Florida's idea that the presence of bohemians is a main factor in attracting other diverse and culture enthusiast individuals was not verified by Boschma and Fritsch's study. Nonetheless, the authors mention that "a location characterized by an atmosphere of openness, cultural opportunity, and the presence of bohemians is of at least equal importance as employment opportunities" (2009, p. 413).

Likewise, the Portuguese territory has been the subject of different studies that also found an unequally distributed creative class. Gabriel and Vale (2012), seeking to understand how strong were the regional differences in the organization of the creative class and what factors explained the distribution of the same, found that the majority of the Portuguese creative employment was concentrated in the municipalities close to the Atlantic Coast where there is a higher concentration of economic activities.

However, the Portuguese creative class, similarly to others, does not set in the same location indefinitely, instead, it moves towards new regions and environments, that present new challenges and where abilities and ideas can grow, where knowledge spillovers between agents can occur with more ease or even where there is adequate financial support for the subsistence of the main sectors or activities that are accounted for in the class (Gabriel & Vale, 2012). Evidencing the fact that the employment growth rate showed a weak impact on the presence of creative individuals – agreeing with Florida's thesis that jobs follow creative people – Gabriel and Vale (2012) argue that creative individuals are more sensitive to changes in factors that traditional economic development theories do not take into account, therefore, decision makers should pay close attention to regional and urban development policies that consider factors that attract and retain creative individuals, employment and industries.

Cruz and Teixeira (2015) sought to answer if in Portugal, creative industries and occupations revealed a tendency to cluster in the same regions, what were the main characteristics of the locations where these creative groups clustered and if different creative groups and activities located differently between themselves. The authors found that the typical arguments sustained by literature that the tendency to cluster and co-locate in large metropolitan areas (e.g. Florida, 2002, 2012; Florida et al. 2008) were applicable to the Portuguese context as they state that "creative employment in Portugal

[19] The authors used share of creative occupations in the total population as indicator for regional creativity because the indicator also accounts for the non-employed people in the regions studied.

tends to concentrate and co-locate in a specific, relatively reduced, number of municipalities" (Cruz & Teixeira, 2015, p. 170).

Cruz & Teixeira (2015) verified as well that clustering, occurred in regions that featured particular characteristics, with variations by creative industry and occupation. Knowledge-intensive creative activities were co-located and clustered in large urban centers – such as Lisboa and Oeiras – that featured higher levels of highest tertiary/upper educational attainment, presented higher population and firm density, suggesting a denser urban agglomeration, presented a larger number of regional amenities and had the highest per capita purchasing power and average earnings. Traditional creative sectors – particularly specialized in manufacturing, design, architecture and crafts – are more widely distributed around intermediate urban centers in the North and Centre regions of the country, presenting lower social diversity ratios due to low attraction rates – the less attractive a municipality in terms of foreigners/newcomers, the lower the levels of social diversity it will present. Creative activities related to leisure – such as performing arts, film, photography and music – are principally co-located in coastal and touristic municipalities or dispersed across minor interior municipalities characterized by where cultural celebrations and social events wield high local impact, with such regions demonstrating significant values of tolerance and social diversity. Teaching, training and researching areas are widely distributed around interior municipalities that contained or were close to universities. The heterogeneity of creative employment in the Portuguese territory found by the authors is shown in Figure A 2.

Similarly, in their study to explore the role of inter-territorial spillovers as drivers of industrial firms' location choices, Alamá-Sabater et al. (2011) employ an empirical model, presented in the equation below (2), where the benefit of a firm in locating in a certain municipality is described by several positive explanatory variables that literature points out as relevant to the location decisions of firms.

$$\pi_{ij} = \beta_1 \text{Industrial Specialization}_j + \beta_2 \text{Diversification}_j + \beta_3 \text{Human Capital}_j + \beta_4 \text{Population}_j + \beta_5 \text{Industrial Share}_j + \beta_6 \text{Services Share}_j + \beta_7 \text{Industrial Surface}_j + \varepsilon_{ij} \quad (2)$$

The hypothesis was that the expected profit of a firm i when establishing in municipality j could be given by the previous equation and consequently, the findings showed that accounting for a highly educated and qualified workforce, as well as the availability of industrial land at the municipality level were a pivotal factor in driving firm's location choices (Alamá-Sabater et al., 2011).

Other empirical models, presented by several international and national researchers that deal with the influencing factors around the distribution of creative industries and individuals have been considered in the following sub-chapters and are resumed in Appendix A Table A 3.

3 Data and Methodology

The following chapter presents the source of data to be used in the study, the variables it will consider and the proposed methodological approach, sourcing existing methodologies from previously mentioned empirical literature.

3.1. Data

The primary source of data to be used in the following dissertation will be the *QP* dataset, which consists on a matched employer-employee database at the national level. This administrative database has been gathered by the Portuguese Ministry of Employment or by the Portuguese Ministry of Labor and Social Security[20] since 1982[21], for the purpose of work inspections and relevant relationships and built from a legally mandatory survey submitted each year by Portuguese private firms with at least one employee to the Ministry. Due to the enormous potential of the database, it has served not only for inspection of work safety and conditions but also has a source of statistical information to many diverse research topics, including an extensive array of information on all private firms, establishments, workers and business owners in the Portuguese economy, considering an average of 145.000 firms and 3 million workers in each annual dataset return (Baptista et al., 2011).

Despite such volume, *QP* dataset excludes public administration and domestic workers, as well as self-employed people. Some studies report that self-employment, especially in developed countries, is a significant contributor to the volume of overall creative employment (Van Steen & Pellenbarg, 2012). Cross-country comparing studies, the exclusion of self-employed people in certain databases is a valid concern as not all national databases might exclude this form of employment, however, since the magnitude of creative employment in the present study is being studied for a single country, this exclusion of workers does not noticeably bias the analysis (Cruz & Teixeira, 2015).

QP datasets have been used throughout Portuguese literature: Mata and Portugal (1994) study regarding the life of new Portuguese manufacturing firms during 1983 denoted many advantages to using *QP* such as the comprehensiveness of the dataset in including virtually all manufacturing firms with over 5 employees. Cabral and Mata (2003) examined the evolution over time of firm size distribution of Portuguese manufacturing firms, relying on the *QP* dataset, as the authors found it to be "a very good source for the study of the firm size distribution" as it "includes firm-level information on the number of employees" (p. 1076). Baptista and Preto (2006) used the database to empirically verify that employment change and industrial re-structuring is mostly related to start-ups that are larger, foreign-owned and/or knowledge-based entrepreneurial activity is characterized by high mortality and low

[20] Currently Ministry of Labor, Solidarity and Social Security
[21] Except for the years 1990 and 2001

growth rates of new firms. Baptista et al. (2008) demonstrate how new business formation that positively contributes to employment growth in a region occurs only after a time lag of eight years with variations of lag depending on the entrant's quality[22] while Baptista et al. (2011) argue that the establishment of a new university has a positive and significant effect on entry levels of knowledge-based firms in municipalities, both studies relying on *QP* as source to extract empirical data.

The dataset enables relating several different parameters such as demographical characteristics or firm's specific characteristics. The main strengths of *QP* dataset are concerned to the amount of information it gathers, the number of units it considers and the possibility to link annual information longitudinally and track companies and workers over time, enabling studies on the workforce distribution over time and other labor market dynamics (Madruga & Escária, 2002).

Employees as well as companies are given a distinct identification number so that throughout the years, their progress can be followed. These identification numbers are recorded in specific *QP* variables enabling the match between employers and employees and ultimately the link to other characteristics such has city or industry type. The selection of creative industries/firms will be done by a specific variable that records the type of industry where the company's is inserted, matching with the codes[23] used by Cruz (2014a), that list advertising, marketing, design, video, film and photography, radio and tv, among others, as the main segments that define creative industries.

When setting geographic parameters to study the location patterns of creative employment, recent empirical literature shows that municipalities are the most suitable territorial unit of analysis, when among other factors, it is needed to account for the spatial effects or externalities such as inter-territorial spillovers or the influence played by external economies of neighboring territories (Alamá-Sabater et al., 2011; Arauzo-Carod, 2013; Cruz and Teixeira, 2015).

The use of municipalities, however, turn this study's objectives unachievable since to characterize the Portuguese creative class on the many variables that make up the *QP* dataset, thousands of queries to the database would be required and accordingly, a very high level of complexity would be given to the econometric model that the following dissertation intends to present. Additionally, the objective of the study does not anticipate predicting the influence of inter-territorial externalities and spatial effects on the presence of creative employment.

Therefore, instead of the LAU[24] I level of territorial division – that in Portugal represents 308 municipalities – the *NUTS*[25] III level will be considered. In 2015, the *NUTS* III level of territorial division was updated from the *NUTS*2002 to *NUTS*2013, turning the previously considered 30 regions in 25 regions, each clustering more municipalities.

[22] Not all entrants are equally efficient and/or innovative (Baptista , Escária, & Madruga, 2008, p. 19).
[23] The codes used by Cruz (2014a) are based in a framework that measured the direct economic contributions that certain industries made to the UK economy and classified (DCMS, 2016).
[24] Local Administrative Unit represents municipalities. LAU1 and 2, introduced by the EU in 2003, replace the NUTS IV and V levels, respectively (Eurostat, 2017).
[25] NUTS (*Nomenclature des Unites Territoriales Statistiques*) is a hierarchical regional classification system used for the member states of EU. NUTS III Regions are relatively identical to the cities size in this study (Florida, Mellander, & Stolarick, 2008).

The estimated figures and information contained will be retrieved from the *QP* datasets regarding the year 2012, using STATA 13® statistical analysis software that yields non-overlapping data for all the considered territorial units.

In Portugal, the magnitude of creative individuals as percentage of total population workforce varies within a wide range of values depending on the methodologic approach used, therefore, due to the reasonable amount of literature containing criticism of Florida's broad definitions of the creative class and its occupations[26], to correctly identify and characterize the Portuguese creative employment – containing both creative class and creative firms – the following dissertation study will consider an adaptation of the taxonomy used by Cruz (2014a) – presented in the Table A 2.

Table 2 presents the adapted taxonomy for the creative employment, keeping out many occupations considered as non-creative, in the healthcare and education sectors. The CPP2010 at 3- and 4-digit level codes will be used to identify creative occupations in the *QP* employees' dataset, and the CAE-Rev.3 codes will be used to identify creative firms in the *QP* employers' dataset, ultimately enabling the descriptive analysis on the Portuguese creative employment.

[26] See chapter 2.1

Table 2. Creative occupations and industry codes

Creative Class Groups	Occupational Categories Descriptions	Portuguese Standard Occupational codes CPP – 2010 (3- and 4-digit summary categories)	Industry Sectors	Portuguese CAE – Rev. 3 Industry codes (SIC)
Super Creative Core	. Computer and mathematical occupations; . Architecture and engineering occupations; . Life, physical and social science occupation; . Education, training and library occupations;	. Physicists, Chemists and related professionals (211); . Mathematicians, Statisticians and related professionals (212); . Life Science professionals (213); . Engineers and engineering professionals (214); . Electrotechnology engineers (215); . Architects, urbanists and product designers (2161, 2162, 2164, 2165); . University and higher education teachers (231); . Vocational, technological and artistic education teachers (232); . Social Science and related professionals (263); . Software, Web and application analysts and developers (251); . Databases and networks specialists (252);	Engineering and Architectural activities	711; 712
			Scientific investigation and R&D activities	721; 722
			Post-secondary educational activities	854;
			Software and Digital Media: Software publishing; Computer programming/ consultancy; Data processing/hosting/web portals	5821; 5829; 6201; 6202; 631;
			Libraries/archives/museum activities	910
Creative Professionals	. Management occupations; . Business and financial operations occupations; . Legal occupations; . Healthcare practitioners and technical occupations; . High-end sales and sales management; . Administrative associate professionals;	. Directors, senior managers and managers (1); . Health professionals (except nursing) (221, 224, 225, 226); . Nursing and midwifery professionals (222); . Finance professionals (241); . Administration professionals (242); . Legal professionals (261); . Archivists, museum curators and related information professionals (262); . Physical and engineering sciences technicians (311, 312, 313, 315); . Life science technicians and relates associate professionals (314); . Medical and pharmaceutical technicians and health associate professionals (321, 324, 325); . Financial and mathematical associate professionals (331);	Legal activities	691
			Accounting and auditing activities	692
			Business and Management consulting activities	702
			Veterinary activities	750
			Public administration activities	841
			Professional and cultural educational activities	855

		. Sales and purchasing agents and brokers (332); . Business services agents (333); . Administrative, legal, social and specialized secretaries and related professionals (334); . Regulatory government associate professionals (335); . Information and communications technology operations and user support technicians (351);	Health activities	861; 862; 869;
			Financial services	641; 642; 643; 649; 651; 661;
			Associative organization activities	941; 942;
Bohemians (Contained in the Super Creative Core group)	. Arts, design, entertainment, sports and media occupations;	. Musicians, Actors and other creative and performing artists (265); . Artistic, Entertainment and Sports associate professionals (342; 343); . Fashion and other models (5241); . Telecommunications and broadcasting technicians (352); . Product and garment designers (2163); . Graphic and multimedia designers (2166); . Advertising and marketing professionals (2431); . Public relations professionals (2432); . Creative and performing artists not elsewhere classified (2659); . Qualified jewelers, artisans and precision instruments specialists (731); . Authors, journalists and linguists (264);	TV and Radio activities	6010; 6020; 6391
			Film, Video and Photography: Motion Picture, video and television production, post-production and distribution activities	591
			Music/Entertainment and the Performing Arts: Sound recording/ music publishing activities; Performing arts and support activities; Amusement/recreation activities	592; 900; 931; 932;
			Photography activities	742
			Design and Visual Arts activities	741
			Advertising and Marketing: Market research, Public opinion pooling, Advertising	731; 732
			Crafts and Others	321; 322; 325; 264; 265; 266; 267; 231; 232; 233; 2341
			Publishing of books, periodicals/others; New agencies activities	581; 6391; 6399
			Translation/interpretation activities	743

Source: Cruz S., (2014) adapted from Boschma and Fritsch (2009)

3.2. Methodology

The following work will begin with a cross-section analysis for the year 2012 – the most recent *QP* dataset available where the *NUTS* III regions are considered – where the number of creative class participants in the Portuguese private sector will be determined, alongside with a thoroughly descriptive analysis of the Portuguese creative employment. Such analysis will be possible due to the use of the *QP* dataset and its variables, briefly covered in chapter 3.1 .

A correlation analysis of the explanatory variables will be performed to confirm that the variables are indeed independent, and multicollinearity is not verified. The objective is to introduce to the econometric model independent variables with low multicollinearity but with high correlation with the variable of interest (Gabriel & Vale, 2012). After the correlation matrix is verified for independent variables, the share of creative class individuals per *NUTS* III region regarding 2012 will be used as the variable of interest (dependent variable) as the following dissertation hopes to examine which location determinants factors – defined in Table 3 – have a significant relation with the share of creative class individuals in each specific region considered in this study

The explanatory variables are presented in Table 3 as well, in the column 'Indicators (proxy)', and, similarly to previous empirical literature (see subchapter 2.2.4; Table A 3) consider regional characteristics such as concentration of population, creative individuals, presence of consumer amenities and universities, education levels and average wages.

It is determined a cross-sectional regression model as follows:

$$S_n = \beta_0 + AE_n\beta_1 + RF_n\beta_2 + RC_n\beta_3 + \varepsilon_n \quad (3)$$

where n indexes the specific *NUTS* III region being examined regarding the year 2012; S_n is the share of create class individuals regarding region n in that period; β_0 is the constant term; AE_n is a vector of regional characteristics considering all indicators for agglomeration economies; RF_n is a vector of regional characteristics considering all indicators for regional facilities; and RC_n is a vector of regional characteristics considering all indicators for the regional culture (cf. Table 3); ε_n is the error term that can account for a number of factors such as non-identified externalities or spatial correlation spillovers.

Since the geographic disaggregation level considered in this study is not detailed enough to comprehend the intra-regional dynamics[27], the phenomena of dependency and spatial correlation will not be considered in the regions studied, hence, this model does not present a spatial error term.

[27] Studies that consider intra-regional dynamics as a location determinant factor for the creative class are conducted using a higher geographic disaggregation level such as municipalities (see chapter 3.1).

Table 3. Adapted creative industries location determinants, proxies and hypothesis.

Group Type	Location determinants	Indicator (Proxy)	Indicator computation	Source
Agglomeration Economies; Hypothesis 1: agglomeration economies are positively related to creative firm's location choices thus attracting creative employment (Harris, 2011; Alamá-Sabater et al., 2011; Arauzo-Carod, 2013)	Localization Economy	Creative employment density	Location Quotient (LQ) of creatives in the region by author' own computations for all regions (n=25)	*QP* Dataset: GEE/ME, Portugal, National Statistics
	Urbanization Economy	Population Density	Total number of people divided by the area in square kms, by region	INE, National Statistics
Regional Facilities; Hypothesis 2: Consumer amenities explain the location choices of creative individuals (Glaeser et al., 2001; Clark, 2003); Major research universities drive the location of creative industries attracting creative employment (Audretsch and Feldman, 2004; Audretsch et al., 2005)	Consumer amenities	Constructed Amenities Index	Summed values of the following amenities: Museums, Zoo's, Gardens and Aquariums, Cinema rooms, Art galleries and similar art venues	INE, National Statistics
	Public Services (Health and Education)	University Proximity Index	Number of major universities per square km considering the NUTS III region	INE, National Statistics
		Public Provision Index	Share of employment in health and education occupations by the total employment in the region	QP Dataset: GEE/ME, Portugal, National Statistics
		Proportion of population with completed tertiary education	Resident population with 21 and more years with complete tertiary education, in total resident population with 21 or more years old	INE, National Statistics
		Gross enrolment rate in upper secondary education	Proportion of pupils enrolled on upper secondary education in resident population aged between 15 and 17 years old	INE, National Statistics
	Urban and regional development	Employment growth rate	Employment growth rate verified in the NUTS II region	INE, National Statistics
		Proportion of purchasing power	Index of purchasing power (Portugal=100) weighted by each region's population weight (district population / national population)	INE, National Statistics
		Average monthly earnings (euros)	Average monthly amount in Euros (per worker) by geographic localization	QP Dataset: GEE/ME, Portugal, National Statistics
Regional Culture; Hypothesis 3: The region's tolerance, talent and technological endowments are positively related to presence of creative individuals (Florida, 2002, 2005)	Tolerance	Bohemian Index	Proportion of bohemian occupations as share of total creative occupations in a region	QP Dataset: GEE/ME, Portugal, National Statistics
		Foreign Population	Foreign population who have applied for resident status in total number by region considered	INE, National Statistics
	Talent (Human Capital)	Private R&D Investment	Total expenditures in R&D made by private firms in high technological sectors with 10 or more employees	INE, National Statistics
		R&D Human capital	Proportion of people employed in R&D activities at firms	INE, National Statistics
	Technology	Industry technology intensity	Proportion of firms in high technological sectors in the region considered	INE, National Statistics

Source: Gabriel and Vale (2012), Cruz and Teixeira (2015)

3.3. Creative class location determinants

A set of indicators, commonly associated with the presence and distribution of creative individuals in a region, as the previous literature review shown (see chapter 2.2; Table A 3) were defined to determine explanatory variables in the testing of location determinants for creative employment.

Presented in the subchapter 2.2.1, the first hypothesis (*H1)* to test is that agglomeration economies – both localization and urbanization economies – are positively related with creative firm's location choices thus attracting creative individuals and employment. Since there is a relevant unevenness in the distribution of the population in different regions, the first indicator used will be the local creative employment density, measured as the location quotient (LQ) of creative employment in the *NUTS* III regions considered in this study. This quotient is calculated according to:

$$LQ_n = \frac{\frac{Creative\ employment_n}{Total\ employment_n}}{\frac{National\ creative\ employment}{National\ total\ employment}}\ , n = 1,..,25 \qquad (4)$$

The calculation will be done to all *NUTS* III regions considered (where n varies from the value 1 to 25) and the location quotient will indicate if that region presents concentration levels above the national average – when the indicator is over the value 1 – or if the region is below the national average – when the value in inferior to 1. This quotient has been a standard measure applied in many empirical literature cases to assess agglomeration due to its treatability and suitability as a measure of concentration in a region (e.g., Fritsch, 2007; Lazzeretti et al., 2008; Alamá-Sabater, 2011; Cruz & Teixeira, 2015) and will be used as a proxy for the localization economies indicator.

For urbanization economies, a traditional indicator will be used, as it has been used throughout vast empirical literature (e.g. Baptista and Preto, 2011; Gabriel and Vale, 2012) which is population density. This indicator is vigorous to differences in area sizes and enables the control of urban scale economies originating from very populated regions (Cruz & Teixeira, 2015). Often used as a control variable, this indicator is very generic, easy to calculate and conveys the effects of several regional factors (Boschma & Fritsch, 2009).

The second hypothesis (*H2)* concerns the ideas presented in subchapter 2.2.2. The thesis is that facilities (often mentioned as amenities) existing in a region explain the location choices of creative individuals (Glaeser et al., 2001; Clark, 2003), therefore the indicator considered in this study for the consumer amenities will be the Constructed Amenities Index (Clark, 2003). The index consists on the observing the number of museums, gardens, cinemas, theatres, bars and other leisure-related structures.

Regarding public amenities, the Public Provision Index will be used – calculating the share of doctors and teachers in the total workforce of each region (Gabriel & Vale, 2012). The presence of major universities in the region will be calculated and used as an indicator of educational amenities, since literature finds close relationships between knowledge-intensive industries where many creatives are inserted, and, the proximity to universities (see Audretsch et al., 2005; Baptista & Preto, 2011). Two other indicators will be considered which consist in the proportion of individuals with completed tertiary education and the enrolment rate of individuals in secondary education[28].

Urban and regional development is also considered by literature as a location determinant of creative industries and individuals (e.g. Florida et al., 2008) therefore indicators considered in the presented literature such has the employment rate, the proportion of purchasing power and the average monthly earning are also introduced to the model. The employment growth rate is useful to test Florida's idea that jobs follow (creative) people, meaning if the indicator has a small significance in the concentration of creative people in the region analyzed, it can be stated that the presence of creative individuals is not explained by jobs, as Florida argued (Gabriel & Vale, 2012).

To test the third hypothesis (*H3*) different indicators were determined regarding the previously discussed Florida's 3T's arguments. Tolerance-related indicators will be proxied by the proportion of foreign population who applied for resident status and the Bohemian Index (Florida, 2002, 2004). Other indicators could fit to test this hypothesis such as the tolerance-related gay index (Florida, 2004; Knudsen et al., 2007), however, this indicator measures coupled gay and lesbian couples in a region, and, such detailed and reliable data regarding the Portuguese context could not be retrieved. Talent-related indicators will be the total expenditures made in R&D by private firms in high technological sectors and the proportion of people employed in R&D activities. Technology-related indicators will be proxied by Industry technology intensity which is based in the proportion of firms in high technological sectors in the region considered.

Variables regarding all hypothesis to test will be inserted as logarithmic values because these tend to correspond better to the assumption of a normal distribution than do the original values, reducing the effect of outliers on the results. The use of logarithmic values in all variables will also be beneficial to the results explanation as the estimated coefficients can be read as an elasticity that gives the percentual change of the dependent variable resulting from a 1-percent change in the independent variable, thus, a comparison between elasticities will provide the relative importance between different determinants (Boschma & Fritsch, 2009).

Since the model will analyze results at the *NUTS* III level of disaggregation, spatially-lagged explanatory variables will not be considered, as there is no significant spatial dependence nor neighboring effects in individuals' distribution, due to the size of the considered regions (see Cruz & Teixeira, 2015; Alamá-Sabater et al., 2011). All the variables, indicators and sources are summarized in Table 3.

[28] College graduates, consisting in the groups 5A and 6 of ISCED 1997; Secondary education and post-secondary non-tertiary education, consisting in the groups 3 and 4 of ISCED 1997.

4 Descriptive Analysis

4.1. Creative workers and creative firms

The 2012 *QP* dataset relative to employees considers a total of 2,617,133 entries. To depict more accurate results, all 55,253 duplicate or incorrectly filled entries were removed from the dataset. The total number of entries after duplicates were removed, each mentioning one Portuguese employee, cumulated in 2,562,080 entries.

Table 4. Creative and non-creative workers present in the 2009 and 2012 *QP* dataset

	Number of workers, 2009*	**%**	**Number of workers, 2012****	**%**
Non-creative workers	2,304,561	74.4	1,865,243	72.8
Creative workers	791,588	25.6	696,837	27.2
Total	3,096,149	100.0	2,562,080	100.0

* Sourced from Preto & Farlens (2018) using the 2009 QP dataset; ** Following Cruz (2014a) broader definitions for defining the creative class.

Table 4 describes how these entries are divided by creative and non-creative workers, showing that despite the variation between 2009 and 2012 datasets is small, it is in line trends verified by literature (see chapter 2.1). The creative class grew in percentage by almost 2 points, accounting for 27.2 percent of the total, still consisting in less than a third of the total Portuguese workforce. Table 5 shows how the creative workers are segmented, according to the previously presented Florida's creative class definition. In spite of being in the same subset of the creative class as defined by Florida, due to the differences in terms of distribution, occupation and educational level, the super creative core and the bohemians will be studied and characterized separately in all upcoming tables.

Table 5. Creative class workers segmentation according to Florida's definitions

	Number of Workers**	**%**	**Number of workers***	**%**
Super creative core	139,891	19.3	90,446	13.0
Creative professionals	547,533	75.7	560,557	80.4
Employed Bohemians	35,982	5.0	45,834	6.6
Total	723,406	100.0	696,837	100.0

* Adapted version presented in Table 2, excluding less creative occupations; ** Following Cruz (2014a) broader definitions for defining the creative class.

Table 5 also shows the main difference between using the more broad, occupational taxonomy from Cruz (2014a) in the left hand side of the table (see chapter 3.1; Appendix A Table A 2) , and using the adapted version considered in this study where many occupations that literature finds as non-creative or less creative were removed or considered in a different segment of the creative class (see 3.1 and Table *2*), in the right hand side of the table. The results are that in this dissertation, the 'Super creative core' segment yielded a smaller number of professionals however, it is valid to argue that this smaller number more accurately depicts what is the highest form of creativity at the professional level.

The 2012 *QP* dataset relative to firms (employers) considers a total of 274,388 unique entries. Making use of the CAE Rev-3. codes identified in the literature review, a number of creative firms was established. Table 6 portrays how firms are distributed in terms of being creative and non-creative.

Table 6. Creative and non-creative firms present in 2012 *QP* dataset

Firm type	**Number of firms**	**%**
Non-creative firms	231,989	84.5
Creative firms	42,399	15.5
Total	274,388	100.0

4.2. Industry sector

By merging the employees and firms (employers) datasets, more in-dept results could be achieved towards understanding the creative industries side. Table 7 shows how the Portuguese workforce is distributed, by segmenting the creative class in all the different industry sectors considered in the CAE Rev.3.

The less represented segment of the creative class in terms of participants are the Bohemians, with almost half of its participants belonging to the 'Manufacturing Industries' and the 'Information and communication' segments (22,691 out of 45,834 individuals). The Super creative core segment has more than a third of its participants in the 'Information and communication' and 'Consulting, scientific, technical and similar activities' segments (31,551 out of 90,446 individuals). The most represented segment of the creative class is the Creative professionals, accounting for 80 percent of the entire creative class regarding the 2012 dataset. Creative professionals are highly participative of the 'Manufacturing Industries' and 'Wholesale and Trade' segments (215,374 out of 560,557 individuals).

Table 7. Portuguese workforce distribution according to CAE major groups

SIC codes: CAE – Rev.3 (1-digit)	Super Creative Core[29]	Creative Professionals	Employed Bohemians	Non-creative workers	Total
A. Agriculture, animal production, fishing and related	827 (1.6)	5,893 (11.4)	42 (0.1)	44,822 (86.9)	51,584 (100.0)
B. Extractive Industries	286 (3.3)	1,314 (15.2)	28 (0.3)	7,044 (81.2)	8,672 (100.0)
C. Manufacturing Industries	11,150 (2.0)	95,382 (16.9)	11,541 (2.0)	447,658 (79.1)	56,5731 (100.0)
D. Production and distribution of electricity, gas and related	521 (6.9)	3,324 (43,7)	45 (0.6)	3,710 (48.8)	7,600 (100.0)
E. Collection, treatment and distribution of water; waste management and depollution	1,419 (6.9)	4,833 (23.5)	100 (0.5)	14,255 (69.2)	20,607 (100.0)
F. Construction	12,027 (5.5)	48,672 (22.5)	1,181 (0.5)	154,851 (71.4)	216,731 (100.0)
G. Wholesale and retail trade	4,602 (0.9)	119,992 (23.3)	4,332 (0.8)	385,402 (74.9)	514,328 (100.0)
H. Transport, Storage and related	2,018 (1.6)	21,436 (16.7)	439 (0.3)	104,503 (81.4)	128,396 (100.0)
I. Accommodation, catering and similar	170 (0.1)	28,112 (14.9)	2,698 (1.4)	157,649 (83.6)	188,629 (100.0)
J. Information and communication activities	19,182 (28.7)	22,440 (33.6)	11,150 (16.7)	14,058 (21.0)	66,830 (100.0)
K. Financial and insurance activities	2,626 (3.1)	41,755 (48.6)	347 (0.4)	41,201 (47.9)	85,929 (100.0)
L. Real estate activities	588 (3.1)	7,422 (39.7)	174 (0.9)	10,519 (56.2)	18,703 (100.0)
M. Consulting, scientific, technical and similar activities	12,369 (11.2)	51,335 (46.6)	4,277 (3.9)	42,222 (38.3)	110,203 (100.0)
N. Administrative and support services activities	3,015 (1.5)	22,575 (11.0)	1,825 (0.9)	177,210 (86.6)	204,625 (100.0)
O. Public Administration and Defense	391 (3.6)	1,588 (14.7)	91 (0.8)	8,703 (80.8)	10,773 (100.0)
P. Education	5,620 (10.7)	6,550 (12.5)	495 (0.9)	39,911 (75.9)	52,576 (100.0)
Q. Human health activities and social support	8,519 (3.9)	61,083 (28.0)	1,836 (0.8)	146,914 (67.3)	218,352 (100.0)
R. Artistic, entertainment, sports and recreational activities	447 (2.1)	4,407 (20.7)	3,605 (17.0)	12,796 (60.2)	21,255 (100.0)
S. Other service activities	4,669 (6.6)	12,419 (17.6)	1,627 (2.3)	51,790 (73.5)	70,505 (100.0)
T. Activities of households employing domestic help	-	-	-	-	-
U. Activities of international organizations	-	25 (49.0)	1 (2.0)	25 (49.0)	51 (100.0)
Total	90,446 (3.5)	560,557 (21.9)	45,834 (1.8)	1,865,243 (72.8)	2,562,080 (100.0)

[29] The numbers in parenthesis correspond to each cells' percentage for each CAE group.

Table 8. Portuguese workforce distribution by creative industry sectors

SIC codes: CAE – Rev.3 (3 & 4 digits)	Creative industry Sector	Super Creative Core	Creative Professionals	Employed Bohemians	Non-creative workers	Total
7211, 7219, 7220	Teaching, training and research activities	885 (25.3)	1,687 (48.2)	44 (1.3)	883 (25.2)	3,499 (100.0)
711, 712	Engineering and Architectural activities	6,916 (28.0)	9,654 (39.1)	392 (1.6)	7,707 (31.2)	24,669 (100.0)
721	Scientific investigation and R&D activities	786 (25.5)	1,538 (50.0)	37 (1.2)	714 (23.2)	3,075 (100.0)
854	Post-secondary educational activities	2,690 (44.7)	1,144 (19.0)	102 (1.7)	2,085 (34.62)	6,021 (100.0)
5821, 5829	Software and Digital Media: Software publishing	501 (36.4)	500 (36.3)	50 (3.6)	326 (23.7)	1,377 (100.0)
6201, 6202, 631	Computer programming/ consultancy; Data processing/hosting/web portals	11,550 (46.5)	8,373 (33.7)	552 (2.2)	4,350 (17,5)	24,825 (100.0)
910	Libraries/archives/museum activities	125 (7.5)	284 (17.1)	279 (16.8)	969 (58.5)	1,657 (100.0)
691	Legal activities	9 (0.1)	1,592 (28.8)	18 (0.3)	3,912 (70.73)	5,531 (100.0)
692	Accounting and auditing activities	443 (1.47)	18,231 (60.5)	49 (0.2)	11,395 (37.8)	30,118 (100.0)
702	Business and Management consulting activities	3,006 (10.8)	11,856 (42.5)	701 (2.5)	12,319 (44.2)	27,882 (100.0)
750	Veterinary activities	5 (0.2)	1,691 (76.7)	2 (0.1)	507 (22.9)	2,205 (100.0)
841	Public administration activities	381 (11.4)	935 (28.0)	33 (0.9)	1,986 (59.6)	3,335 (100.0)
855	Professional and cultural educational activities	1,719 (9.4)	3,482 (19.0)	222 (1.2)	12,852 (70.3)	18,275 (100.0)
861, 862, 869	Health activities	1,554 (1.6)	49, 879 (53.2)	157 (0.2)	42,152 (44.9)	93,742 (100.0)
641, 642, 643, 649, 651, 661	Financial services	2,505 (3.2)	37,820 (48.2)	326 (0.4)	37,743 (48.2)	78,394 (100.0)
941, 942	Associative organization activities	610 (7.8)	2,764 (35.4)	121 (1.6)	4,319 (55.3)	7,814 (100.0)

591, 592	Music/Entertainment and the Performing Arts: Sound recording/ music publishing activities;	53 (1.7)	907 (29.3)	992 (32.0)	1,148 (37.0)	3,100 (100.0)
900, 931, 932	Performing arts and support activities; Amusement/recreation activities	318 (1.8)	3,830 (22.0)	3,267 (18.8)	9,982 (57,4)	17,397 (100.0)
601, 602, 6391	TV and Radio activities	44 (0.9)	858 (18.0)	3,133 (65.8)	730 (15.3)	4,765 (100.0)
5911, 5912, 5913, 5914	Film, Video and Photography: Motion Picture, video and television production, post-production and distribution activities	24 (0.8)	757 (27.7)	958 (35.0)	998 (36.5)	2,737 (100.0)
742	Photography activities	2 (0.1)	352 (29.0)	425 (35.0)	435 (35.8)	1,214 (100.0)
741	Design and Visual Arts activities	42 (2.97)	656 (46.39)	377 (26.7)	339 (23.9)	1,414 (100.0)
731, 732	Advertising and Marketing: Market research, Public opinion pooling, Advertising	338 (3.9)	3,232 (37.7)	1,858 (21.7)	3,153 (36.7)	8,581 (100.0)
321, 322, 325, 264, 265, 266, 267, 231, 232, 233, 2341	Crafts and Others	544 (1.9)	5,312 (18.8)	4,987 (17.67)	17.384 (61.6)	28,227 (100.0)
5811, 5812, 5813, 5814, 5819	Publishing of books, periodicals/others	157 (2.2)	1,968 (27.1)	2,629 (36.2)	2,513 (34.6)	7,267 (100.0)
6391, 6399	News agencies activities	35 (6.1)	120 (20.8)	288 (49.9)	134 (23.2)	577 (100.0)
743	Translation/interpretation activities	6 (1.5)	120 (29.7)	189 (46.8)	89 (22.0)	404 (100.0)
Total		90,446 (3.5)	560,557 (21.9)	45,834 (1.8)	1,865,243 (72.8)	2,562,080 (100.0)

Table 8 presents the distribution of workers by each creative industry sector, previously identified in the literature review. The super creative core workers are in greater proportion in areas such as Computer programming and/or consultancy, Data processing, Post-secondary educational activities and Software and Digital Media. Complementarily, to understand how creative occupations are distributed in each creative class category, Table 9 was developed, showing that 'Engineers and engineering professionals' (CNP-2010 code 214) and 'Software, Web and application analysts and developers' (CNP-2010 code 251) are the most common occupation among the super creative core participants, representing more than half of the same (61.5%).

Table 9. Super Creative Core distribution by occupation

SOC codes: CNP-2010	Occupation	Number of Workers	%
211	Physicists, Chemists and related professionals	1,434	1.6
212	Mathematicians, Statisticians and related professionals	475	0.5
213	Life Science professionals	3,889	4.3
214	Engineers and engineering professionals	29,175	32.3
2161, 2162, 2164, 2165	Architects, urbanists and product designers	4,851	5.4
231	University and higher education teachers	2,971	3.3
232	Vocational, technological and artistic education teachers	2,287	2.5
263	Social Science and related professionals	16,279	18.0
251	Software, Web and application analysts and developers	26,443	29.2
252	Databases and networks specialists	2,651	2.9
Total		90,446	100.0

The same is achieved in Table 10 regarding the Bohemians segment, where 'Artistic, Entertainment and Sports associate professionals' (CNP-2010 codes 342 and 343) and 'Qualified jewelers, artisans and precision instruments specialists' (CNP-2010 codes 731) are the most represented occupations, representing almost half of the entire Bohemian segment (42.4%).

Table 10. Employed Bohemians distribution by occupation

SOC codes: CNP-2010	Occupation	Number of Workers	%
265	Musicians, Actors and other creative and performing artists	2,598	5.6
342; 343	Artistic, Entertainment and Sports associate professionals	9,560	20.8
5241	Fashion and other models	24	0.1
352	Telecommunications and broadcasting technicians	7,581	16.5
2163	Product and garment designers	1,601	3.5
2166	Graphic and multimedia designers	2,381	5.2
2431	Advertising and marketing professionals	6,013	13.1
2432	Public relations professionals	1,320	2.9
264	Authors, journalists and linguists	4,904	10.7
731	Qualified jewelers, artisans and precision instruments specialists	9,852	21.5
Total		45,834	100.0

Table 11 depicts the same information than the previous two tables, now regarding the creative professionals' segment distribution. The most populated occupation is undoubtedly 'Directors, senior managers and managers' (CNP-2010 1), however, much debate exists on this point of Florida's taxonomy regarding creative occupations, due to the low-to-none creative skill that many managerial positions require (see chapter 2.1).

It is also important to infer that the mapping of occupations between the ISCO-08 and CNP-94 codes required some adjustments because the match at 3- and 4-digit levels is not exact. Therefore the CNP-2010 codes, as presented in Cruz (2014a) study were used and adapted, since some occupations present in the CNP-2010 do not exist in the ISCO-08.

Table 11. Creative Professionals distribution by occupation

SOC codes: CNP-2010	Occupation	Number of Workers	%
1	Directors, senior managers and managers	239,906	42.8
221, 224, 225, 226	Health professionals (except nursing)	25,602	4.6
222	Nursing and midwifery professionals	19,590	3.5
241	Finance professionals	24,389	4.4
242	Administration professionals	15,831	2.8
261	Legal professionals	2,992	0.5
262	Archivists, museum curators and related information professionals	763	0.1
311, 312, 313, 315	Physical and engineering sciences technicians	87,260	15.6
314	Life science technicians and relates associate professionals	1,599	0.3
321, 324, 325	Medical and pharmaceutical technicians and health associate professionals	25,656	4.6
331	Financial and mathematical associate professionals	21,833	3.9
332	Sales and purchasing agents and brokers	23,362	4.2
333	Business services agents	7,234	1.3
334	Administrative, legal, social and specialized secretaries and related professionals	47,099	8.4
335	Regulatory government associate professionals	351	0.1
351	Information and communications technology operations and user support technicians	17,040	3.0
Total		560,557	100.0

4.3. Geography

Table 12 presents the number of creative workers and non-creative workers at the *NUTS* II level, and, the percentage of both in the total percentage of each region.

Table 12. Distribution of creative and non-creative workers (NUTS II)

NUTS II	Non-creative workers	Creative Workers	Total	Population density
Norte	652,982 (75.1)	216,409 (24.9)	869,391 (100.0)	173
Centro	349,086 (74.0)	122,588 (26.0)	471,674 (100.0)	82
Lisboa	656,187 (69.1)	293,083 (30.9)	949,270 (100.0)	940
Alentejo	99,012 (76.8)	29,903 (23.2)	128,915 (100.0)	24
Algarve	68,105 (75.9)	21,642 (24.1)	89,747 (100.0)	90
Açores	1,264 (67.6)	605 (32.4)	1,869 (100.0)	106
Madeira	38,602 (75.4)	12,576 (24.6)	51,178 (100.0)	334
Total	1,865,243 (72.8)	696,837 (27.2)	2,562,080 (100.0)	173

Figure 1 demonstrates the distribution of creative and non-creative workers by the total percentage of the Portuguese workforce, in every *NUTS* II region. The figure allows the understanding that the *NUTS* II region 'Lisboa' accounts for almost half (42.1%) of the total workforce of creatives in Portugal and more than two thirds (73.2%) of the entire creatives in Portugal, when the region 'Norte' is added.

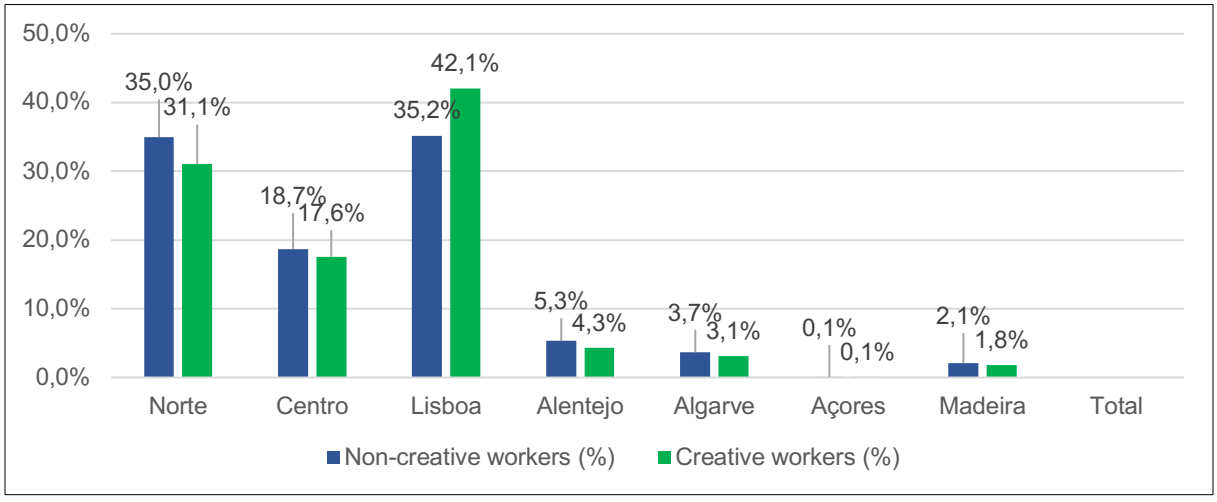

Figure 1. Creative and non-creative workers distribution by NUTS II region

While the region '*Lisboa*' presents the higher number and percentage of creative workers, it is also important to notice that it is by far the most densely populated area in Portugal as well. Hence, considering that the population is rather unevenly distributed among the Portuguese territory,

Table 13 will introduce the results for the location quotient presented in chapter 3.3, showing how the share of creative people is related to the population. As mentioned previously in said chapter, a value higher than 1 means that the location quotient is higher than the national average. The two highest values where this occurs are major metropolitan areas in Portugal. Such implication can work towards the validation of the proposed hypothesis 1 (*H1*), presented in subchapter 2.2.1, in favor of the positive effect that agglomeration economies have in the presence of creative individuals.

Table 13. Location Quotient for the NUTS III regions

NUTS III	Location Quotient
Alto Minho	0,829
Cávado	0,902
Ave	0,797
Região Metropolitana do Porto	**1,082**
Alto Tâmega	0,705
Tâmega e Sousa	0,812
Douro	0,850
Terras de Trás-os-Montes	0,952
Oeste	0,873
Região de Aveiro	**1,005**
Região de Coimbra	**1,027**
Região de Leiria	1,001
Viseu Dão Lafões	0,932
Beira Baixa	0,871
Médio Tejo	0,920
Beiras e Serra da Estrela	0,863
Região Metropolitana de Lisboa	**1,135**
Alentejo Litoral	0,855
Baixo Alentejo	0,867
Lezíria do Tejo	0,851
Alto Alentejo	0,832
Alentejo Central	0,857
Algarve	0,887
Região Autónoma dos Açores	**1,190**
Região Autónoma da Madeira	0,903

Table 14. Distribution of creative and non-creative workers (NUTS III)

NUTS II	NUTS III	Super Creative Core	Creative Professionals	Bohemians	Non-creative workers	Total
Norte	Alto Minho	1,161 (2.50)	8,763 (18.89)	534 (1.15)	35,934 (77.46)	46,392 (100.00)
	Cávado	2,816 (2.85)	19,705 (19.91)	1,753 (1.77)	74,689 (75.47)	98,963 (100.00)
	Ave	2,541 (1.86)	24,891 (18.23)	2,174 (1.59)	106,916 (78.31)	136,522 (100.00)
	Região Metropolitana do Porto	**13,330 (3.98)**	**79,956 (23.87)**	**5,326 (1.59)**	236,344 (70.56)	334,956 (100.00)
	Alto Tâmega	2,247 (1.84)	19,965 (16.34)	1,210 (0.99)	98,752 (80.83)	122,174 (100.00)
	Tâmega e Sousa	1,868 (2.44)	14,162 (18.53)	837 (1.10)	59,542 (77.93)	76,409 (100.00)
	Douro	890 (3.06)	5,609 (19.28)	226 (0.78)	22,368 (76.88)	29,093 (100.00)
	Terras de Trás-os-Montes	716 (2.88)	5,471 (21.99)	258 (1.04)	18,437 (74.10)	24,882 (100.00)
Centro	Oeste	1,762 (2.41)	14,156 (19.35)	1,450 (1.98)	55,802 (76.26)	73,170 (100.00)
	Região de Aveiro	3,347 (3.57)	19,737 (21.04)	2,553 (2.72)	68,166 (72.67)	93,803 (100.00)
	Região de Coimbra	3,406 (4.08)	18,994 (22.75)	910 (1.09)	60,164 (72.08)	83,474 (100.00)
	Região de Leiria	1,950 (2.85)	15,211 (22.25)	1,450 (2.12)	49,750 (72.78)	68,361 (100.00)
	Viseu Dão Lafões	1,786 (3.49)	10,556 (20.60)	649 (1.27)	38,254 (74.65)	51,245 (100.00)
	Beira Baixa	293 (2.58)	2,301 (20.25)	98 (0.86)	8,673 (76.31)	11,365 (100.00)
	Médio Tejo	1,359 (2.65)	10,849 (21.18)	607 (1.18)	38,409 (74.98)	51,224 (100.00)
	Beiras e Serra da Estrela	982 (2.52)	7,752 (19.86)	430 (1.10)	29,868 (76.52)	39,032 (100.00)
Lisboa	**Região Metropolitana de Lisboa**	**43,753 (4.61)**	**226,764 (23.89)**	**22,566 (2.38)**	656,187 (69.13)	949,270 (100.00)
Alentejo	Alentejo Litoral	484 (2.72)	3,552 (19.93)	109 (0.61)	13,674 (76.74)	17,819 (100.00)
	Baixo Alentejo	693 (3.56)	3,756 (19.30)	142 (0.73)	14,869 (76.41)	19,460 (100.00)
	Lezíria do Tejo	946 (2.16)	8,832 (20.16)	366 (0.84)	33,665 (76.84)	43,809 (100.00)
	Alto Alentejo	365 (2.01)	3,585 (19.78)	151 (0.83)	14,022 (77.37)	18,123 (100.00)
	Alentejo Central	710 (2.39)	5,977 (20.12)	235 (0.79)	22,782 (76.70)	29,704 (100.00)
Algarve	Algarve	1,713 (1.91)	18,859 (21.01)	1,07 (1.19)	68,105 (75.89)	89,747 (100.00)
Açores	Região Autónoma dos Açores	49 (2.62)	519 (27.77)	37 (1.98)	1,264 (67.63)	1,869 (100.00)
Madeira	Região Autónoma da Madeira	1,274 (2.49)	10,611 (20.73)	691 (1.35)	38,602 (75.43)	51,178 (100.00)

Table 14 adds geographic detail to the two previous tables, showing the distribution of creative workers at the *NUTS* III level. The metropolitan area of Lisboa (*Região Metropolitana de Lisboa*) inserted in the *NUTS* II region of '*Lisboa'* and the metropolitan area of Porto (*Região Metropolitana do Porto*) inserted in the *NUTS* II region of '*Norte'* are the main contributors to the creative class, leading in number[30] in all subsets of the same[31], also validating also Fritsch (2007) arguments that the majority of creative class participants resides near agglomerations. Table 15 presents the number of creative and non-creative firms at the *NUTS* II level, as well as the percentage of both as the total percentage of each region.

Table 15. Distribution of creative and non-creative firms (NUTS II)

NUTS II	Non-creative firms	Creative firms	Total
Norte	88,341 (85.9)	14,450 (14.1)	102,791 (100.0)
Centro	54,352 (86.8)	8,286 (13.2)	62,638 (100.0)
Lisboa	53,415 (78.8)	14,346 (21.2)	67,761 (100.0)
Alentejo	17,592 (89.1)	2,151 (10.9)	19,743 (100.0)
Algarve	13,147 (87.1)	1,946 (12.9)	15,094 (100.0)
Açores	27 (81.8)	6 (18.2)	33 (100.0)
Madeira	5,097 (80.8)	1,212 (19.2)	6,309 (100.0)
Total	231,989 (84.5)	42,399 (15.5)	274,388 (100.0)

Both the previous table and Figure 2 demonstrate that 'Lisboa' region has a higher percentage of firms associated with creative sectors, further showing the dependency of closeness between creative firms and creative individuals, in line with the hypothesis that agglomeration economies are positively related with the presence of creative class participants.

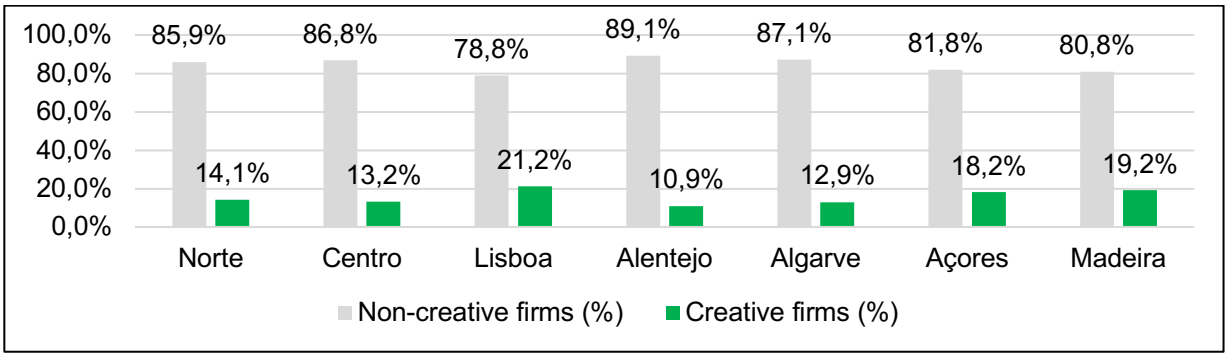

Figure 2. Creative and non-creative firms' distribution by NUTS II region

[30] *Região Autónoma dos Açores,* inserted in NUTS II region of 'Açores' has a higher percentage of creative professionals than *Porto* and *Lisboa*, however, as the entire number of workers is small and contains missing information in some variables, such value can be misleading.

[31] The mentioned regions also lead in number of non-creative workers.

4.4. Education

Table 16 contains the distribution of the creative workers and non-creative workers divided by each educational level present in the 2012 *QP* dataset. Such table enables a detailed characterization of the educational levels of individuals belonging to the Portuguese workforce and considered in the *QP*.

The first observable difference is that almost the entire creative class has at least the level of basic education attained, differently from the non-creative workers. Individuals with basic education or less consist in over two thirds[32] of the entire non-creative workers segment and the percentage of workers with tertiary[33] education in that same segment is less than 10 percent. Oppositely, over a third of all creative class workers has tertiary education, with particular focus on the super creative core segment of the creative class where almost 90 percent of its participants have obtained such educational level.

Table 16. Distribution of creative class and non-creative workers by educational level

Educational Level	Super Creative Core	Creative Professionals	Employed Bohemians	Non-creative workers	Total
Without educational degree or less than entire Basic Education	-	-	121 (0.3)	18,592 (1.0)	18,713 (0.7)
Basic Education	2,758 (3.1)	192,114 (34.3)	16,482 (36.0)	1,262,696 (67.7)	1,474,050 (57.5)
Secondary Education	8,849 (9.8)	148,896 (26.6)	13,082 (28.5)	431,173 (23.1)	602,000 (23.5)
Post-secondary non-tertiary education	634 (0.7)	5,605 (1.0)	540 (1.2)	6,550 (0.4)	13,329 (0.5)
Bachelor's degree	67,332 (74.4)	197,965 (35.3)	14,583 (31.8)	136,331 (7.3)	416,201 (16.2)
Master's degree	7,470 (8.26)	12,325 (2.2)	839 (1.8)	6,031 (0.3)	26,665 (1.0)
Doctorate degree	2,289 (2.5)	2,184 (0.4)	112 (0.2)	736 (0.1)	5,321 (0.2)
Not-filled	1,124 (1.2)	1,468 (0.3)	75 (0.1)	3,134 (0.2)	5,801 (0.2)
Total	90,446 (100.0)	560,557 (100.0)	45,834 (100.0)	1,865,243 (100.0)	2,562,080 (100.0)

Regarding the literature that has been presented, this number fits in line with Glaeser (2005) critiques that the creative class is just another way of measuring education, as in the Portuguese case, the majority of this class does have a substantially higher degree of education than the non-creatives.

The same information presented in the previous table, is charted below in

[32] The values inside the parenthesis are the percentages and the total value is summed by column.
[33] Bachelor's, Master's and/or Doctorate degrees.

Figure 3, where the educational levels were grouped in a more summarized manner. Once more, it is observable the difference in the distribution of workers, where creative class participants account for more than two thirds of all individuals with tertiary education.

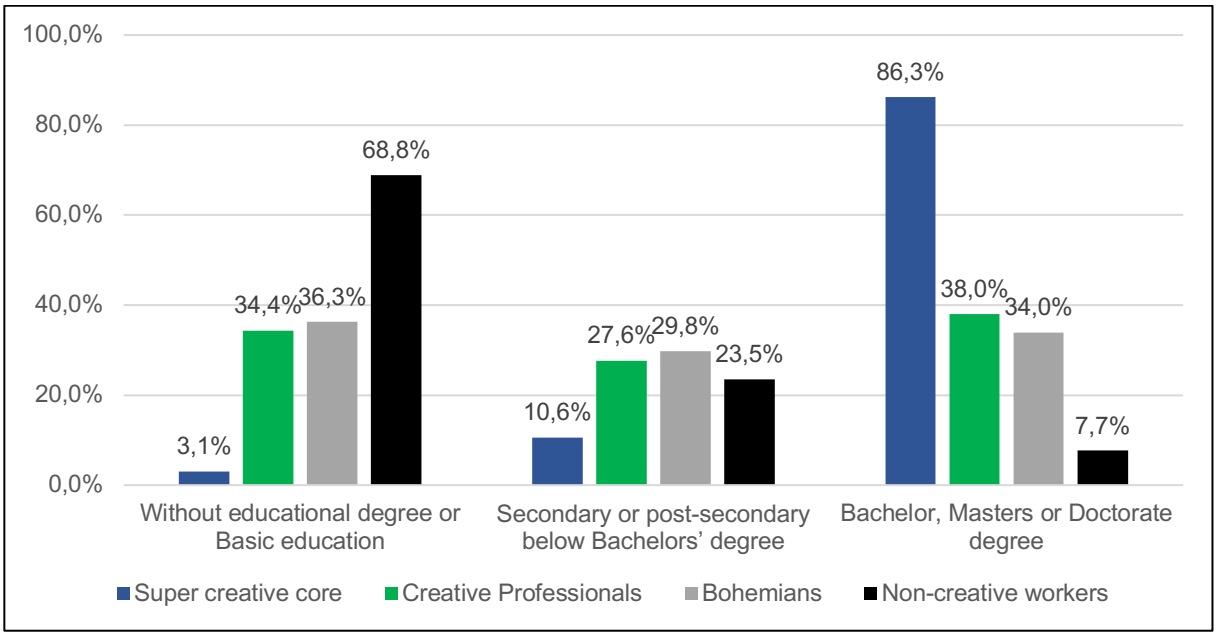

Figure 3. Distribution of creative and non-creative workers by educational level

Since one of the objectives of this study is to analyze and understand what factors influence the presence of the creative class in specific areas, the educational levels in different regions where performed are show in Table 17 at the *NUTS* II level.

Table 17. Education levels distributed by NUTS II regions

NUTS II	Without educational degree or Basic education	Secondary or post-secondary below Bachelors' degree	Bachelor, Masters or Doctorate degree	Total
Norte	575,445 (66.3)	170,042 (19.6)	122,629 (14.1)	868,005 (100.0)
Centro	307,080 (65.2)	96,920 (20.6)	66,862 (14.2)	470,862 (100.0)
Lisboa	434,826 (46.2)	286,165 (30.2)	223,718 (23.6)	946,709 (100.0)
Alentejo	84,800 (65.9)	27,775 (21.6)	15,997 (12.4)	128,572 (100.0)
Algarve	56,071 (62.9)	21,804 (24.5)	11,287 (12.7)	89,162 (100.0)
Açores	679 (36.3)	733 (39.2)	457 (24.5)	1,869 (100.0)
Madeira	31,971 (62.6)	11,876 (23.3)	7,217 (14.1)	51,064 (100.0)
Total	1,492,763 (58.4)	615,329 (24.1)	448,187 (17.5)	2,556,279 (100.0)

'*Açores'* region presents very evenly distributed education levels, however the low number of workers contained in the dataset restricts the ability to accurately characterize the region. Table 18 further details the same information at the *NUTS* III level: in the Portuguese mainland, 'Norte' and 'Lisboa' regions, have the highest number of educated workers, due to the presence of the main metropolitan areas in Portugal in each of these *NUTS* II regions: '*Região Metropolitana do Porto*' and '*Região Metropolitana de Lisboa'*, respectively. These descriptive statistics are in line with Glaeser's arguments against Florida's thesis that the creative class is just another way to measure educational level, as previous chapters shown that these same regions where there is a higher level of educated individuals, also account for the majority of the creative class participants.

Table 18. Education levels distributed by NUTS III regions

NUTS II	NUTS III	Without educational degree or Basic education	Secondary or post-secondary below Bachelors' degree	Bachelor, Masters or Doctorate degree	Total
Norte	Alto Minho	31,689 (68.4)	9,631 (20.8)	4,993 (10.8)	46,313 (100.0)
	Cávado	69,537 (70.4)	17,401 (17.6)	11,895 (12.0)	98,833 (100.0)
	Ave	100,697 (73.9)	22,662 (16.6)	12,982 (9.5)	136,341 (100.0)
	Região Metropolitana do Porto	**183,168 (54.8)**	**81,826 (24.48)**	**69,284 (20.7)**	**334,278 (100.0)**
	Alto Tâmega	98,599 (80.8)	15,176 (12.4)	8,279 (6.8)	122,054 (100.0)
	Tâmega e Sousa	56,578 (74.2)	11,972 (15.7)	7,732 (10.1)	76,282 (100.0)
	Douro	19,214 (66.1)	5,757 (19.8)	4,089 (14.1)	29,060 (100.0)
	Terras de Trás-os-Montes	15,852 (63.8)	5,617 (22.6)	3,375 (13.6)	24,844 (100.0)
Centro	Oeste	50,079 (68.6)	15,389 (21.1)	7,513 (10.3)	72,981 (100.0)
	Região de Aveiro	60,763 (64.8)	18,626 (19.9)	14,322 (15.3)	93,711 (100.0)
	Região de Coimbra	51,302 (61.6)	16,919 (20.3)	15,071 (18.1)	83,292 (100.0)
	Região de Leiria	43,982 (64.5)	15,152 (22.2)	9,080 (13.3)	68,214 (100.0)
	Viseu Dão Lafões	34,112 (66.6)	10,108 (19.7)	6,957 (13.6)	51,177 (100.0)
	Beira Baixa	7,644 (67.3)	2,057 (18.1)	1,652 (14.5)	11,353 (100.0)
	Médio Tejo	32,716 (63.9)	11,374 (22.2)	7,063 (13.8)	51,153 (100.0)
	Beiras e Serra da Estrela	26,482 (67.9)	7,295 (18.7)	5,204 (13.4)	38,981 (100.0)
Lisboa	**Região Metropolitana de Lisboa**	**436,826 (46.1)**	**286,165 (30.2)**	**223,718 (23.6)**	**946,709 (100.0)**
Alentejo	Alentejo Litoral	11,211 (63.2)	4,351 (24.5)	2,171 (12.2)	17,733 (100.0)
	Baixo Alentejo	12,635 (65.2)	4,112 (21.2)	2,645 (13.6)	19,392 (100.0)
	Lezíria do Tejo	29,526 (67.6)	8,827 (20.2)	5,339 (12.2)	43,692 (100.0)
	Alto Alentejo	12,553 (69.4)	3,434 (18.9)	2,102 (11.6)	18,090 (100.0)
	Alentejo Central	18,874 (63.6)	7,051 (23.7)	3,740 (12.6)	29,665 (100.0)
Algarve	Algarve	56,071 (62.9)	21,804 (24.5)	11,287 (12.7)	89,162 (100.0)
Açores	**Região Autónoma dos Açores**	**679 (36.3)**	**733 (39.2)**	**457 (24.5)**	**1,869 (100.0)**
Madeira	Região Autónoma da Madeira	31,971 (62.6)	11,876 (23.3)	7,217 (14.1)	51,064 (100.0)

4.5. Wages

The comparison between creative and non-creative workers' wages was done relying on the variables from the 2012 *QP* dataset that sum the monthly base remuneration with the remaining regular monthly earnings considered, as Table 19 shows. The first segment of wages corresponds to the minimum national wage in 2012, before taxes.

Table 19. Creative and non-creative workers' wages

Wage Scale	Super Creative Core	Creative Professionals	Bohemians	Non-creative workers
Less than 485,00 euros	5,429	12,684	2,113	210,893
Equal to 485,00 euros	504	81,58	800	68,743
485,01 to 599,99 euros	2,089	20,510	4,929	385,864
600,00 to749,99 euros	3,522	39,108	5,958	453,175
750,00 to 999,99 euros	10,067	62,964	8,592	351,795
1000,00 to 1499,99 euros	23,702	102,498	8,642	211,931
1500,00 to 2499,99 euros	25,190	89,966	8,335	96,483
2500,00 to 3749,99 euros	11,065	44,649	284	16,852
3750,00 to 4999,99 euros	3,452	14,982	751	2,912
Over 5000,00 euros	1,538	14,330	754	1,084
No wages considered	3,888	150,708	212	65,511
Total	90,446	560,557	45,834	1,865,243

To observe the data in a more concise and insightful manner, Table 20 was developed, where the workers with 'no wages considered' in the dataset were removed and the wage scale was reduced as well, merging some of the segments in that same scale. The first segment of wages in the mentioned table corresponds to the minimum wage before tax in the year 2019[34].

Table 20. Creative and non-creative workers' wages (summarized)

Wage Scale	Super Creative Core	Creative Professionals	Bohemians	Non-creative workers
Less than 599 euros	8,022 (9.3)	41,352 (10.1)	7,842 (19.1)	665,500 (37.0)
[600, 1499] euros	37,291 (43.1)	204,570 (49.9)	23,192 (56.3)	1,016,901 (56.5)
[1500, 3749] euros	36,255 (41.9)	134,615 (32.8)	8,619 (20.9)	113,335 (6.3)
Over 3750 euros	4,990 (5.8)	29,312 (7.2)	1,505 (3.7)	3,996 (0.2)
Total	86,558 (100.0)	409,849 (100.0)	41,158 (100.0)	1,799,732 (100.0)

[34] Considering the agriculture minimum wage, *salário mínimo agrícola*, retrieved from PORDATA.

As both Table 20 details and Figure 4 visually presents, the creative class segments are much significant in the higher wages segments. Over 90 percent of the non-creative workers situate in the two first segments where total monthly earnings do not exceed the 1,500 euros and less than one percent of these workers are placed in the highest wage segment, exceeding 3,750 euros monthly.

Oppositely, almost 50 percent of the super creative core is present in the two higher segments (47.7%) with monthly wages exceeding 1,500 euros. Accordingly, 40 percent of the creative professionals and 24.6 percent of the bohemians are in the same two higher segments of wages as well.

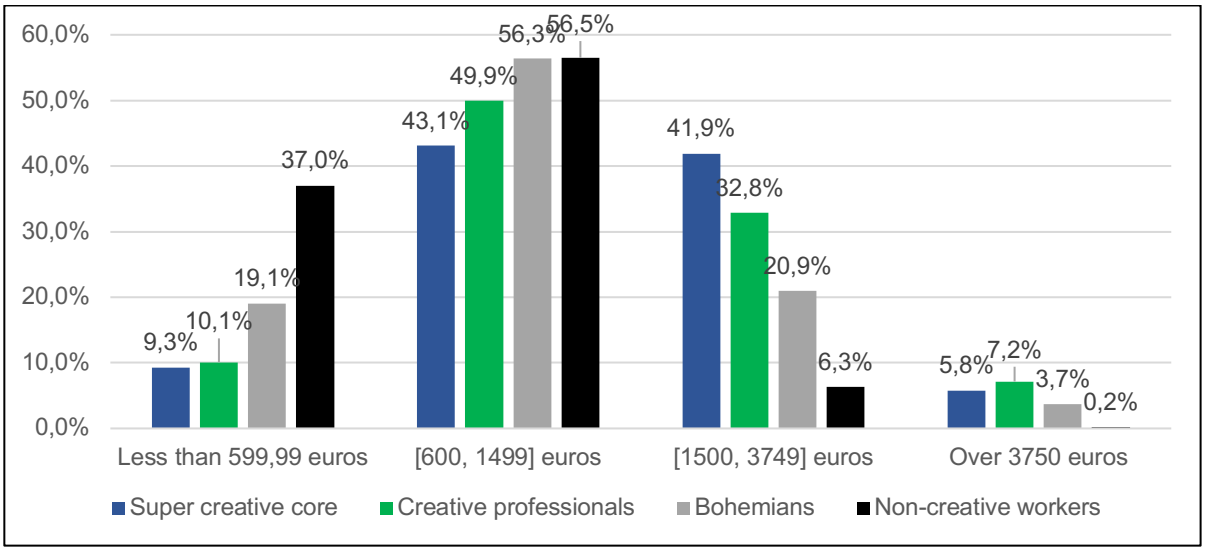

Figure 4. Creative and non-creative workers' wages

As literature presented many evidences of links between the creative class and educational levels, the importance of understanding how wages were distributed according different educational level arose as well. Table 21 shows such distribution of workers as per educational level.

Table 21. Wage distribution by different educational levels

Wage Scale	Without educational degree or Basic education	Secondary or post-secondary below Bachelors' degree	Bachelor, Masters or Doctorate degree
Less than 599 euros	549,972 (39.9)	139,950 (24.6)	36,934 (9.0)
[600, 1499] euros	750,515 (55.2)	338,480 (59.6)	190,544 (46.9)
[1500, 3749] euros	63,488 (4.7)	83,035 (14.6)	148,309 (36.5)
Over 3750 euros	2,721 (0.2)	6,580 (1.2)	30,403 (7.5)
Total	1,360,696 (100.0)	568,045 (100.0)	406,190 (100.0)

As Figure 5 shows, near the entire workers with lower educational levels are considered in the first two wage segments (95.1%) and almost 90 percent of workers with secondary education (84.2%) are in the same segment as well. Workers with tertiary education are the most significant in the higher wage segments (44%) that exceed the 1,500 euros on a monthly basis.

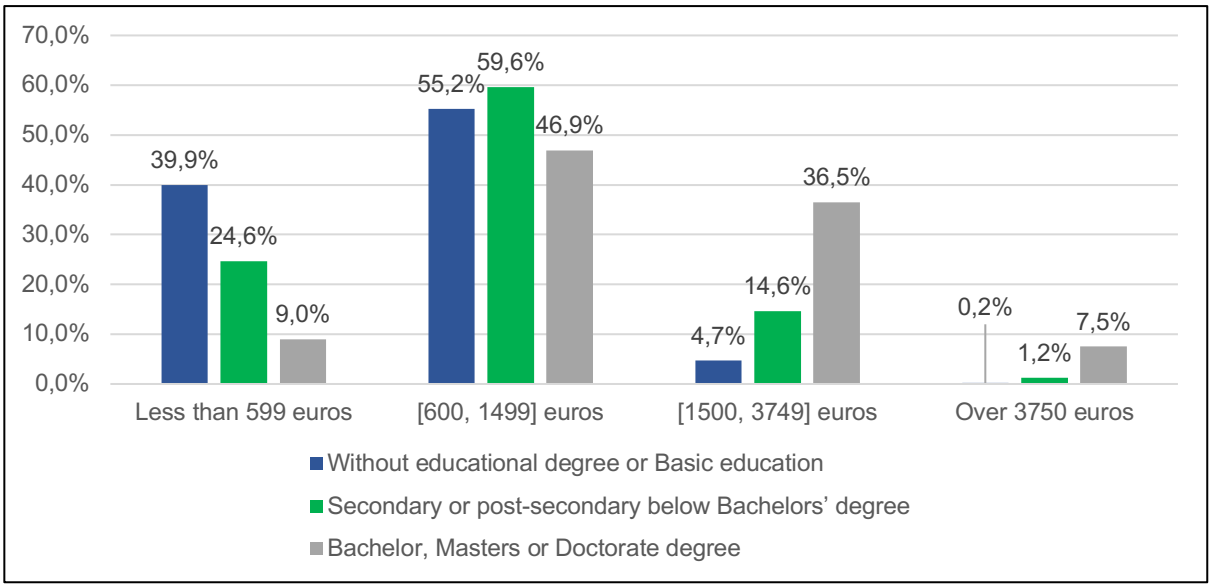

Figure 5. Educational level distribution by wage segment

Wages also present strong links to geography as Table 22 shows. The *NUTS* II region of '*Lisboa'* concentrates a higher number of workers than the other regions, however, as Figure 6, more visually shows, disregarding the total number of workers but observing the data proportion-wise, when accounting only for the Portuguese mainland regions, '*Lisboa'* concentrates the higher proportions of workers with larger monthly remunerations.

Table 22. Wage segment distribution by NUTS II region

Wage Scale	Norte	Centro	Lisboa	Alentejo	Algarve	Açores	Madeira
Less than 599 euros	299,052	136,465	213,064	36,964	25,843	334	10,993
[600, 1499] euros	412,579	252,819	469,634	69,460	47,684	792	28,978
[1500, 3749] euros	66,795	30,466	178,400	8,741	4,968	552	5,438
Over 3750 euros	7,696	2,502	27,150	1,029	460	144	815
Total	786,122	422,252	888,248	116,194	78,955	1,822	46,224

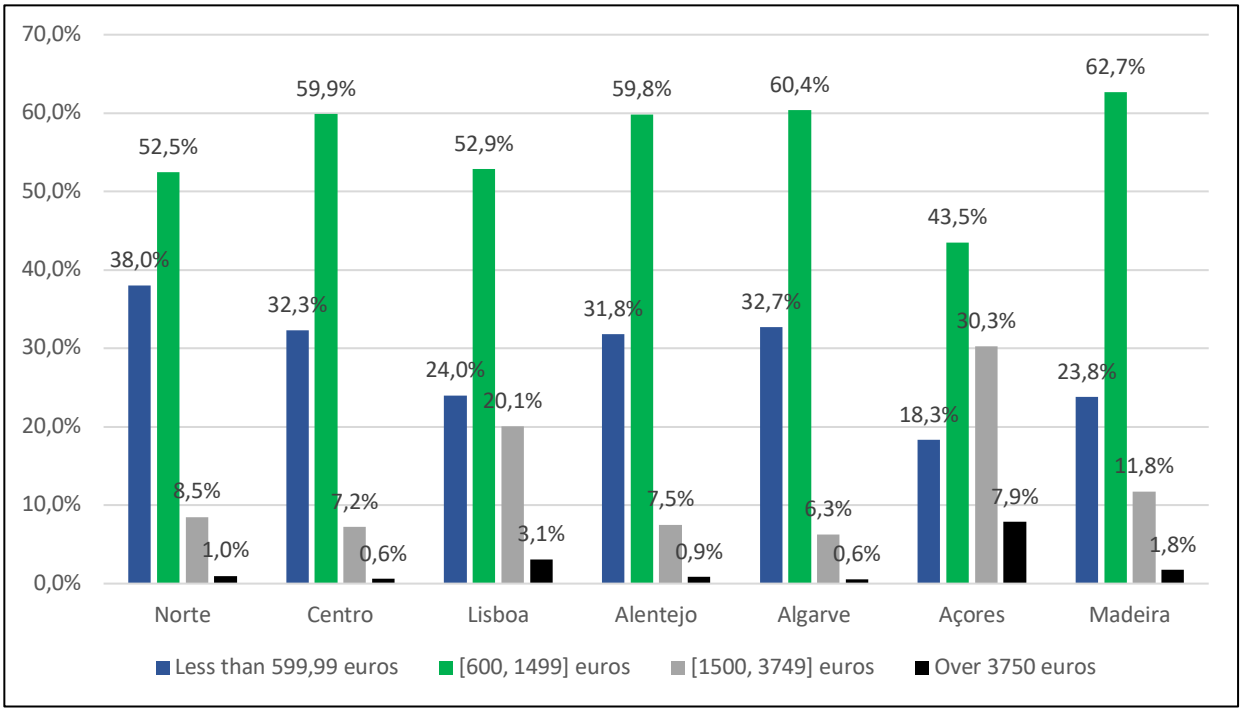

Figure 6. Wage segment distribution by NUTS II region

In higher geographic detail, Table 23 depicts the consistency in the information that previous tables and figures shown: in the Portuguese mainland, 'Norte' and 'Lisboa' regions have more workers in the highest segments of monthly remuneration than the other regions, due to the presence of the main metropolitan areas in Portugal in each of these *NUTS* II regions: '*Região Metropolitana do Porto*' and '*Região Metropolitana de Lisboa'*, respectively. This data falls in line with hypothesis 2 (*H2*) regarding urban and regional development, which contains indicators such as purchasing power and average monthly wage, to infer that regions where these indicators are higher are positively related with the presence of creative class participants (see chapter 3.3 and Table 3).

Table 23. Wage segment distribution by NUTS III region

NUTS II	NUTS III	Less than 599 euros	[600, 1499] euros	[1500, 3749] euros	Over 3750 euros
Norte	Alto Minho	17,113 (41.4)	21,897 (53.0)	2,137 (5.2)	150 (0.4)
	Cávado	36,051 (40.7)	46,944 (53.0)	5,068 (5.73)	458 (0.5)
	Ave	53,085 (42.9)	62,620 (50.6)	7,461 (6.0)	721 (0.6)
	Região Metropolitana do Porto	**87,288 (28.9)**	**171,434 (56.1)**	**41,577 (13.6)**	**5,404 (1.8)**
	Alto Tâmega	60,712 (55.2)	45,132 (41.0)	3,944 (3.6)	262 (0.2)
	Tâmega e Sousa	22,671 (32.9)	40,915 (59.4)	4,698 (6.8)	553 (0.8)
	Douro	12,117 (46.4)	12,594 (48.3)	1,267 (4.9)	118 (0.5)
	Terras de Trás-os-Montes	10,015 (46.1)	11,043 (50.8)	647 (2.9)	30 (0.1)
Centro	Oeste	22,732 (35.1)	38,042 (58.8)	3,698 (5.7)	269 (0.4)
	Região de Aveiro	25,012 (29.4)	51,787 (60.9)	7,565 (8.9)	626 (0.7)
	Região de Coimbra	24,692 (33.0)	43,775 (58.5)	5,772 (7.7)	526 (0.7)
	Região de Leiria	15,255 (25.0)	39,810 (65.4)	5,527 (9.1)	321 (0.5)
	Viseu Dão Lafões	15,564 (33.9)	27,463 (59.8)	2,604 (5.7)	326 (0.7)
	Beira Baixa	3,854 (37.2)	5,801 (56.0)	627 (6.1)	70 (0.7)
	Médio Tejo	14,021 (30.8)	28,009 (61.6)	3,179 (6.9)	267 (0.6)
	Beiras e Serra da Estrela	15,335 (43.7)	18,132 (51.7)	1,494 (4.3)	97 (0.3)
Lisboa	**Região Metropolitana de Lisboa**	**213,064 (23.9)**	**469,634 (52.9)**	**178,400 (20.1)**	**27,150 (3.1)**
Alentejo	Alentejo Litoral	4,958 (30.3)	9,314 (56.8)	1,785 (10.9)	329 (2.0)
	Baixo Alentejo	5,631 (31.9)	10,136 (57.4)	1,719 (9.7)	186 (1.1)
	Lezíria do Tejo	12,897 (32.9)	23,284 (59.5)	2,653 (6.8)	271 (0.7)
	Alto Alentejo	5,142 (31.4)	10,203 (62.2)	940 (5.7)	108 (0.7)
	Alentejo Central	8,336 (31.3)	16,523 (62.0)	1,644 (6.2)	135 (0.5)
Algarve	Algarve	25,843 (32.7)	47,684 (60.4)	4,968 (6.3)	460 (0.6)
Açores	Região Autónoma dos Açores	334 (19.3)	792 (43.5)	552 (30.3)	144 (7.9)
Madeira	Região Autónoma da Madeira	10,993 (23.8)	28,978 (62.7)	5,438 (11.8)	815 (1.8)

Other tables containing descriptive statistics from other variables, compiled using data from the 2012 *QP* dataset but that do not, however, present direct assumptions, linkable with the literature review are present in Appendix B.

5 Results

This chapter presents the main empirical results obtained from the econometric model regressions. First, an explanation will be undertaken regarding the procedures on how the variables' data was sourced, treated and prepared for the analysis. Afterwards, the cross-sectional model results will be presented allowing for the evaluation of the statistical significance of the many different factors have in influencing the location of creative class individuals.

5.1. Data preparation

The independent variables to be considered in the regression model and mentioned in Table 3 were calculated as the following:

- Population Density – acting as a control variable for the size of the population in each region, this indicator was retrieved from INE[35] and is calculated as the total number of people divided by each *NUTS* III regions' area.
- Constructed Amenities Index – considers the sum of several constructed amenities such as Museums, Zoo's, Gardens and Aquariums, Cinema rooms, Art galleries. The values were gathered from INE, relative to the year 2011, at the *NUTS* III geographic level.
- Public Provision Index – obtained by querying the *QP* dataset, the index was calculated using the share of Health and Teaching occupations divided by the total employment in each region.
- University Proximity Index – using information from INE, the index was calculated dividing the sum of public and private universities by the area, in square kilometers, of each *NUTS* III region.
- Employment Growth rate – sourced from INE, the data was only available at the *NUTS* II level (7 regions) therefore *NUTS* III regions inserted in the same level two region present the same value. This rate measures the working population on a year-on-year (YoY) basis.
- Proportion of purchasing power – retrieved from INE, this indicator measures each *NUTS* III region purchasing power relative to the base value of 100, viewed as a national average. The indicator is weighted by the regions' population weight.
- Average monthly earnings – queried from the *QP* dataset, this indicator considers the average earnings per month of all workers in each of the *NUTS* III regions considered in this study. Not only wage, but all remunerations registered in the dataset are considered for the calculation.
- Bohemian Index – queried from the *QP* dataset, this indicator considers the proportion of bohemian occupations as share of total creative occupations in a region.
- Foreign population – sourced from INE, the Foreign population indicator measures people who have applied for resident status in total number by region considered.

[35] *Instituto Nacional de Estatística,* is the Portuguese national statistics institute that collects national information, developing databases, studies and surveys. Mention onwards only as INE.

- Private R&D Investment – retrieved from INE, considers total expenditures in R&D made by technological firms with 10 or more people inserted in CAE Rev. 3 categories: B through H, J, K, M and Q. The corresponding industry to these letters can be found in Table 7.
- R&D Human Capital – retrieved from INE, this indicator directly provides the percentage of people employed in R&D activities at Portuguese firms, considering the year 2013.
- Industry Technology Index – Proportion of firms in high technological sectors in the *NUTS* III region considered, retrieved directly from INE.

The resulting data is presented in Appendix B Table B 6. The columns regarding share of creative class segments (to be used as dependent variables) in the regression analysis where filled based on the author's own computations using STATA software by exploring the 2012 *QP* dataset.

As previously mentioned, the logarithm of each value was considered to reduce the skewness of the data and reduce the effect that outliers might have and could ultimately influence the results obtained in the regressions. The literal interpretation of the estimated coefficients β associated will be that a one-unit increase in the dependent variable will produce an expected increase in the independent variable of β units (Benoit, 2011), since the logarithmic values tend to correspond better to the assumption of a normal distribution than do the original values. Appendix B presents the full visualizations of data preparation – scatter plots and histograms – undertook to ensure the linearity and normality, respectively, of the variables to be considered in the model.

As the scatterplot in Figure B 1 demonstrates, and also due to how the indicator is computed (see equation (4), the location quotient indicator presents a direct linear relationship with the dependent variables in study, therefore, this indicator will be solely used in the previous chapter for the descriptive analysis of the dataset. The population density indicator, as previously mention will act as a control variable for the size of the population in each region, therefore the previously mentioned hypothesis 1 (*H1*) will be dissolved, having already provided insights in chapter 4, through the location quotient indicator, showing that indeed regions with a high value in this indicator were characterized by a greater number of creative employees, higher educational levels and better wages.

The proposed cross-sectional regression model will consider only the two remaining hypotheses to test – the previously presented hypothesis 2 (*H2*) linking creatives with regional facilities and hypothesis 3 (*H3*) linking creatives with regional culture. The previously presented equation *(3)* for the cross-sectional model, shown in the methodology chapter, further proceeds in this dissertation derived in the following vectors:

$$S_n = \beta_0 + RF_n\beta_1 + RC_n\beta_2 + \varepsilon_n \qquad (5)$$

5.2. Results

The descriptive statistics for variables to be used for the regressions are in Appendix B Table B 7 and the correlation matrix of the same in Table B 8 and Table B 9. Breusch-Pagan and White tests were also conducted on STATA – to control for heteroskedasticity in the data – resulting in chi squared and p-values that inferred that the null hypothesis of homoscedasticity could not be rejected, or, in other words, no heteroskedasticity was verified in the data.

However, as the correlation table between explanatory variables presented in Appendix B Table B 9 shows, there is a reasonable amount of correlation between several of the independent variables to be used; and while the table only provides information about the pairs of predictors, it becomes important to test for the Variance Inflation Factor – mentioned as VIF onwards – in order to detect the existence on multicollinearity; because of this, the regressions considering the share of creative class workers as a dependent variable, or other subsets of the same class, will be presented considered in different models, each categorizing the independent variables as follows:

- model (I) containing all independent variables regarding hypothesis 2 (*H2*);
- model (II) containing all independent variables regarding hypothesis 3 (*H3*);
- model (III) considering all independent variables regressed simultaneously to verify the hypothesis altogether;
- model (IV) considering, again, all independent variables from both hypothesis except for those who are excluded from the Variance Inflation Factor test;

All variables and hypothesis in evaluation can be found in Table 3. The first regression completed was for the determinants of the regional share of Portuguese creative workers, presented in Table 24. The first column considers model I and it is observable that none of the explanatory variables enters the model significantly. Different are the results for model II where the Bohemian Index indicator exhibits statistical significance evidencing its positive relationship with the share of creative class workers in the Portuguese context. The same holds for models III and IV, considering all variables, which reveals the importance of the subset of the Bohemians as an attractive element to the remaining creative class, as Florida argued.

It is fundamental to notice that the difference between the R squared and adjusted r-squared values decreases from model III to model IV, and, the positively related explanatory variables increase its level of statistical significance due to the exclusion of multicollinear independent variables. For model III, as the VIF tests show in Table 25, other than the control variable – population density – remain three indicators with a high variance inflation factor value.

Table 24. Determinants of the regional share of Portuguese creative class workers

	Share of Creative Class Workers			
	(I)	**(II)**	**(III)**	**(IV)**
Population density	-0.01 (-0.35)	-0.04* (-1.5)	-0.05** (-3.1)	-0.03*** (-3.4)
Constructed Amenities Index	0.01 (0.301)	-	0.01 (0.440)	0.01 (0.45)
University proximity	0.02 (1.19)	-	0.01 (0.647)	-
Public Provision Index	-0.03 (-1.0)	-	0.03 (1.20)	0.01 (0.63)
Population with tertiary Education (proportion)	0.31*** (4.41)	-	0.28*** (6.10)	0.32*** (9.77)
Enrollment in upper secondary education (proportion)	-0.04 (-0.33)	-	0.06 (0.574)	0.10 (1.35)
Employment growth rate	0.64 (1.96)	-	-0.01 (-0.03)	-0.08 (-0.35)
Purchasing power (proportion)	0.05 (0.329)	-	-0.07 (-0.41)	-
Average monthly earnings	0.04 (0.283)	-	0.14 (1.24)	-
Bohemian Index	-	0.16* (2.38)	0.07* (2.12)	0.07** (2.89)
Foreign Population	-	0.07 (2.67)	0.04** (2.72)	0.03*** (3.33)
Private R&D Investment	-	-0.00 (-0.26)	-0.01 (-0.73)	-0.01 (-1.7)
R&D Human Capital	-	-0.15 (-1.9)	-0.02 (-0.35)	-0.03 (-1.0)
Industry Technology Intensity	-	-0.10 (-0.81)	-0.22*** (-3.8)	-0.22*** (-4.3)
Constant	0.40 (0.517)	1.54*** (7.78)	1.62** (3.04)	1.94*** (4.42)
F test	0.0000	0.0024	0.0000	0.0000
R squared	0.9277	0.6422	0.9818	0.9788
Adjusted R squared	0.8844	0.5229	0.9564	0.9608

Beta coefficients for the multiple linear regressions; t-values in parenthesis; *statistically significant at the 5 percent level, **statistically significant at the 1 percent level, ***statistically significant at the 0.1 percent level; number of observations: 25.

This VIF values mean that these are highly correlated variables with at least one other predictor in the model. To reduce the data-based multicollinearity in the model, another regression was performed

– model IV – excluding these predictors with a VIF higher than ten (O'Brien, 2007) – except for the control variable.

Table 25. Variance Inflation Factor test with share of creative class workers as dependent variable

Variable	VIF	
	(III)	(IV)
Purchasing power (proportion)	20.01	-
Average monthly earnings	18.41	-
Population density	15.29	7.46
University proximity	10.34	-
Public Provision Index	9.55	6.12
Foreign Population	9.04	5.28
Private R&D Investment	9.00	4.84
Industry Technology Intensity	8.92	8.34
Enrollment in upper secondary education (proportion)	7.22	4.18
Bohemian Index	7.20	4.57
R&D Human Capital	6.78	2.72
Population with tertiary Education (proportion)	6.41	3.61
Constructed Amenities Index	5.97	4.75
Employment growth rate	5.36	3.31
Mean VIF	9.96	5.02

Regarding the regression in model IV, a positive effect can be found for the population with tertiary education, Bohemian Index and Foreign Population, while a negative significant effect in the Industry Technology Intensity indicator. It is important to notice however that the greater and positive statistically significant value is for the first indicator mentioned, with a beta coefficient – by far – larger than the remaining. It can be concluded for the presented results that while Florida's argument regarding the importance of a Tolerant region hold – due to the positive statistical significance of the Bohemian Index and Foreign Population indicators – a larger, more strong relationship exists for the case of Glaeser who critiques Florida's thesis, due to the strong linkages between the creative class and individuals with a high level of education. The characteristics of the region however, or Consumer Amenities as many authors (e.g. Lloyd and Clark, 2001; Glaeser 2005) refer to it, do not hold such strong relations regarding the share of creative individuals in specific regions.

Regarding the control variable in use, no positive significant effect is found to support previously mentioned empirical evidence that agglomeration economies have a positive effect on the location decisions of creative class participants (Arauzo-Carod, 2013).

Table 26. Determinants of the regional share of Portuguese super creative core workers

	Share of Super Creative Core workers			
	(I)	**(II)**	**(III)**	**(IV)**
Population density	-0.01 (-0.20)	0.08 (-1.1)	-0.15 (-2.1)	-0.04 (-0.69)
Constructed Amenities Index	0.09 (0.814)	-	0.03 (0.366)	-0.05 (-0.60)
University proximity	0.05 (0.515)	-	0.05 (0.719)	-
Public Provision Index	0.22 (1.78)	-	0.35** (3.40)	0.11 (1.26)
Population with tertiary Education (proportion)	0.58 (1.97)	-	0.35 (1.53)	0.76** (3.62)
Enrollment in upper secondary education (proportion)	0.03 (0.061)	-	-0.25 (-0.49)	-0.39 (-0.83)
Employment growth rate	2.17 (1.58)	-	1.64 (1.20)	0.36 (0.277)
Purchasing power (proportion)	-1.02 (-1.6)	-	-1.85* (-2.4)	-
Average monthly earnings	0.69 (1.08)	-	1.44* (2.64)	-
Bohemian Index	-	0.14 (0.796)	0.15 (0.949)	0.02 (0.123)
Foreign Population	-	0.14* (2.26)	0.17* (2.75)	0.06 (0.976)
Private R&D Investment	-	0.10* (2.55)	0.10 (1.85)	0.10* (2.50)
R&D Human Capital	-	-0.29 (-1.5)	-0.32 (-1.1)	-0.19 (-0.92)
Industry Technology Intensity	-	0.01 (0.024)	-0.14 (-0.52)	-
Constant	-2.71 (-0.84)	0.13 (0.260)	-1.66 (-0.64)	1.38 (0.523)
F test	0.0072	0.0384	0.0023	0.0026
R squared	0.7153	0.4890	0.9040	0.7912
Adjusted R squared	0.5445	0.3186	0.7697	0.6421

Beta coefficients for the multiple linear regressions; t-values in parenthesis; *statistically significant at the 5 percent level, **statistically significant at the 1 percent level, ***statistically significant at the 0.1 percent level; number of observations: 25.

Considering the results presented in Table 26 – with the share of super creative core workers as dependent variable - while empirical literature (e.g. Audretsch et al. 2005; Baptista et al., 2011), demonstrate that many firms – but especially technological ones – have a high propensity to locate close to universities to leverage knowledge spillovers, being the proximity to universities a driver of location, the same does not seem to hold for the creative class participants in the Portuguese context. While

model I does not present statistically significant explanatory variables for the share of super creative core in a region and model II indicate positive statistical significance for the Foreign Population and Private R&D Investment indicators, the full-scale model III does not hold University proximity as a statistically significant indicator. Furthermore, as the VIF tests show in Table 27, this latter indicator indicates multicollinearity with other predictors and is omitted for model IV.

From model III in Table 26 is still visible a strong positive statistically significant relation with Public Provision Index, average monthly earnings and the proportion of Foreign population, however, when the multicollinear variables are dropped, in model IV, the share of super creative core workers exhibits a positive statistically significant relationship with the indicator for Tertiary education and also for the Private R&D Investment. This later indicator links the results to Florida's arguments of the 3T's and the regional Talent.

Table 27. Variance Inflation Factor test with share of super creative core workers as dependent variable

Variable	**VIF**	
	(III)	**(IV)**
Purchasing power (proportion)	20.01	-
Average monthly earnings	18.41	-
Population density	15.29	7.46
University proximity	10.34	-
Public Provision Index	9.55	6.12
Foreign Population	9.04	5.28
Private R&D Investment	9.00	4.84
Industry Technology Intensity	8.92	8.34
Enrollment in upper secondary education (proportion)	7.22	4.18
Bohemian Index	7.20	4.57
R&D Human Capital	6.78	2.72
Population with tertiary Education (proportion)	6.41	3.61
Constructed Amenities Index	5.97	4.75
Employment growth rate	5.36	3.31
Mean VIF	9.96	5.02

Table 28 contains the regression results for the share of employed Bohemians as dependent variable. In model I, II and III, only the Industry Technology Intensity is statistically significant with a negative coefficient; however, in model IV when multicollinear biased independent variables are excluded, the Public Provision Index appears with a negative relation and as statistically significant to explain the regression. This indicates that Bohemian creatives in some way are not influenced by the consumer amenities of this sort in a region, while, the employment growth rate does seem to have a

positive influence – being statistically significant with a very high beta coefficient – towards the share of employed Bohemians in a region.

In model IV, the indicator employment growth presents a positive statistically significant relationship with the dependent variable. As mentioned in the literature review, this beta coefficient is an argument in favor of Florida's idea that jobs follow (creative) people, meaning for the present case that one can argue that the presence of Bohemians is positively influenced by jobs – proxied by the employment growth rate – as Florida argued (Gabriel & Vale, 2012).

Table 28. Determinants of the regional share of Portuguese employed bohemians

	Share of Employed Bohemians			
	(I)	**(II)**	**(III)**	**(IV)**
Population density	0.07 (0.714)	0.08 (0.939)	-0.04 (-0.26)	0.12 (1.46)
Constructed Amenities Index	-0.02 (-0.17)	-	-0.01 (-0.05)	0.17 (1.33)
University proximity	0.19 (1.62)	-	0.11 (0.913)	-
Public Provision Index	-0.25 (-1.5)	-	-0.17 (-0.93)	-0.22* (-1.7)
Population with tertiary Education (proportion)	0.09 (0.225)	-	0.25 (0.596)	0.36 (1.11)
Enrollment in upper secondary education (proportion)	-0.72 (-1.0)	-	-1.42 (-1.6)	-0.65 (-0.88)
Employment growth rate	3.59 (1.96)	-	0.41 (0.162)	3.56* (1.89)
Purchasing power (proportion)	0.68 (0.808)	-	2.47 (2.01)	-
Average monthly earnings	-0.27 (-0.32)	-	0.10 (0.103)	-
Bohemian Index	-	-	-	-
Foreign Population	-	0.13 (1.63)	-0.14 (-1.2)	-0.02 (-0.18)
Private R&D Investment	-	-0.06 (-1.1)	0.07 (0.759)	0.03 (0.556)
R&D Human Capital	-	0.01 (0.050)	0.69 (1.54)	0.37 (1.21)
Industry Technology Intensity	-	-0.87** (-2.3)	-0.30 (-0.61)	-
Constant	-5.27 (-1.2)	0.87 (1.39)	-2.33 (-0.49)	-5.87 (-1.4)
F test	0.0006	0.0009	0.0047	0.0013
R squared	0.8061	0.6413	0.8611	0.7801
Adjusted R squared	0.6898	0.5468	0.6969	0.6482

Beta coefficients for the multiple linear regressions; t-values in parenthesis; *statistically significant at the 10 percent level, **statistically significant at the 5 percent level, ***statistically significant at the 1 percent level; number of observations: 25.

Table 29 presents the VIF tests for the previous regression. It remains important to mention that the Bohemian Index indicator was not considered due to the dependent variable in this regression being the share of employed bohemian, otherwise, both the explanatory variable and dependent variable would be accounting for the same effect.

Table 29.Variance Inflation Factor test with share of employed bohemians as dependent variable

Variable	**VIF**	
	(III)	**(IV)**
Average monthly earnings	18.39	-
Population density	15.19	4.74
Purchasing power (proportion)	14.60	-
University proximity	9.61	-
Public Provision Index	8.85	3.54
Industry Technology Intensity	8.62	-
Private R&D Investment	8.55	3.01
Foreign Population	7.89	5.01
Population with tertiary Education (proportion)	6.21	3.32
Constructed Amenities Index	5.97	4.10
Enrollment in upper secondary education (proportion)	5.77	3.74
R&D Human Capital	5.57	2.25
Employment growth rate	5.35	2.55
Mean VIF	**9.28**	**3.58**

Regarding Table 30 that regresses for the share of creative professionals as dependent variable, the proportion of population with tertiary education enters model I significantly while on model II, is the foreign population indicator which does so – with a significantly smaller beta coefficient.

Model III shows a positive statistically significant relationship with the proportion of population with tertiary education indicator, showing once again the very strong link between a population with high education level and the share of creatives in the region. This also holds for model IV where the multicollinear variables are excluded, keeping the indicator statistically significant at the 0.1 percent level.

No excessive overfitting appears to have happened in any of the regressions, since when some independent variables where excluded from the model due to multicollinearity concerts, the R squared value did not increase, meaning that the model did not became more explicative of the dependent variable with the exclusion of the previous multicollinear explanatory variables.

Table 30. Determinants of the regional share of Portuguese creative professionals

	Share of Creative Professionals			
	(I)	**(II)**	**(III)**	**(IV)**
Population density	-0.01 (-0.42)	-0.03 (-1.3)	-0.03 (-1.6)	-0.01 (-0.41)
Constructed Amenities Index	-0.01 (-0.20)	-	0.00 (0.028)	-0.01 (-0.07)
University proximity	0.01 (0.587)	-	0.01 (0.362)	-
Public Provision Index	-0.05 (-1.6)	-	-0.02 (-0.70)	-0.05* (-2.1)
Population with tertiary Education (proportion)	0.29** (3.84)	-	0.30*** (4.82)	0.27*** (4.82)
Enrollment in upper secondary education (proportion)	0.01 (0.060)	-	0.12 (0.848)	0.09 (0.692)
Employment growth rate	0.20 (0.567)	-	-0.27 (-0.72)	0.05 (0.136)
Purchasing power (proportion)	0.14 (0.904)	-	0.18 (0.873)	-
Average monthly earnings	-0.03 (-0.20)	-	-0.05 (-0.30)	-
Bohemian Index	-	0.11 (1.57)	-0.01 (-0.19)	0.02 (0.539)
Foreign Population	-	0.06* (2.36)	0.02 (0.972)	0.02 (1.09)
Private R&D Investment	-	-0.02 (-1.2)	-0.02 (-1.6)	-0.01 (-0.46)
R&D Human Capital	-	-0.14 (-1.8)	0.02 (0.323)	0.05 (0.847)
Industry Technology Intensity	-	-0.13 (-1.0)	-0.25** (-3.3)	-
Constant	0.99 (1.22)	1.54*** (7.85)	1.97* (2.79)	1.12 (1.57)
F test	0.0000	0.0122	0.0000	0.0000
R squared	0.8984	0.5614	0.9602	0.9150
Adjusted R squared	0.8374	0.4152	0.9044	0.8543

Beta coefficients for the multiple linear regressions; t-values in parenthesis; *statistically significant at the 5 percent level, **statistically significant at the 1 percent level, ***statistically significant at the 0.1 percent level; number of observations: 25.

On this regression, the model (model IV) disregards the indicators average monthly earnings, purchasing power, university proximity, to once again achieve a lower, more acceptable level of multicollinearity between the explanation variables as Table 31 will show in the right-hand side column.

Table 31. Variance Inflation Factor test with share of creative professionals as dependent variable

Variable	VIF	
	(III)	(IV)
Purchasing power (proportion)	20.01	-
Average monthly earnings	18.41	-
Population density	15.29	5.42
University proximity	10.34	-
Public Provision Index	9.55	4.28
Foreign Population	9.04	5.03
Private R&D Investment	9.00	3.08
Industry Technology Intensity	8.92	-
Enrollment in upper secondary education (proportion)	7.22	3.94
Bohemian Index	7.20	4.55
R&D Human Capital	6.78	2.47
Population with tertiary Education (proportion)	6.41	3.59
Constructed Amenities Index	5.97	4.59
Employment growth rate	5.36	3.16
Mean VIF	9.96	4.01

6 Conclusions

This chapter states the conclusions reached by linking the results reached in the previous chapter with the empirical literature brought to light throughout the dissertation. Subsequently, considers limitations that were encountered during this study as well as notes for future research in related topics.

6.1. Final Remarks

This study first achievement towards the fulfillment of the proposed objectives was the selection of variables and indicators to consider, and the treatment of the same. Literature has shown that in every step of the empirical analysis, many authors argue for different definitions, approaches and methodologies that yield diverse results (see chapter 2.1). It has been shown as well that a single taxonomy for creative class occupational codes cannot be directly applied to empirical studies that compare different countries since most used national databases apply occupational codes that are country-specific and that the disaggregation levels of territorial unit to be use should vary as well according to the objective of the subject (see Cruz & Teixeira, 2014). Hence, this dissertation reviewed and applied the approaches and methodologies that already has significant linkages to the Portuguese context, further improving them to yield a more accurate Portuguese creative class, which in turn hoped to provide more accurate and reliable results related to the objectives in scope.

The first objective of this study, to characterize the Portuguese landscape in regards of location at the *NUTS* III level, segmentation by industry, earnings and educational level, was achieved in chapter 4 through an extensive descriptive analysis of the 2012 *QP* database. Aligned with the vast empirical literature presented, the descriptive analysis shown that creative class participants are highly concentrated on the largest cities, with approximately 56% of the entire creative class belonging to the two main major *NUTS* III regions in Portugal: *Região Metropolitana do Porto* and *Região Metropolitana de Lisboa* – aligned with Alamá-Sabater et al. (2011) arguments that agglomeration economies, have higher levels of formal education than the non-creatives and are also among the highest earning workers. Accordingly, the same regions also concentrate 65% of the total Portuguese population with tertiary education and 66% of the total population who earns more than 1500 euros monthly. While previous empirical literature had already shown that being a creative worker presented advantages at the level of earning and education (see Preto & Farlens, 2018); This dissertation, however, further shown that such advantages are not homogenous throughout the Portuguese territory at the *NUTS* III level.

Regarding the second objective of this study, a model to show what location determinants of the creative class had higher positive statistically significant value was also developed and evaluated. The main critics about Florida's approach to talented human capital (e.g. Markusen, 2004; Glaeser, 2005) stating the author measures the impact of qualification on economic development, are holded as valid for the Portuguese context, as the emprirical results of this dissertation shown that it is found a

high positve statistical significant relation between the share of all segments of the creative class – except for the bohemians subset, who is believed to have an higher independence to economic/market forces and more easily adapt to labour market opportunities (Florida & Mellander, 2010; Faggian et al., 2013) – and the proportion of population with tertiary education. The same correlations between creative class and high levels of education was also found by Hansen (2007) and Andersen et al. (2010) regarding a large number of European countries (see chapter 2.1).

While in some instances other indicators, supporting Florida's 3T's thesis of regions with high Talent, Technology and Tolerance also attracted creative individuals, showed positive statistically significance towards the share of creatives in the evaluated region, none presented beta coefficients in any way close to the indicator proportion of population with tertiary education from hypothesis 2 (*H2*).

6.2. Limitations and pitfalls

This study approaches skill levels of talent in the form of formal education only, while other literature sources point out that some firms will prefer different types of training in workers (cf. Arauzo-Carod, 2013). Also, since the segments of creative class are built based on occupational codes, it is possible to have circumstances where individuals can enter a specific occupation and then increase their level of formal education, however, the dataset and methodology used does not anticipate these circumstances. This, and similar circumstances of assessing the state of the variables throughout time, could be antecipated with a time-series regression model instead of a cross-section model, as this dissertation presents.

Also, despite the data being inserted in logarithmic values, big disparities in the independent variables regarding some *NUTS* III regions do exist, possibly leading to some outliers in specific regions. The option to have these outliers removed and ensure more optimal conditions for the model was equated, however, this would duplicate the number of regressions performed – to compare results with and without outliers – largely increasing the scope of the dissertation and results interpretation, and, further reducing an already not high number of observations.

It is important to consider that in some of the variables used, the detail does not go all the way to the *NUTS* III level of disaggregation. For example, regarding the Indicator 'R&D Human Capital' which is the proportion of people employed in R&D activities at firms mentioned in Table 3, all *NUTS* III regions that belong to the same *NUTS* II region have the same value. In more practical terms this means that, for example, *Minho Lima*, *Cávado*, *Ave*, *Área Metropolitana do Porto*, *Alto Tâmega*, *Tâmega e Sousa*, *Douro*, *Terras de Trás-os-Montes NUTS* III regions all have the same value on this indicator as they are all in the same *NUTS* II region. This was due to the *NUTS* II level of disaggregation on these indicators being the highest in the data sources used.

Another set of issues is overfitting and multicollinearity: As the estimated model takes into account several independent variables, the issue of overfitting may occur, meaning that a number of

independent variables considered in the model is only adding more variance to it, without explaining any of the effects expected. STATA software enables for the verification of this issue by comparing the R-squared with the predicted r-squared of the regression model in study, therefore, statements regarding the overfitting of the model were also presented.

Multicollinearity is another limitation that was considered but, in any way, improved to a point where no multicollinearity could be taken as a certainty. As more independent variables are added to the model, more relationships exist not only from the independent variable to the dependent variable of the model but also between the independent variables themselves. This is also linked to the fact that the model contains a considerably small amount of observations, and further excluding independent variables would lead to results without any statistical significance.

6.3. Future research

It goes without saying that the presented econometric model is a vastly oversimplified model even of the core periphery issue, and it says nothing very few about the localization of creatives in particular industries. The model does illustrate, however, how tools drawn from industrial organization theory can help to formalize and sharpen the insights of a much-neglected field.

As other empirical studies stated, and this study as well, increasing the number of observations and detailing the information into an even higher degree of geographic disaggregation, while also introducing spatially related variables to account for regional spillover effects and inter-territorial externalities for firms (Alamá-Sabater, Artal, & Navarro-Azorín, 2011) would be valid points for future research to account for and reduce the model error and other limitations.

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Appendix A

Literary Review Tables and Figures

Appendix A contains tables and figures to complement mainly the first three chapters of this dissertation.

Table A 1. Merged occupations table. Source: Fritsch (2007), Boschma and Fritsch (2009)

Groups of Creative People	Occupations (ISCO-08 codes)
Creative Core	Physicists, chemists and related professionals (221)
	Mathematicians, statisticians and related professionals (212)
	Computing professionals (213)
	Architects, engineers and related professionals (214)
	Life science professionals (221)
	Health professionals (except nursing) (222)
	College and other higher education teaching professionals (231)
	Secondary education teaching professionals (232)
	Primary and preprimary education teaching professionals (232)
	Special-education teaching professionals (235)
	Social sciences and related professionals (244)
	Public service administrative professionals (247)
Creative Professionals	Legislators, senior officials and managers (1)
	Nursing and midwifery professionals (223)
	Business professionals (241)
	Legal professionals (242)
	Physical and engineering science associate professionals (31)
	Life science and health associate professionals (32)
	Finance and sales associate professionals (341)
	Business services agents and trade brokers (342)
	Administrative associate professionals (343)
	Police inspectors and detectives (345)
	Social work associate professionals (346)
Bohemians	Writers and creative or performing artists (245)
	Photographers, image and sound operators (3131)
	Artistic, entertainment and sports associate professionals (347)
	Fashion and other models (521)

Table A 2. Merged taxonomy of the Portuguese creative class and occupational and codes

Source: Cruz S., (2014) adapted from Boschma and Fritsch (2009)			Source: Cruz and Teixeira (2015)			
Creative Class Groups	**Occupational Categories Descriptions**	**Occupational ISCO-08 codes (summary categories) / Portuguese Standard Occupational codes CPP – 2010 (summary categories)**	**Industry Sectors**	**Portuguese CAE – Rev. 3 Industry codes (SIC)**	**Creative occupations categories**	**Portuguese CNP94 Occupational Nomenclature (SOC)**
Super Creative Core	. Computer and mathematical occupations; . Architecture and engineering occupations; . Life, physical and social science occupation; . Education, training and library occupations;	. Mathematicians, Statisticians and related professionals (212); . Life Science professionals (213); . Physicists, Chemists and related professionals (211); . Social Science and related professionals (263); . University and higher education teachers (231); . Vocational, technological and artistic education teachers (232); . Secondary and basic education teachers (233); . Primary school and early childhood teachers (234); . Primary school and early childhood teachers (234); . Other teaching professionals (235);	Teaching, training and research: Research on natural sciences, engineering, social sciences and humanities	7211; 7219; 7220	Physicists/Chemists, Mathematicians/Statisticians, Life science professionals, Secondary/Higher education teachers, Social/Human sciences professionals	211; 212; 221; 23; 244
			Architecture: Architectural activities	7111;	Building, town planning architects, cartographers	2141; 2148; 3118
		. Computing Professionals (25);	Software and Digital Media: Software publishing; Computer programming/ consultancy; Data processing/hosting/web portals	5821; 5829; 6201; 6202; 6203; 6209; 6311; 6312	Computer systems professionals, Computing programmers, Directors of computing/IT, Computing/IT technicians	2131; 3121; 1236; 3122
		. Archivists, museum curators and related information professionals (262);	Libraries/archives/museum activities	9101; 9102; 9103; 9104	Archivists, Museum curators, Librarians	2431; 2432
Creative Professionals	. Management occupations; . Business and financial operations occupations; . Legal occupations; . Healthcare practitioners and technical occupations; . High-end sales and sales management; . Administrative associate professionals;	. Legislators, senior officials and managers (1); . Finance professionals (241); . Administration professionals (242); . Financial and mathematical associate professionals (331); . Sales and purchasing agents and brokers (332); . Business services agents (333); . Legal professionals (261); . Health professionals (except nursing) (221, 223, 224, 225, 226); . Nursing and midwifery professionals (222); . Nursing and midwifery associate professionals (322); . Life science technicians and relates associate professionals (314); . Medical and pharmaceutical technitians and health associate professionals (321, 323, 324, 325); . Physical and engineering sciences technicians (311, 312, 313, 315); . Information and communications technology operations and user support technicians (351); . Regulatory government associate professionals (335); . Finance and sales associate professionals (2433, 2434);	No SIC/SOC codes are presented for this creative class group			

		. Administrative, legal, social and specialized secretaries and related professionals (334, 3411, 3412);				
Bohemians	. Arts, design, entertainment, sports and media occupations;	. Actors (2655); . Creative and performing artists (265); . Musicians, singers and composers (2652); . Dancers and choreographers (2653); . Artistic, Entertainment and Sports associate professionals (342; 343); . Fashion and other models (5241);	Music/Entertainment and the Performing Arts: Sound recording/ music publishing activities; Performing arts and support activities; Amusement/recreation activities	5920; 9001; 9002; 9003; 9004; 9321/9	Actors, Composers, Musicians, Singers, Dancers; Choreographers, Models, Sports Professionals, Restaurant/Cafeteria chefs	245510; 2453; 3473; 2454; 514950; 512105; 512205;
		. Advertising and marketing professionals (2431); . Public relations professionals (2432);	Advertising and Marketing: Market research, Public opinion pooling, Advertising	7311; 7312; 7320	Sales/marketing managers; Public relations managers and professionals; Advertising/marketing professionals; Survey and market researchers	1233; 1234; 2419; 341505; 341510; 419090
		. Product and garment designers (2163); . Graphic and multimedia designers (2166);	Design and Visual Arts activities	7111	Visual artists, Designers, Decorators	2452; 3471
		. Creative and performing artists not elsewhere classified (2659);	Crafts and Others	(No SIC codes match this category)	Technicians of precision instruments; Jewelers; Glass makers; Decorative Painters; Woodworkers; Tailors; Hatters and Dressmakers	3115; 7311; 7312; 7313; 7321; 7322; 7323; 7324; 7331; 7424; 7422; 7332; 7432; 7433; 7434;
		. Film, stage and related directors and producers (2654);	Film, Video and Photography: Motion Picture, video and television production, post-production and distribution activities	5911; 5912; 5913; 5914; 7420;	Film directors/Producers; Assistants of film production; Photographers/technicians for sound and image recording; Printing professionals; Photographic developing	2455; 3131; 343120; 514920; 514945; 7344
		. Authors, journalists and linguists (264);	Publishing of books, periodicals/others; Translation/interpretation activities; New agencies activities	5811; 5812; 5813; 5814; 5819; 6391; 6399	Writers, Journalists, Translators, Interpreters, new agencies related professionals	2451; 2444; 7341; 343115
		. Announcers on radio, television and other media (2656); . Telecommunications and broadcasting technicians (352);	TV and Radio activities	6010; 6020	Speakers/ announcers of radio/television/entertainment activities; TV Producers; Technicians of broadcasting (radio, television, telecommunications)	3472; 121040; 311410; 311490; 313205; 313290

Table A 3. Synthesized table of similarly applicable methodologies

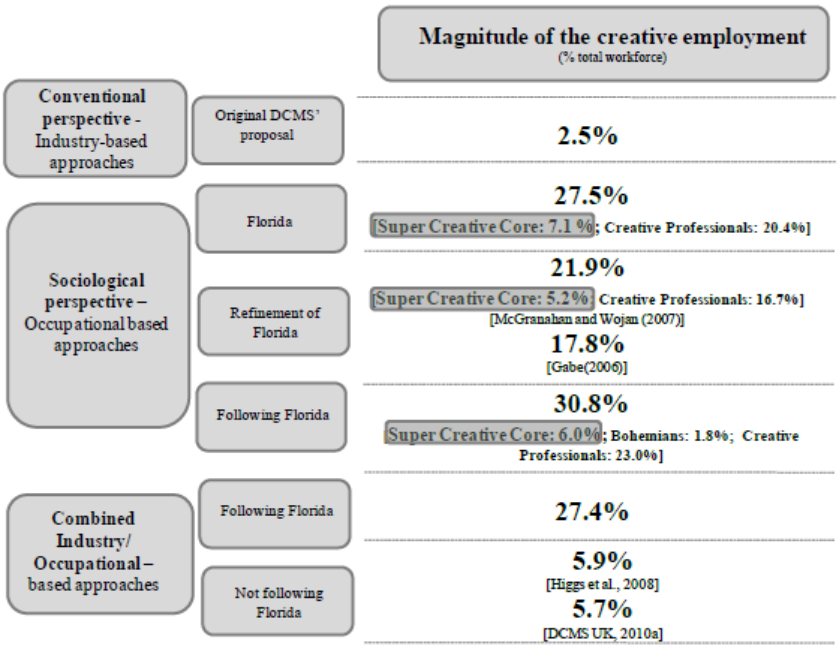
Objective and Author	Data Source	Geographic Unit	Methodological approach	Independent Variables	Dependent variables	Model
Empirical model of rural county growth (McGranahan & Wojan, 2007)	US census	Counties	Three-stage least squares (3SLS)	Employment change (log) ΔE Net migration (log) ΔP_M; Employment share in creative class (CC); Settlement variables, density, adjacency (S); landscape measures (L); climate measures (C); industry employment (I); labor market characteristics (LM); presence of universities (U); age, race and ethnicity measures (D); aggregate employment change in neighboring counties (ΔAE)	Change in creative class ΔCC	$\Delta CC = f\ (\Delta E, \Delta P_M, CC, S, L, C, I, LM, U, D, \Delta AE)$
Density of creative workers as a key factor influencing regional innovation (Knudsen et al., 2007)	US census	Primary Metropolitan Statistical Area[36] (PMSA)	Multivariate statistics: Principal components analysis (PCA); Ordinary least squares regression (OLS)	Different population density measures, creative capital, gay index, bohemian index, research and development state levels, Milken Tech-Pole index of tech clustering	Innovation (as metropolitan area utility patents per 100,000 people)	$Innovation = \beta_1 + \beta_2 density + \beta_3 creativity + \beta_4 creativity * density + \beta_5 R\&D + \frac{\beta_6 scientists}{engineers} + \beta_7 bohemians + \beta_8 gays + \varepsilon$
Occupational versus educational measures and distribution factors (Florida, Mellander, & Stolarick, 2008)	US census	331 Metropolitan cities	Structured equation model; Path analysis; Correlation analysis	Human capital; Creativity; Tolerance; Consumer services; Universities	Creative Class segments; Wages; Income	$lnTalent = \beta_{11} lnTolerance + \beta_{12} lnUniversity + \beta_{13} lnConsumerAmenities + \varepsilon$
Uneven distribution of the creative class across Europe (Boschma & Fritsch, 2009)	European study[37] - National data sources	503 European regions – NUTS III regions	Gini coefficients; Simple regression analysis	Bohemian Index, Openness index; Public provision index; cultural opportunity index; region's economic condition; Population density	Employment share of creative core and creative professional occupations; share of bohemians in a region	The full-fledged regional growth model was not presented due to missing data on several key factors in different countries

[36] "Geographical area comprised of a central county and its economically related outlying territories" (Knudsen et al., 2007, p.11).
[37] The data used for the study was collected by seven European teams during 2004-2006 from national data sources. (Cooke, Gertler, & Asheim, 2007)

Employment growth prediction using educational vs occupational measures (Marlet & Woerkens, 2007)	Dutch statistical institute CBS	City Level – COROP[38] regions	Multivariate regression models	Share of the creative class; population growth; diversity; concentration; unemployment rates; sectoral diversity; agglomeration forces; education	Employment growth	A full econometric model is not presented in the study
Study the migration of the creative class in Sweden (Hansen & Niedomysl, 2009)	Statistics Sweden longitudinal database;	70 Labor markets (Statistics Sweden definition)	Correlation analysis; Descriptive statistics	Education levels; Migration rate; Age	Share of people moving across a labor market	A full econometric model is not performed in the study
Effects of new firm formation on employment growth (Baptista & Preto, 2011)	Portuguese Statistics Data: *Quadros de Pessoal*	30 Portuguese regions – NUTS3 regions	Multivariate regression models	Firm birth rates; Regional agglomeration; Population density	2-year relative employment change as proxy of regional development	$\Delta EMP_{t,r} = \left[\alpha_0^I . BIR_{t,r}^I + \alpha_1^I . BIR_{t-1,r}^I + \alpha_n^I . BIR_{t-n,r}^I\right] + \left[\alpha_0^{II} . BIR_{t,r}^{II} + \alpha_1^{II} . BIR_{t-1,r}^{II} + \alpha_n^{II} . BIR_{t-n,r}^{II}\right] + X_{t,r} . \beta + \varepsilon_t$
Location determinants of newly created firms in the creative sector (Cruz, 2014b)	Portuguese Statistics Data: *Quadros de Pessoal*	308 municipalities – LAU1 regions	Discrete Choice Model	Population density; Creative Firms; Education levels; Culture; Foreigners presence; Social Inequality; R&D Firms; and additional spatial lags for variable	Profit of each new creative establishment *i* obtains from locating in municipality *j*	$\pi_{ij} = \beta_1 PopulationDensity + \beta_2 LQCreativeFirms + \beta_3 LQServiceFirms + \beta_4 LQKnowledge\ Firms + \beta_5 IndustrialDiversity + \beta_6 CreativeDiversity + \beta_7 HigherEducation + \beta_8 SecondaryEducation + \beta_9 Culture + \beta_{10} Foreigners + \beta_{11} SocialInequality + \beta_{12} R\&D\ Firms$

[38] Regional boundary used for analytical purposes by Statistics entities, similar to NUTS regions used in Portugal and other European countries

Figure A 1. Magnitude of the creative employment in Portugal according to the main measurement approaches.



Source: Cruz S. (2014)

Figure A 2. Location patterns of the Portuguese creative clusters.

Source: Cruz and Teixeira (2015)

Appendix B

Tables and Figures built based on STATA retrieved data.

Appendix B contains tables and figures to complement the descriptive analysis and results chapters – the empirical section – of this dissertation.

Table B 1. Creative and non-creative firms sizes by number of employees

Number of employees (scale)	Non-creative Firm	Creative Firm
1 to 9	196,095 (84.5)	37,810 (89.2)
10 to 49	30,265 (13.1)	3,703 (8.8)
50 to 249	4,955 (2.1)	709 (1.7)
250 to 499	412 (0.2)	87 (0.2)
500 to 999	144 (0.1)	49 (0.1)
Over 1000	118 (0.1)	41 (0.1)
Total	231,989 (100.0)	42,399 (100.0)

Table B 2. Creative and non-creative firms by firm seniority

Firm seniority (scale)	Non-creative firm	Creative firm
Less than 1 year	9,849 (4.3)	1,555 (3.7)
1 to 4 years	44,893 (19.4)	9,323 (21.9)
5 to 9 years	41,499 (17.9)	8,683 (20.5)
19 to 19 years	71,027 (30.6)	13,957 (32.9)
20 to 49 years	59,438 (25.6)	8,236 (19.4)
Over 50 years	5,230 (2.3)	629 (1.5)
Not filled	53 (0.02)	16 (0.04)
Total	231,989 (100.0)	42,399 (100.0)

Manufacturing and transformative industries associated with non-creative firms require great investments in machinery and infrastructure, it is expected to verify higher share capital values in firms belonging to these sectors instead of firms belonging to creative industries, as Table B 3 shows.

Table B 3. Creative and non-creative firms by share capital

Share capital in thousands (scale)	Non-creative firms	Creative firms
<5	4,951 (2.9)	1,329 (3.6)
[5,24]	109,688 (63.4)	27,002 (74.1)
[25,49]	12,339 (7.1)	1,770 (4.9)
[50,249]	32,886 (19.0)	4,171 (11.5)
[250,499]	5,098 (2.9)	517 (1.4)
[500; 2,499]	6,023 (3.5)	788 (2.2)
[2,500; 4,999]	977 (0.6)	203 (0.6)
[5,000; 24,999]	825 (0.5)	399 (1.1)
[25,000; 49,999]	119 (0.1)	106 (0.3)
>50,000	111 (0.1)	138 (0.4)
Total	173,017 (100.0)	36,323 (100.0)

Table B 4. Creative and non-creative firms by turnover

Turnover (scale)	Non-creative firms	Creative firms
Less than 10 million euros	211,466 (98.6)	38,382 (98.7)
10 to 49 million euros	2,513 (1.2)	362 (0.9)
Over 50 million euros	565 (0.2)	139 (0.4)
Total	214,544 (100.0)	38,883 (100.0)

Table B 5. Creative and non-creative workers by firm turnover

Turnover (scale)	Non-creative workers	Creative workers
Less than 10 million euros	1,561,444 (65.2)	50,248 (58.2)
10 to 49 million euros	358,624 (14.9)	16,402 (19.0)
Over 50 million euros	476,491 (19.8)	19,649 (22.7)
Total	2,396,559 (100.0)	86,299 (100.0)

Table B 4 and Table B 5 exclude 20,961 firms which were not considered since their entries in the 2012 *QP* dataset did not contain Turnover values.

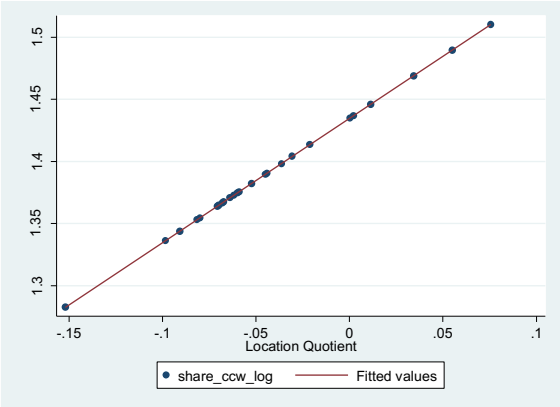


Figure B 1. Scatter Plot of Share of Creative Class workers (DV) by Location Quotient (IV)

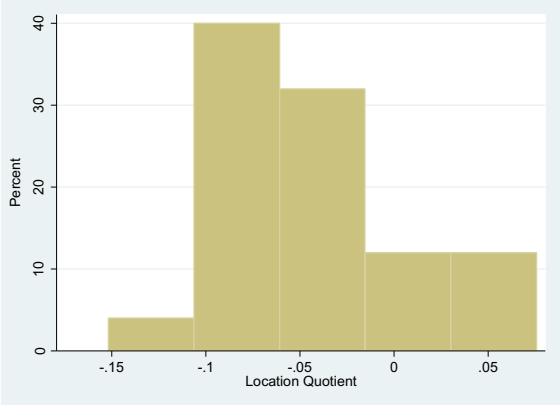


Figure B 2. Histogram of Share of Creative Class workers (DV) by Location Quotient (IV)

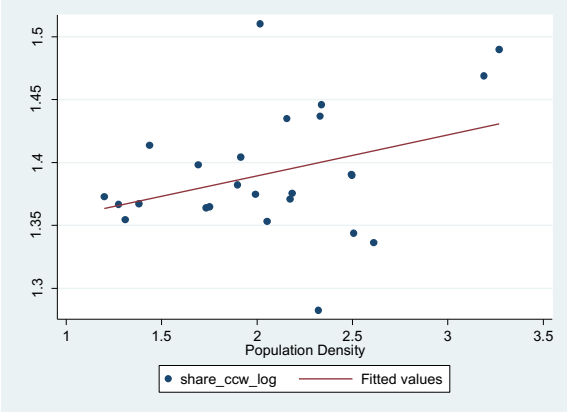


Figure B 3. Scatter Plot of Share of Creative Class workers (DV) by Population Density (IV)

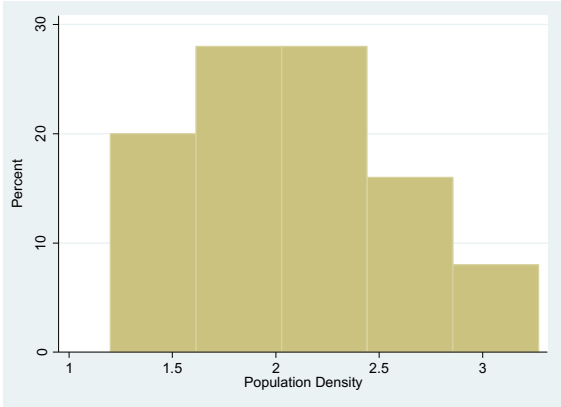


Figure B 4. Histogram of Share of Creative Class workers (DV) by Population Density (IV)

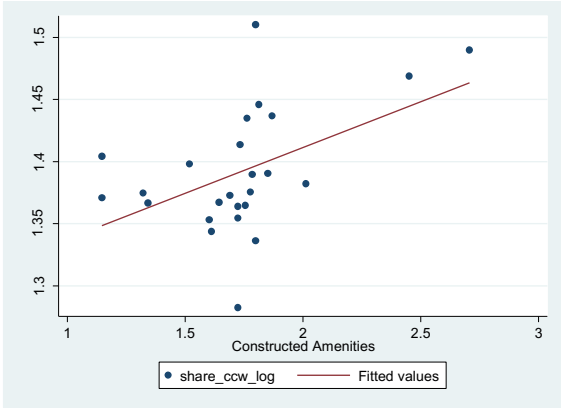


Figure B 5. Scatter Plot of Share of Creative Class workers (DV) by Constructed Amenities (IV)

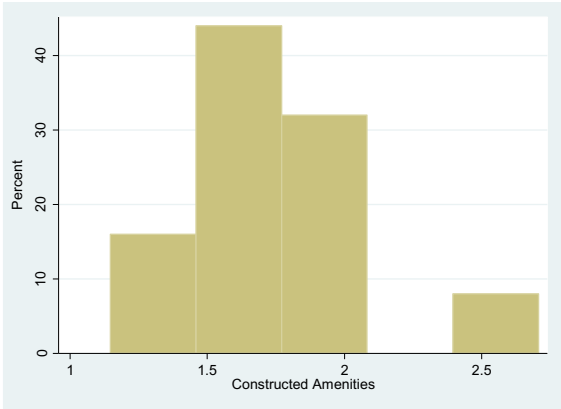


Figure B 6. Histogram of Share of Creative Class workers (DV) by Constructed Amenities (IV)

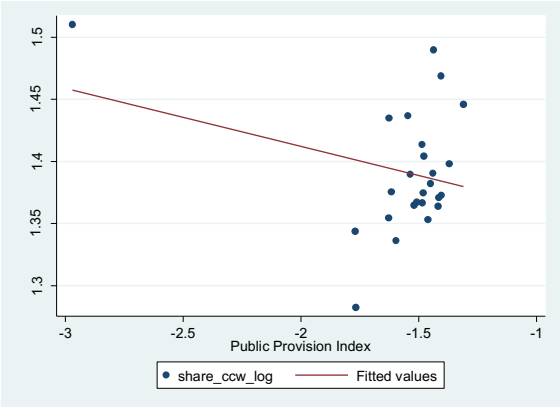


Figure B 7 Scatter Plot of Share of Creative Class workers (DV) by Public Provision Index (IV)

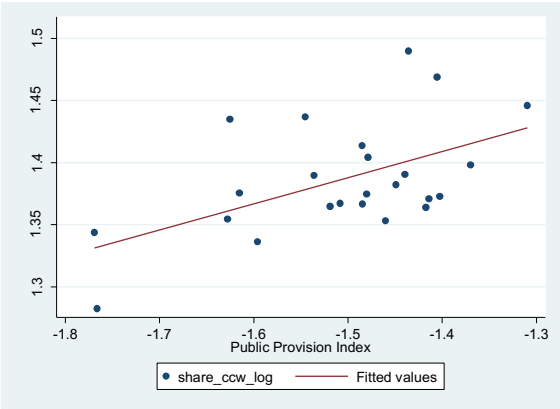


Figure B 8. Scatter Plot of Share of Creative Class workers (DV) by Public Provision Index (IV) removing outliers

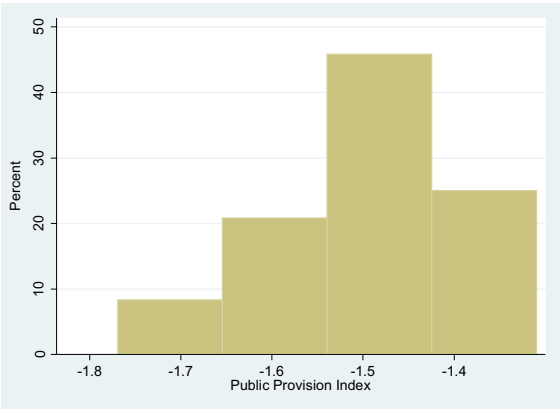


Figure B 9. Histogram of Share of Creative Class workers (DV) by Public Provision Index (IV) removing outliers

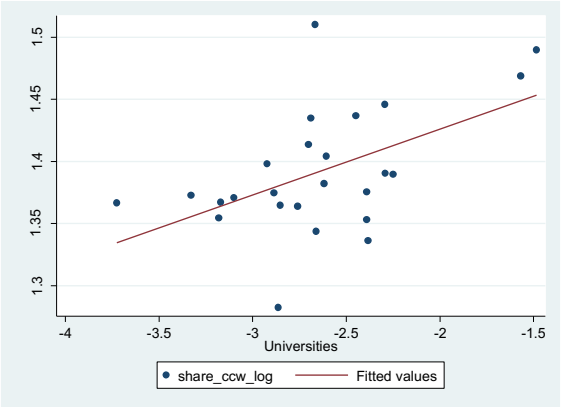


Figure B 10. Scatter Plot of Share of Creative Class workers (DV) by Universities per square km (IV)

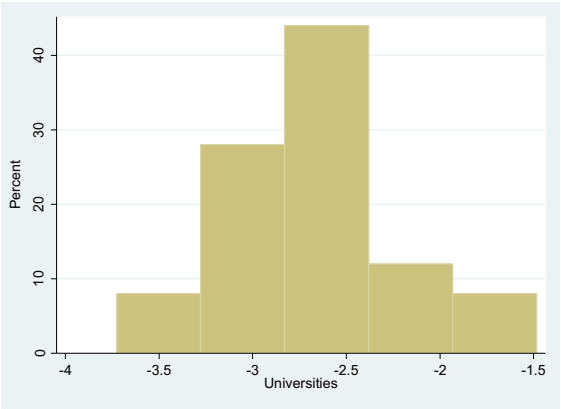


Figure B 11. Histogram of Share of Creative Class workers (DV) by Universities per square km (IV)

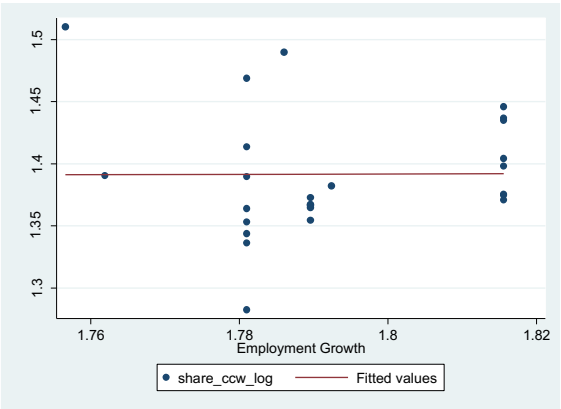


Figure B 12. Scatter Plot of Share of Creative Class workers (DV) by Employment Growth (IV)

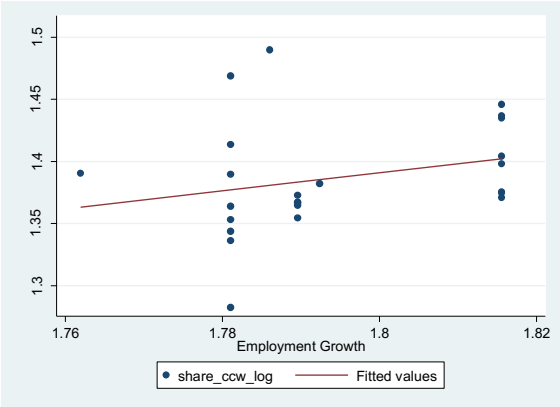


Figure B 13. Scatter Plot of Share of Creative Class workers (DV) by Employment Growth (IV) removing outliers

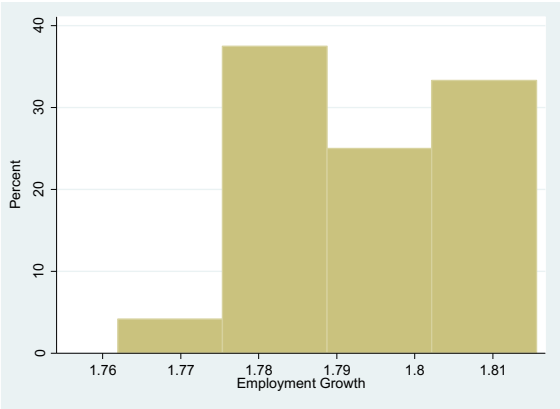


Figure B 14. Histogram of Share of Creative Class workers (DV) by Employment Growth (IV) removing outliers

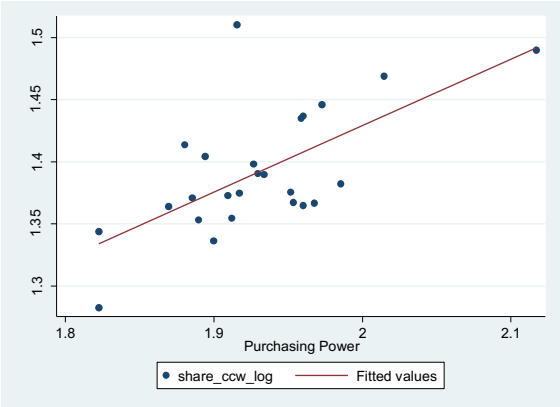


Figure B 15. Scatter Plot of Share of Creative Class workers (DV) by Purchasing Power (IV)

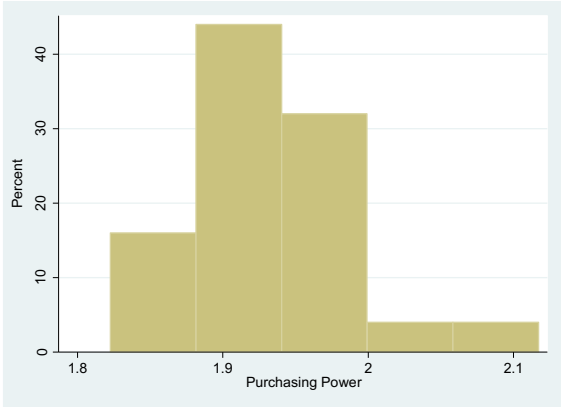


Figure B 16. Histogram of Share of Creative Class workers (DV) by Purchasing Power (IV)

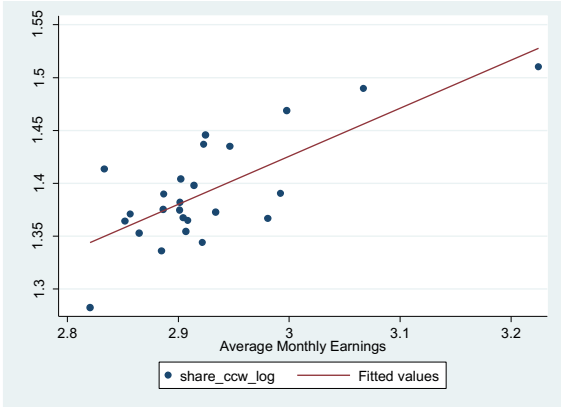


Figure B 17. Scatter Plot of Share of Creative Class workers (DV) by Average Monthly Earnings (IV)

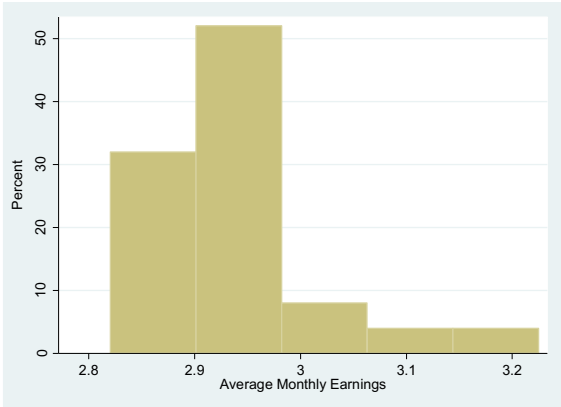


Figure B 18. Histogram of Share of Creative Class workers (DV) by Average Monthly Earnings (IV)

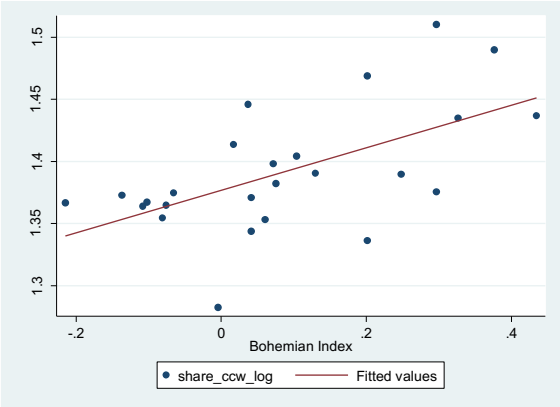


Figure B 19. Scatter Plot of Share of Creative Class workers (DV) by Bohemian Index (IV)

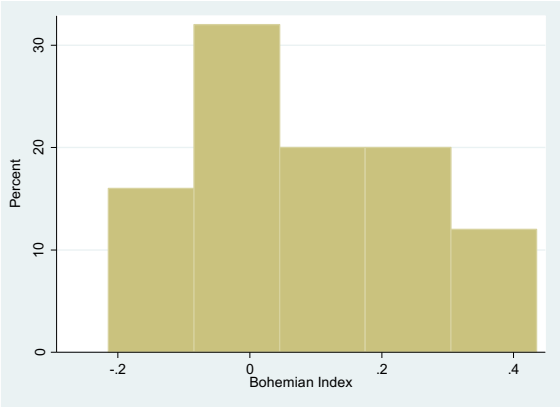


Figure B 20. Histogram of Share of Creative Class workers (DV) by Bohemian Index (IV)

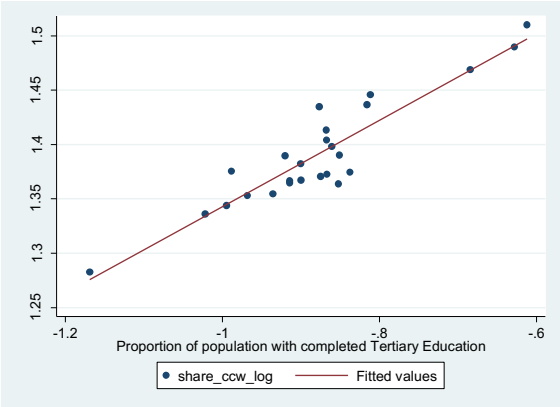


Figure B 21. Scatter Plot of Share of Creative Class workers (DV) by Proportion of population with completed Tertiary Education (IV)

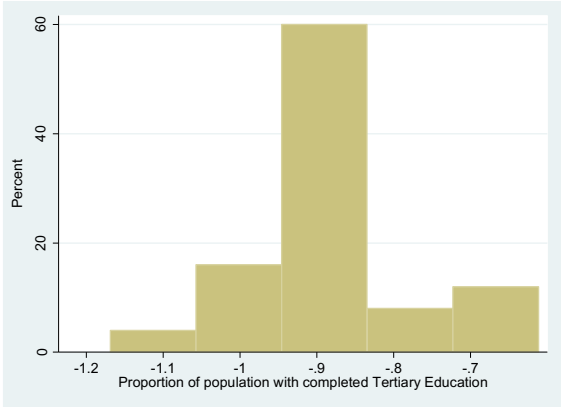


Figure B 22. Histogram of Share of Creative Class workers (DV) by Proportion of population with completed Tertiary Education (IV)

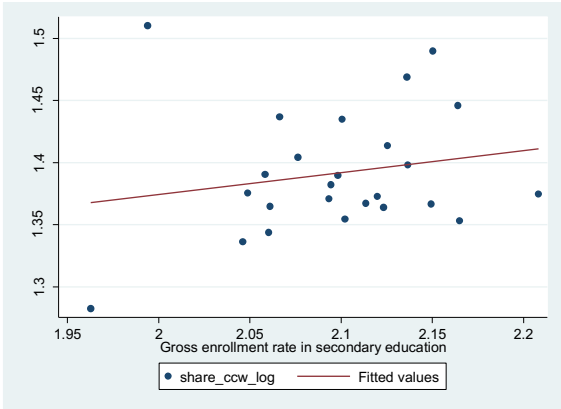


Figure B 23. Scatter Plot of Share of Creative Class workers (DV) by Gross enrollment in secondary education (IV)

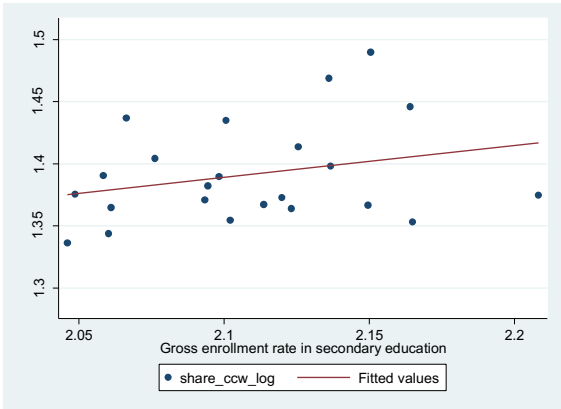


Figure B 24. Scatter Plot of Share of Creative Class workers (DV) by Gross enrollment in secondary education (IV) removing outliers

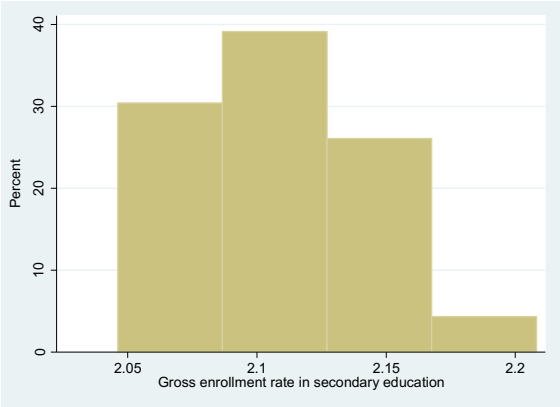


Figure B 25. Histogram of Share of Creative Class workers (DV) by Gross enrollment in secondary education (IV) removing outliers

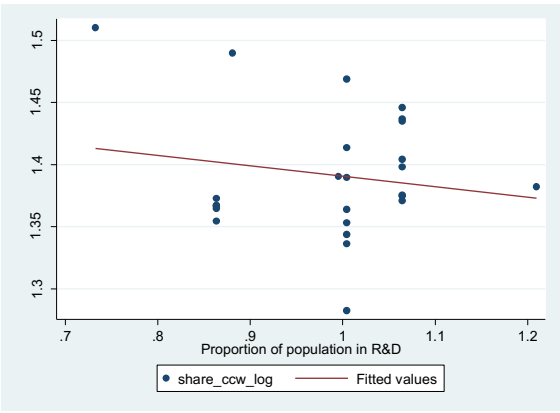


Figure B 26. Scatter Plot of Share of Creative Class workers (DV) by Proportion of population in R&D (IV)

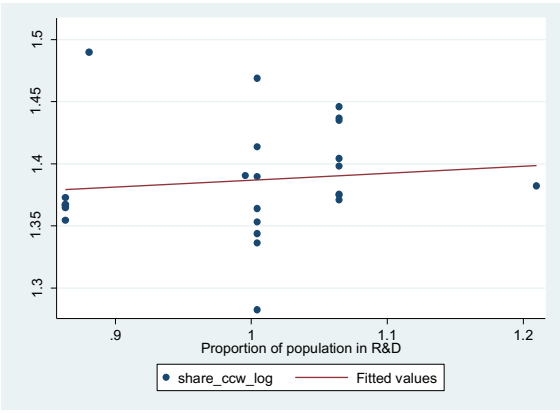


Figure B 27. Scatter Plot of Share of Creative Class workers (DV) by Proportion of population in R&D (IV) removing outliers

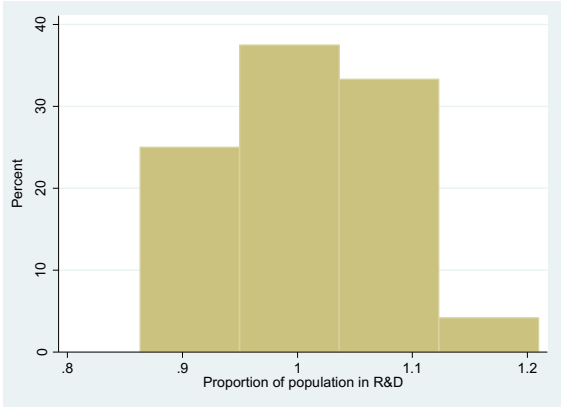


Figure B 28. Histogram of Share of Creative Class workers (DV) by Proportion of population in R&D (IV) removing outliers

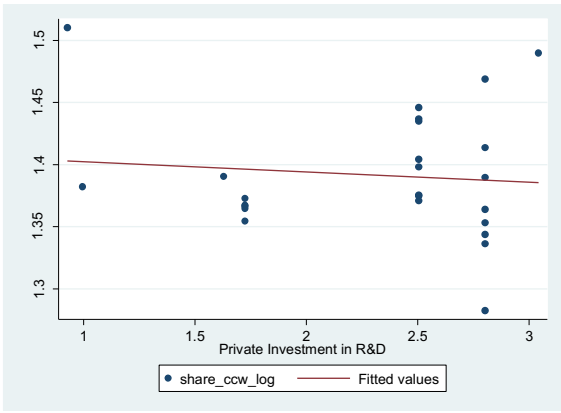


Figure B 29. Scatter Plot of Share of Creative Class workers (DV) by Private Investment in R&D (IV)

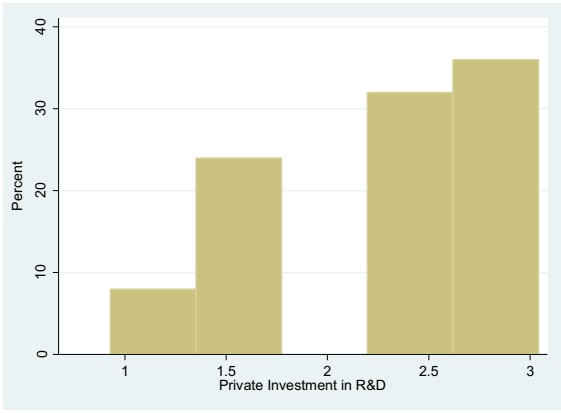


Figure B 30. Histogram of Share of Creative Class workers (DV) by Private Investment in R&D (IV)

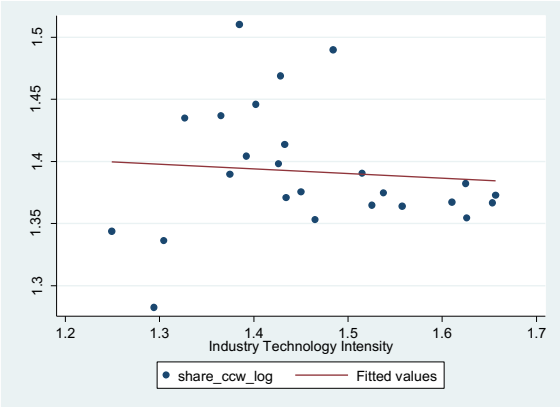


Figure B 31. Scatter Plot of Share of Creative Class workers (DV) by Industry Technology Intensity (IV)

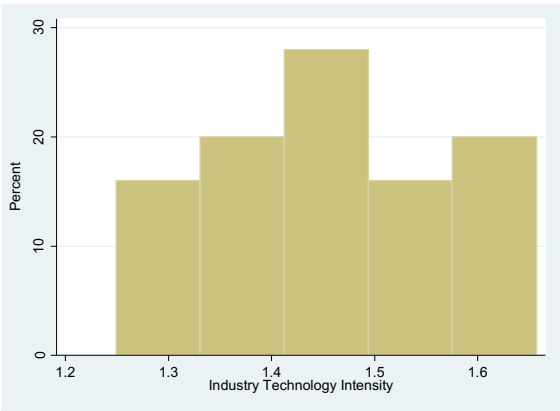


Figure B 32. Histogram of Share of Creative Class workers (DV) by Industry Technology Intensity (IV)

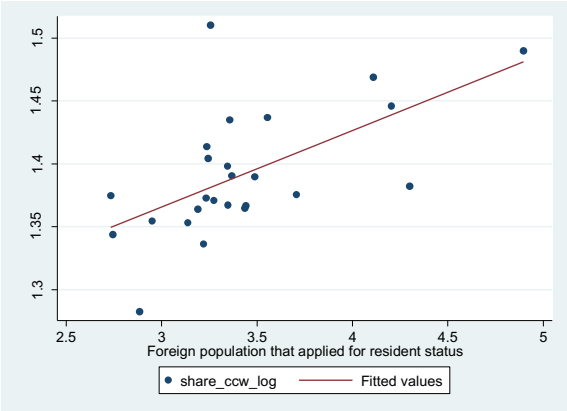


Figure B 33. Scatter Plot of Share of Creative Class workers (DV) by Foreign population that applied for resident status (IV)

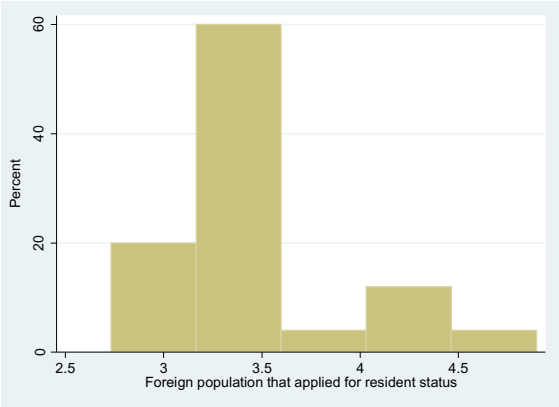


Figure B 34. Histogram of Share of Creative Class workers (DV) by Foreign population that applied for resident status (IV)

Table B 6. Independent variables database

Indicator	NUTS III	Share of Super Creative Core Workers	Share of Creative Professionals Workers	Share of Bohemians Workers	Share of Non-Creative Class Workers	Share of Creative Class Workers	Population density	Constructed Amenities Index	Public Provision Index	Universities (per km2)	Employment Growth	Purchasing Power	Avg. Monthly earnings	Bohemian Index	Foreign Population that applied for a resident status	Population with completed tertiary education (proportion)	Gross enrolment rate in upper secondary education	R&D Human Capital	Private R&D Investment	Industry Technology Intensity
STATA variable	region	share_scc_log	share_cp_log	share_bohem_log	share_ncworkers_log	share_ccw_log	pop_dens_log	constr_amen_log	ppi_log	univ_log	emp_growth_log	purch_pow_log	avg_month_earn_log	bohem_index_log	Foreign_log	proportion_terciary_log	gross_enroll_rate_log	proportion_rd_log	private_investment_log	iti_proportion_log
Minho Lima	111	0,398	1,276	0,061	1,889	1,353	2,052	1,602	-1,460	-2,392	1,781	1,890	2,865	0,061	3,137671	-0,968	2,165	1,004	2,803	1,465
Cávado	112	0,455	1,299	0,248	1,878	1,390	2,499	1,785	-1,536	-2,250	1,781	1,934	2,887	0,248	3,488127	-0,920	2,098	1,004	2,803	1,375
Ave	119	0,270	1,261	0,201	1,894	1,336	2,612	1,799	-1,596	-2,384	1,781	1,900	2,885	0,201	3,220631	-1,022	2,046	1,004	2,803	1,305
Região Metropolitana do Porto	11A	0,600	1,378	0,201	1,849	1,469	3,190	2,452	-1,405	-1,569	1,781	2,015	2,998	0,201	4,110421	-0,684	2,136	1,004	2,803	1,428
Alto Tâmega	11B	0,265	1,213	-0,004	1,908	1,283	2,323	1,724	-1,766	-2,864	1,781	1,822	2,820	-0,004	2,884795	-1,169	1,963	1,004	2,803	1,294
Tâmega e Sousa	11C	0,387	1,268	0,041	1,892	1,344	2,507	1,613	-1,769	-2,661	1,781	1,822	2,922	0,041	2,745075	-0,995	2,060	1,004	2,803	1,249
Douro	11D	0,486	1,285	-0,108	1,886	1,364	1,732	1,724	-1,417	-2,761	1,781	1,870	2,852	-0,108	3,188928	-0,852	2,123	1,004	2,803	1,558
Terras de Trás-os-Montes	11E	0,459	1,342	0,017	1,870	1,413	1,437	1,732	-1,485	-2,702	1,781	1,880	2,833	0,017	3,236285	-0,868	2,125	1,004	2,803	1,433
Oeste	16B	0,382	1,287	0,297	1,882	1,375	2,183	1,778	-1,615	-2,392	1,816	1,952	2,886	0,297	3,706974	-0,989	2,049	1,064	2,504	1,450
Região de Aveiro	16D	0,553	1,323	0,435	1,861	1,437	2,331	1,869	-1,545	-2,450	1,816	1,960	2,923	0,435	3,554368	-0,816	2,066	1,064	2,504	1,365
Região de Coimbra	16E	0,611	1,357	0,037	1,858	1,446	2,338	1,813	-1,310	-2,295	1,816	1,973	2,925	0,037	4,204852	-0,812	2,164	1,064	2,504	1,402
Região de Leiria	16F	0,455	1,347	0,326	1,862	1,435	2,157	1,763	-1,626	-2,691	1,816	1,959	2,947	0,326	3,357554	-0,877	2,101	1,064	2,504	1,327
Viseu Dão Lafões	16G	0,543	1,314	0,104	1,873	1,404	1,914	1,146	-1,479	-2,607	1,816	1,894	2,902	0,104	3,244277	-0,867	2,076	1,064	2,504	1,392
Beira Baixa	16H	0,412	1,306	-0,066	1,883	1,375	1,991	1,322	-1,480	-2,886	1,816	1,917	2,901	-0,066	2,733197	-0,838	2,208	1,064	2,504	1,538
Medio Tejo	16I	0,423	1,326	0,072	1,875	1,398	1,692	1,519	-1,370	-2,922	1,816	1,927	2,914	0,072	3,345374	-0,860	2,137	1,064	2,504	1,426
Beiras e Serra da Estrela	16J	0,401	1,298	0,041	1,884	1,371	2,174	1,146	-1,414	-3,101	1,816	1,886	2,857	0,041	3,274158	-0,875	2,093	1,064	2,504	1,434
Grande Lisboa	170	0,664	1,378	0,377	1,840	1,490	3,270	2,707	-1,436	-1,485	1,786	2,117	3,067	0,377	4,897396	-0,628	2,150	0,881	3,041	1,484
Alentejo Litoral	181	0,435	1,300	-0,215	1,885	1,367	1,275	1,342	-1,484	-3,725	1,790	1,968	2,981	-0,215	3,441852	-0,914	2,150	0,863	1,725	1,654
Baixo Alentejo	184	0,551	1,286	-0,137	1,883	1,373	1,199	1,690	-1,403	-3,330	1,790	1,909	2,934	-0,137	3,23325	-0,867	2,120	0,863	1,725	1,657
Leziria do Tejo	185	0,334	1,304	-0,076	1,886	1,365	1,751	1,756	-1,519	-2,853	1,790	1,960	2,909	-0,076	3,43664	-0,914	2,061	0,863	1,725	1,525
Alto Alentejo	182	0,303	1,296	-0,081	1,889	1,354	1,308	1,724	-1,628	-3,182	1,790	1,912	2,907	-0,081	2,950851	-0,936	2,102	0,863	1,725	1,626
Alentejo Central	183	0,378	1,304	-0,102	1,885	1,367	1,381	1,643	-1,508	-3,170	1,790	1,954	2,904	-0,102	3,347525	-0,900	2,114	0,863	1,725	1,610
Algarve	150	0,281	1,322	0,076	1,880	1,382	1,898	2,013	-1,449	-2,619	1,792	1,986	2,901	0,076	4,299529	-0,900	2,094	1,210	0,995	1,625
Açores	200	0,418	1,444	0,297	1,830	1,510	2,018	1,799	-2,971	-2,667	1,757	1,916	3,225	0,297	3,256718	-0,612	1,994	0,732	0,928	1,385
Madeira	300	0,396	1,317	0,130	1,878	1,390	2,494	1,851	-1,440	-2,293	1,762	1,930	2,992	0,130	3,367542	-0,851	2,058	0,996	1,630	1,515

Table B 7. Descriptive Statistics for the variables in the regressions

Variable	Obs.	Mean	Std.Dev.	Min	Max
Share of super creative core	25	.434	.106	.264	.663
Share of creative professionals	25	1.313	.045	1.213	1.443
Share of employed bohemians	25	.086	.172	-.214	.434
Share of creative class workers	25	1.391	.050	1.282	1.510
Population density	25	2.056	.569	1.170	3.292
Constructed Amenities Index	25	1.732	.335	1.146	2.706
University proximity	25	-2.649	.491	-3.724	-1.484
Public Provision Index	25	-1.564	.313	-2.970	-1.309
Population with tertiary Education (proportion)	25	-.877	.117	-1.169	-.611
Enrollment in upper secondary education	25	2.098	.054	1.962	2.208
Employment growth rate	25	1.792	.017	1.756	1.815
Purchasing power (proportion)	25	1.939	.060	1.822	2.117
Average monthly earnings	25	2.925	.082	2.820	3.224
Bohemian Index	25	.086	.172	-.214	.434
Foreign Population	25	3.426	.496	2.733	4.897
Private R&D Investment	25	2.306	.598	.927	3.041
R&D Human Capital	25	.987	.102	.732	1.209
Industry Technology Intensity	25	1.460	.116	1.249	1.656

Table B 8. Correlation Matrix for the dependent variables in the regressions

	Share of super creative core	Share of creative professionals	Share of employed bohemians	Share of creative class workers
Share of super creative core	1.0000			
Share of creative professionals	0.5336*	1.0000		
Share of employed bohemians	0.2914	0.4402*	1.0000	
Share of creative class workers	0.7008*	0.9600*	0.5860*	1.0000

*statistically significant at the 5 percent level

Table B 9.Correlation Matrix for the independent variables in the regressions

	Population density	Constructed Amenities Index	University proximity	Public Provision Index	Population with tertiary Education (proportion)	Enrollment in upper secondary education	Employment growth rate	Purchasing power (proportion)	Average monthly earnings	Bohemian Index	Foreign Population	Private R&D Investment	R&D Human Capital	Industry Technology Intensity
Population density	1.0000													
Constructed Amenities Index	0.6299*	1.0000												
University proximity	-0.0091	-0.0132	1.0000											
Public Provision Index	0.8605*	0.7406*	0.0527	1.0000										
Population with tertiary Education (proportion)	-0.1313	-0.3638	0.4449*	-0.1472	1.0000									
Enrollment in upper secondary education	0.3626	0.6618*	0.2025	0.4759*	0.1271	1.0000								
Employment growth rate	0.2605	0.3925	-0.6418*	0.2478	-0.3742	0.4683*	1.0000							
Purchasing power (proportion)	0.7242*	0.4979*	-0.2795	0.7162*	0.0742	0.3912	0.3806	1.0000						
Average monthly earnings	0.5249*	0.7179*	0.2357	0.6054*	0.0784	0.8745*	0.3336	0.4272*	1.0000					
Bohemian Index	0.2298	0.4337*	-0.2238	0.4044*	-0.0854	0.6242*	0.7529*	0.3576	0.5277*	1.0000				
Foreign Population	-0.2114	-0.0079	0.5910*	0.0222	0.3322	0.3758	-0.1163	-0.2821	0.2314	0.3232	1.0000			
Private R&D Investment	0.2257	-0.1224	0.5055*	0.2311	0.5482*	-0.0914	-0.5619*	0.1995	0.1198	-0.2856	0.1507	1.0000		
R&D Human Capital	0.4504*	0.0951	0.4016*	0.4425*	0.2539	-0.1070	-0.4429*	0.2444	-0.0088	-0.1767	0.2162	0.3571	1.0000	
Industry Technology Intensity	-0.6078*	-0.0321	0.2888	-0.4262*	-0.0568	0.3027	0.0248	-0.5818*	0.1425	0.1560	0.4506*	-0.2737	-0.5592*	1.0000