
# Creative industries and the productivity of the European regions

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**Área Temática:** *Sesión especial Industrias Creativas*

**Resumen:** *This research analyses the effect of creative service industries (CSI) on labour productivity in the regions of the European Union. CSI offer services that increase the capacity of generation and combination of ideas for the whole economy of the region, resulting in increased production of innovations through the generation of new products or varieties, which in turn raises productivity. The article proposes an analytical framework that is contrasted for a sample of 250 regions in 24 countries of the European Union in 2008. We find that a doubling of the percentage of jobs in CSI increases average labour productivity by around 8.6%. This evidence suggests that policy based on creative industries can be as important for productivity as scientific or human capital policies, being an alternative for some regions.*

**Palabras Clave:** *creative industries; creative service industries; regional productivity*
**Clasificación JEL:** R11, R12, R58

## 1. INTRODUCCIÓN

In a simple economic identity, the output of a region depends on the number of persons employed (workforce) and the output per employee (productivity). The differences of productivity across the regions of the European Union (EU) are remarkable: whereas Inner London's productivity is more than 300% above the average, most regions in Romania and Bulgaria are more than 70% below the average. The debate about the causes of the differences in productivity across regions has remarked the role of capital and the elements of the total factor productivity such as the agglomeration economies, human capital, institutions, social capital, infrastructures, scientific production, and the composition of the structure of activities (GARDINER *et al.* 2004; MAROTO and CUADRADO-ROURA 2011). Last decades economic debate has witnessed the emergence of a new set of concerns that have turned the attention of scholars and policy-makers towards business and industries that so far have been neglected. With the relocation of a part of the mass production in low cost countries, and with technological advancement having transformed many industries and invented others, the focus has now shifted to those economic activities and business that are producing value in developed countries, particularly through the use of intangibles.

In this debate, *creative industries* have received increasing attention of scholars and policy-makers (Department for Culture, Media and Sport DCMS 1998 and 2001; HAWKINS 2007; EUROPEAN COMMISSION 2010; UNCTAD 2010). Creative industries can be defined as a set of knowledge-based activities focused on the generation of meaning, content and aesthetic attributes by means of creativity, skill and talent, and with the potential to create wealth from trade and intellectual property rights (DCMS 2001; UNCTAD 2010). Industries such as publishing, fashion, audiovisual, radio and TV, software, architecture and engineering, research and development, advertising, design, photography, and arts and entertainment, are generally considered to be “creative”. In practice, a few creative industries tend to be assimilated with codes of activity belonging to the manufacturing sector, i.e. *clothing and footwear* manufacturing when it is not possible to isolate *fashion design* services, producing confusion and mixing heterogeneous behaviours. To avoid these problems, Boix et al. (2013) suggest to focus on services exclusively. *Creative service industries* (CSI) add up to more than 6% of the persons employed in the regions of the EU in 2008.

This paper investigates the effect of CSI on labour productivity in the regions of the European Union. The questions are whether CSI explain differences in labour productivity across European regions and what part do they explain. Our hypothesis is that higher shares of workforce in CSI results in higher levels of productivity. This is due to the fact that CSI offer services that increase the capacity of generation and combination of ideas for the whole economy of the region, resulting in increased production of innovations through the generation of new products or varieties, which in turn raises productivity. Our objective is to contrast the effects of differences in workforce in CSI on the productivity of regions.

Despite the recent emphasis on the role of creative industries to the development of countries, regions and cities, contributions focused on explaining and measuring the impact of creative industries on labour productivity are scarce. This article contributes to the debate with an analytical framework that is contrasted for a sample of 250 regions in the European Union. The research findings are relevant to both the scientific debate as to policy: evidence that CSI have a significant impact on productivity differentials in European regions would imply than a way to raise productivity is through increased specialization in creative industries.

The article is divided into seven parts. After Section 1's introduction, Section 2 reviews the literature relating creative industries and productivity. Section 3 then develops the analytical model. Section 4 introduces the data. Section 5 explains the variables. Section 6 presents the contribution to CSI to the productivity of regions. Finally, Section 7 is devoted to a discussion of the results and their implications.

## 2. CREATIVE INDUSTRIES AND PRODUCTIVITY

The term "creative industries" seems to originate in Australia (DCA, 1994), and then its use expanded thanks to the actions of Tony Blair's British Labour government which needed to find new bases for growth for the UK's post-industrial economy (O'CONNOR, 2007; DCMS, 1998). One of the raisons because the DCMS (2001) focused on creative industries was because they showed high growth rates in Great Britain during the 1990s. In addition, the discourse had an attraction of changing the perception of certain activities such as arts and culture from being subsidized sectors (BAUMOL AND BOWEN, 1965) to being generators of wealth (DCMS, 1998; UNCTAD, 2010) and as contributors to the so called *new economy*. The contemporary success of Richard FLORIDA's (2002) book *The Rise of the Creative Class* helped with the dissemination of the idea. However, whereas Florida's creative class perspective is human capital-based, the creative industries approach is industry-based.

The research agenda on creative industries has hitherto focused on four basic aspects: epistemological and taxonomical issues (DCMS, 2001; O'CONNOR, 2007; HESMONDHALGH, 2008¸ FLEW AND CUNNINGHAM, 2010); geographies (COOKE AND LAZZERETTI, 2008; LAZZERETTI *et al*., 2008; CAPONE, 2008; DE PROPRIS *et al*., 2009; LAZZERETTI, 2012); policy-making (MOMMAAS, 2004;

GARNHAM, 2005; RAUNIG, 2007; HESMONDHALGH, 2008); and economic and social impacts (UNCTAD, 2010; FLEW AND CUNNINGHAM, 2010; POTTS AND CUNNINGHAM, 2008; RAUSELL *et al*., 2011; DE MIGUEL *et al*., 2012; BOIX *et al*., 2013; MARCOS *et al.* 2014).

The relationship between creative industries and productivity is inserted into the last line, although it has still received little attention. This relationship is intrinsically linked to the debate on the impact of creative industries on economic growth and wealth. A good point of departure to contextualize the problem is POTTS AND CUNNINGHAM (2008) and POTTS (2009), who propose four models relating creative industries and economic performance: welfare model, competitive model, growth model, and innovation model.

In the *welfare model*, creative industries are affected by the *Baumol's disease* (BAUMOL AND BOWEN, 1965) and their rate of productivity grow less than in the rest of the economy, even if they are subsidized because they are welfare enhancing. In the *competitive model*, creative industries are just another industry and don't have more effect than the rest of activities on the technological change, innovation or productivity[1]. In the *growth model*, creative industries are a growth driver and their impact on the economy is more than proportional. From a supply-side, creative industries have been growing more than the rest of industries because they were in their phase of expansion[2]. In the *innovation model*, the main effects of creative industries are their contribution to technological change, more than their direct effects on production. Creative industries

[1] See MAROTO (2012) for a discussion of Baumol's paradox in the service literature.

[2] In this model, the growth of creative industries is explained in terms of increased investment and qualitative improvement in input factors through increases in human capital and embodied technology, the growth of the demand, and institutional change affecting organizational forms, business models and market strategies. From a demand-side, the raison could be that a growth in income causes a proportionate increase in demand for creative industries services.

are part of a process of economic evolution and their role is to provide *evolutionary services* to the innovation system, facilitating the change of the entire economic system (POTTS 2009).

Innovation model has a point of support in the theory of the differentiated knowledge bases (ASHEIM *et al*. 2011 and ASHEIM and PARRILLI 2012). Analytical and synthetic knowledge bases are well-known in economics: *analytical knowledge base* refers to the development of new knowledge through the use of the deductive scientific method and scientific laws (i.e. the pharmaceutical industry), and *synthetic knowledge base* generates knowledge in an inductive process of testing, experimentation, and practical work (i.e. as found in mechanical engineering). Which is interesting is the introduction of a third category, the s*ymbolic knowledge base,* usual in cultural and creative industries and related to the "creation of meaning and desire as well as aesthetic attributes of products, producing designs, images and symbols, and to the economic use of such forms of cultural artefacts" (ASHEIM *et al*. 2011, p.897). In the symbolic base, knowledge inputs and outputs are aesthetic more than cognitive and new knowledge is usually developed through a *creative process* more than through analytical or problem solving processes. Creative industries provide services to the rest of the productive system in two ways: as an input demanded for other industries, and through a horizontal spillover effect since they affect the perceptions of people, business and institutions in places.

Most of the contributions of other authors justifying the impact of creative industries on productivity and growth have also focused on POTTS and CUNNINGHAM (2008) third and fourth scenarios. Thus, RAUSELL *et al*. (2011) and MARCOS *et al*. (2014) propose a theoretical model with circular causal effects: an increase in the GDP per capita increases the share of people with high levels of education and income, the percentage of public and private expenditure oriented to creative goods and services, and the stock of cultural capital. The result is an increase in the demand of creative goods and services that makes grow the share of workers in creative industries. This has two effects: first, an increase in the number of innovations due to the innovations produced by creative industries (supply side) and the higher propensity to consume innovations of workers in creative industries (demand side); second, and increase in the levels of productivity of the economy, under the assumption that productivity in creative industries is higher than in the average of the economy. Increases in innovation and productivity results in an increase in the GDP per capita, and the process starts over.

SACCO AND SEGRE (2006) propose a virtuous circle based on the acquisition of *competences*, where the notion of competence refers to the effect of the stimulus of cultural, symbolic and identitarian capital. The basic assumption is that the level of competence and capability of consumers is large enough to guarantee that they will be willing to pay for the creative component of a given quality commodity, where a part of these consumers is made of creative workers. Firms invest in creative assets to take advantage of the skills of creative workers in order to increase the creative component in the production of goods and services and attend the qualified demand. The result is an increase in the stock of creative capital, which enlarges the quality and dimension of local cultural supply. Changes in the supply and social awareness improve the competences of non-core creative workers and foster the demand of creative commodities. At this point, a part of the value added generated by the process is devoted to financing creative activities by firms and the investment of public sector in creative industries, creating a virtuous cycle.

From the literature review, we can conclude that if creative industries increase the productivity of regions is because of two reasons:

a) Creative industries have higher productivity than the rest of industries, which in practice means that their relative investment in capital and/or their rate of technical change is higher than in the rest of the economy. The empirical evidence on this respect is still poor and unclear, although some works provide positive evidence. Thus, DOLFMAN *et al*. (2007) find that in the United States the average wage in creative industries was 34.9% higher than the comparable national private sector wage, even if the evolution in both cases was similar since 1990. POTTS *et al*. (2008) provide evidence that the average income of creative industries in Australia is 31% higher than the national average and their aggregate growth rate is higher than that of the aggregate economy.

b) Creative industries impact on the total factor productivity of the whole regional economic system by providing innovation services. In this scenario, we could find that the rest of activities do not remunerate part of these services, so that creative industries provide external economies to the rest of the system. Evidence on this respect is also limited, i.e. FLORIDA *et al*. (2008) find that occupational groups related to arts and entertainment, architecture and engineering, and research, have important impacts on the differentials of income, productivity and wages in 331 metropolitan regions of US. If we accept POTTS (2009) argument, the contribution of creative industries in this scenario is quite more important as they affect the performance of the entire regional economy. In order to reinforce evidence on this scenario, in the next section we will propose an analytical framework to analyse the contribution of creative industries to the productivity of the regions.

## 3. CREATIVE INDUSTRIES AND PRODUCTIVITY IN AN ENDOGENOUS GROWTH APPROACH

In this section we propose a supply-based view of the contribution of creative industries to the productivity of the regions, based on the endogenous growth theory. It has been chosen because it allows to analyse the relationship between creative industries and productivity of the regions through the generation of innovations. The use of this approach is mainly instrumental in this article, being aware of its limitations.

Endogenous growth theory explains the occurrence of long-run growth as something which emanates from economic activities internal to an economic system creating new knowledge. It proposes channels through which the rate of technological progress, and hence the long-run rate of economic growth, can be influenced by economic factors. A second wave of endogenous growth theory, generally known as *innovation-based growth theory*, recognizes that intellectual capital, the source of technological progress, is distinct from physical and human capital. The key point is that whereas physical and human capital are accumulated through saving and schooling, intellectual capital grows through creativity, and this drives innovation.

Innovation-based growth is generally thought to develop in accordance with either of two main conceptual frameworks, namely *Schumpeterian theory* (GROSSMAN and HELPMAN 1991; AGHION and HOWITT 1992), which accommodates very well the notions of analytic and synthetic knowledge; or *endogenous technological change models* proposed by ROMER (1990a,b), which accord perfectly with the idea of symbolic knowledge. Romer-type models assume that aggregate productivity is an increasing function of the degree of product variety: innovation causes productivity growth by creating new, but not necessarily improved, varieties of products. Intuitively, an increase in product variety raises productivity by allowing society to spread its intermediate production more thinly across a larger number of activities, each of which is subject to diminishing returns and hence exhibits a higher average product when operated at a lower intensity. The implication is that the way to increase productivity levels is not by saving, but by dedicating a large fraction of output to creative activities.

Our framework is based on the Romer-Jones model, reproducing the solution of JONES (1995, 2001). The model departs from a multiplicative production function $Y = K^{\propto}(AL_Y)^{1-\propto}$ (1), where $Y$ is the output, $A$ is labour-augmenting technology (knowledge stock), K is capital, and $\alpha$ is output elasticity of capital. The key of the model is that working people ($L$), the source of creativity, can be dedicated to producing ideas ($L_A$) in the creative sector or, alternatively, producing goods and services in other sectors ($L_Y$): $L = L_A + L_y$ (2). We can express that the share of persons employed in the creative sector as a fraction of the total employment $s_R = L_A/L$ (3) so that $L_A = s_R L$, (4), and the share of persons employed in the rest of the economy can be written as $s_Y = 1 - s_R$ (5).

The general production function for ideas is $\dot{A} = A_t - A_0 = \bar{\delta} L_A^{\lambda}$ (6), where $\bar{\delta} = \delta A^{\phi}$ (7). $\delta$ is the rate of creation of ideas, 0<λ≤1 measures the existence of scale economies, and $\phi$ measures the productivity (returns) in the production of the ideas[3]. Combining (6) and (7), generation of ideas is $\dot{A} = \delta L_A^{\lambda} A^{\phi}$ (8) and the growth rate of generation of ideas $\frac{\dot{A}}{A}$ can be expressed as $g_A = \delta L_A^{\lambda} \frac{A^{\phi}}{A}$ (9). Substituting $L_A$ by $s_R L$ and solving for $A$, the knowledge function equals to $A = \left[\frac{\delta (s_R L)^{\lambda}}{g_A}\right]^{\frac{1}{1-\phi}}$ (10). The term for

[3] $\phi < 0$ involves that every time is more difficult to create new ideas, $\phi = 0$ means that the productivity in creation of new ideas is independent from previous knowledge, and $\phi > 0$ means that creation increases more than proportionally due to the existence of previous ideas.

capital is similar than in the Solow model, so that in terms of the production function (1), the general solution of JONES (1995, 2001) to the simplest version of the model for a path of balanced growth and a moment of time *t* can be written as[4]:

$$y = \left(\frac{s_K}{n+g_A+d}\right)^a s_Y \left[\frac{\delta(s_R L)^\lambda}{g_A}\right]^b \quad (11)$$

, where $y$ is the labour productivity for a year $t$, $s_K$ is the intensity of capital per worker, $n$ is the population growth rate, $d$ the rate of depreciation of capital, $a = \frac{\propto}{1-\propto}$ and $b = \frac{1}{1-\phi}$. The equation can be linearized taking logarithms:

$$\ln y = b\, ln\delta + b\lambda\, lns_R + lns_y + a \ln s_k - a \ln(n + g_A + d) + b\lambda\, lnL - b\, lng_A \quad (12)$$

## 4. DATA

The sample comprises data for 250 NUTS 2 regions in 24 countries of the European Union in 2008: Austria, Belgium, Bulgaria, Check Republic, Cyprus, Denmark, France, Estonia, Finland, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Nederland, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden, and the United Kingdom. The countries for which data was not available, such as for Greece, Luxembourg and Malta, were not included. Data were drawn from Eurostat's Structural Business Statistics (SBS), Science and Technology Statistics (STS) and Regional

[4] See the complete development of the model in JONES (1995 and 2001). Jones provides solutions for particular values, i.e. $\lambda=1$ and $\phi=0$, which assures the stability of the model. For all the values, the final equation to be estimated is similar. The only difference is the interpretation of the parameters.

Economic Accounts (ESA) databases for the year 2008. The new NACE Rev.2 is particularly designed to deal with the requirements of the knowledge economy, with the consequence that creative industries are properly captured at the two digits level. Data for multimodal accessibility come from ESPON Accessibility update and data of consumption of fixed capital by country comes from the OECD National Accounts at a Glance 2009.

## 5. VARIABLES

### *5.1. Dependent variable*

The dependent variable is the apparent labour productivity, measured as the regional GDP per person employed in 2009. Average labour productivity is about 52,000 euros for the regions of the sample. The region with lowest productivity is Yuzhen Tsentralen in Bulgaria (14,931 euros per person employed), 71% below the average. The highest productivity is found in Inner London (165,957 euros per person employed), 314% above the average.

### *5.2. Explanatory variables*

Explanatory variables are directly derived from the model and includes the percentage of persons employed in creative service industries, the percentage of persons employed in the rest of the economy, capital intensity, the total number of persons employed, a composite variable $n+g+d$, and the growth rate of ideas:

a) $s_R$ refers to the share of persons employed in creative service industries. Creative industries have been measured using the taxonomy proposed by UNCTAD (2010). This taxonomy has the advantage of being firmly founded, encompassing both cultural and technological dimensions of creative industries, and particularly appropriate to cross-country comparisons. It includes both manufacturing and service industries, although the majority of creative industries are in fact services, especially knowledge-intensive services (such as audiovisual, broadcasting, computer programming, R&D, publishing, architecture and engineering, advertising, design, and arts and entertainment services) (Table 1). In their research on the differentials of wealth in the European regions, BOIX *et al.* (2013) suggest there should be an exclusive focus on creative services because in many countries it is not clear whether creative manufacturing is creation or making, and services are the only creative industries that seem to have a positive impact on wealth differentials. Focus on services is also more consistent with POTTS (2009) proposal introduced in the Section two, in which creative industries provide evolutionary services to the rest of the activities.

b) $s_Y$ refers to the share of persons employed in the rest of manufacturing and services industries. In order to make for greater coherency with the theoretical section, activities are aggregated by type of knowledge base, in this case, analytical and synthetic, since symbolic knowledge is represented by CSI. Analytic knowledge includes high-tech manufacturing and service sectors (except those already classified as creative services) (Table 1). Synthetic knowledge groups the rest of manufacturing and service activities classified as non-creative[5]. There is a residual group including

[5] This elaboration is imperfect, although it provides a first proxy for exploring the idea of separating the three types of knowledge bases. The fact that analytic and synthetic knowledge bases do not create ideas could seem counterintuitive. A more realistic view is that the creative sector is more intensive in the

agriculture, mining and construction, which is difficult to assign to a concrete knowledge base. In order to avoid perfect collinearity, in the estimates only symbolic, analytic and synthetic activities are included, excluding the residual group of non-classified activities.

*Table 1- Classification of activities by knowledge base in NACE Rev.2*

| Knowledge base | NACE Rev.2 codes |
|---|---|
| Symbolic (creative services) | 4779 Retail sale of second-hand goods in stores<br>58 Publishing<br>59 Audiovisual<br>60 Programming and broadcasting<br>62 Computer programming<br>71 Architecture and engineering<br>72 R&D<br>73 Advertising<br>74 Design, photography<br>90 to 93 Arts, entertainment and recreation (section R) |
| Analytic | 21, 23 High tech manufacturing<br>61, 63 High tech knowledge intensive services (excluding creative services) |
| Synthetic | 20, 27, 28, 29, 30 Medium-high tech manufacturing<br>19, 22, 23, 24, 25, 33 Medium-low tech manufacturing<br>10, 11, 12, 13, 14, 15, 16, 17, 18, 31, 32 Low tech manufacturing<br>50, 51, 64, 65, 66, 69, 70, 75, 78, 80, 84, 85, 86, 87, 88 Rest of knowledge intensive services (excluding creative services)<br>45, 46, 47 (excluding 4779), 49, 52, 53, 55, 56, 68, 77, 79, 81, 82, 94, 95, 96, 97, 98, 99 Less-knowledge-intensive services |
| Non classified | Rest of NACE codes |

Source: Elaborated from UNCTAD (2010) and Eurostat (2009).

c) The capital investment rate $s_K$ is measured using gross fixed capital formation per worker;

d) The composite term $n+g_A+d$ includes the growth rate of population ($n$), the growth rate of ideas ($g_A$), and the depreciation rate ($d$). The first part, $n$, has been measured using the annual growth rate of the working age population (15 to 64 years) between 1992 and 2008 (the largest series without significant problems of missing data). The depreciation rate ($d$) has been measured using OECD data of consumption of fixed capital by country (data about depreciation rates are not available for regions). As

production of ideas and the rest produces basically goods and services. In any case, this does not affect the structure of the model.

a simplification, $g_A$ is assumed to be equivalent to $n$. Although the assumption than $g$=$n$ is valid only for an economy close to the steady state, it is more flexible that considering, as many articles do, that $g$+$d$ is fixed to 0.05 for every region as in the Mankiw-Romer-Weil estimates[6].

e) $L$ is the number of persons employed in the region.

*5.3. Modelling the growth rate of ideas ($g_A$)*

In order to measure the growth rate of ideas ($g_A$), we follow GLAESER *et al.* (1992), HENDERSON *et al.* (1995) and subsequent relevant literature derived from regional and urban economics, which assumes that the growth rate of ideas $g_A$ is a function of knowledge spillovers generated by dynamic externalities. Dynamic external economies are related to the generation and exchange of knowledge spillovers and have the ability to produce irreversible changes in the production function. Dynamic external economies focus on three theories based on agglomeration: MAR (specialization), Jacobs (diversity) and Porter (competition), and a fourth category called *network economies* is introduced to take into account recent advances in system's dynamics between places:

a) Marshall, Arrow and Romer (MAR) focus on knowledge spillovers between firms in the same industry. MAR specialization economies are measured using the percentage of firms employed in specialized sectors (clusters) in the region. To elaborate the variable, we first calculated the location quotient of the persons employed in the region in each sector at two digits (64 branches), using as base the total for the

[6] In any case, the result using $g$+$d$ = 0.05 does not produce very different results in the estimates, since in both cases the coefficient is very small and statistically non-significant.

250 regions. Then, we sum the firms in sectors for which the location quotient is higher than one, and divide by the total number of persons employed in the region[7].

b) Jacobs dynamic economies emphasises variety and diversity of geographically proximate industries as the key determinant of innovation through cross-fertilization processes. The most popular index for Jacobs economies is the Simpson-Hirschman-Herfindahl, which measures the degree of entropy across sectors in the region (e.g. HENDERSON *et al.* 1995; BOIX *et al.* 2013). Simpson's index can be expressed as: $D_i = 1 - \sum_{j=1}^{J} \left(\frac{F_{i,j}}{F_i}\right)^2$, where $F$ is the number of firms' local units, $i$ refers to the region, and $j$ to the sector. Multiplying $D$ by N/(N-1) so that $DH_i = D_i \frac{N}{N-1}$ (Hulbert, 1971), the index represents the probability of inter-sector encounter within the region, more than just the probability two randomly selected firms belong to different sectors.

A limitation of the Simpson-Hulbert index is that it does not allows differentiating whether inter-sector encounters that produce external economies takes place through the specialized sectors of the region or through the non-specialized ones. Our assumption is that only specialization (clustering) activates the mechanisms to produce and absorb significant knowledge externalities to/from the rest of sectors, favouring the production of new varieties using mixed sources of knowledge. From this point of view, more variety in the specializations of the region is the only kind of diversity relevant to boost productivity. On the contrary, high inequality among

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7 The indicator is inspired in DE MIGUEL *et al.* (2012), who use as a proxy of MAR economies the number of clusters in the region (sectors with a location quotient above 1). In the estimates we also made some controls calculating the indicator using employment data, and also replacing our relative indicator by the absolute indicator from DE MIGUEL et al., although neither of the two was statistically significant. Glaeser *et al*. and Henderson *et al*. use the location quotient of each industry because their dependent variable is panelled by industry, which is not our case.

specializations as well as serendipity effects coming from more dispersion in the non-specialized part of the economy of a region will influence negatively productivity differentials across regions[8,9].

A way to separate specialized and non-specialized inter-sector encounter is calculating the Simpson-Hulbert index separately for specialized and unspecialized sectors within the region. A simple way to do this computing location quotients for each region-sector and dividing data in two sub-matrices: in the first one, values (number of firms' local units) for non-specialized sectors (those with a location quotient equal or smaller than 1) will be replaced by 0; in the second matrix, values for specialized sectors (location quotient above 1) will be replaced by 0. Then, the Simpson-Hulbert index is calculated for each matrix, producing and index for specialized inter-sector encounter (S-diversity) and another for unspecialized inter-sector encounter (U-diversity).

In table 3 we can see how specialized inter-sector encounter has a positive correlation with labour productivity (Pearson correlation 0.60), whereas higher diversity within the unspecialized part of the economy (non-specialized inter-sector encounter) is negatively correlated with labour productivity (Pearson correlation -0.32). As a consequence, the correlation between specialized diversity and productivity (0.60) is

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[8] Close ideas are found in FRENKEN et al. (2007) with the notions of related and unrelated varieties, and FARHAUER and KRÖLL (2012) with the notion of diversified specialization. Those authors argue that a certain combination of specialized sectors explains differences in regional growth because: a certain diversification of related sectors will have positive effects on productivity due to complementarities, to portfolio effects that protect against negative shocks of demand, and to the fact that an increase in the variety of sectors absorbs unemployment from other mature sectors. The index we propose and their interpretation is, however, different from the quoted authors. FRENKEN et al. related variety index cannot be elaborated here due to constraints imposed by Eurostat information.

[9] This assumption is also coherent with the Romer-Jones model, where the existence of variety of products operating close to the efficient area of the cost curve requires a variety of sectors sufficiently specialized more than crude entropy, but none of them excessively polarizing the economy of the region.

slightly higher than computing the diversity index using all the sectors of the economy (0.56)[10].

c) Porter focus on the same idea that MAR, although remarking that local competition in specialized industries is necessary to foster rapid adoption of innovation. Glaeser measured Porter competition economies the location quotient of the number of firms per worker in city industry. We use the simple version of the competition indicator: the number of firms per person employed in the region.

d) Recently, TRULLÉN *et al*. (2013) introduced the notion of dynamic network economies, occurring between places articulated in networks of cities, with the idea that they facilitate spillovers or network information and knowledge flows among actors located in different cities or regions. To measure TRULLÉN *et al*. (2013) dynamic network external economies, we use the ESPON (2009) multimodal accessibility index, which is weighting the potential of each region to exchange information through transportation infrastructures (GALLEGO and MAROTO, 2013). In addition, the estimation of a spatial version of the growth model will provide additional information on network external economies.

[10] The correlation between the original index and the diversified specialization is 0.84, and the implications for econometric estimates of considering the original or the transformed indexes are moderate. However, the specialized inter-sector encounter index is slightly less collinear than the original DH index and provides a slightly better fit.

Table 2. Descriptive statistics. Variables in logarithms. 250 observations.

| | Mean | Standard deviation |
|---|---|---|
| Productivity | 10.7883 | 0.3281 |
| Percentage of persons employed in creative services | 1.7565 | 0.6807 |
| Percentage of persons employed in analytic knowledge | -0.0695 | 1.3244 |
| Percentage of persons employed in synthetic knowledge | 7.0815 | 0.1825 |
| Capital investment rate | 9.2505 | 0.5315 |
| Number of persons employed | 13.4096 | 0.7627 |
| $n+g_A+d$ | -2.5565 | 0.6138 |
| Percentage of persons employed in clustered sectors | -0.3964 | 0.2149 |
| S-diversity (specialized inter-sector encounter) | -0.1605 | 0.0698 |
| U-diversity (non-specialized inter-sector encounter) | -0.1445 | 0.0474 |
| Competition (Firms per worker) | -1.9454 | 0.6153 |
| Accessibility | 4.5350 | 0.4916 |
| R&D expenditures on GDP | 0.0642 | 0.8631 |
| Percentage of people with tertiary education | 2.9177 | 0.3833 |
| Creative class on active population | 3.2779 | 0.2535 |

Table 3. Correlation matrix. Variables in logarithms

| | Productivity | % PE CSI | % PE analytical | % PE synthetic | Capital | Persons employed | $n+g_A+d$ | Clusters | S-diversity | NS-diversity | Competition | Accessibility | R&D expenditures | Tertiary education | Creative class |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Productivity | 1 | | | | | | | | | | | | | | |
| % PE in CSI | 0.6095 | 1 | | | | | | | | | | | | | |
| % PE in analytical | 0.1186 | 0.1780 | 1 | | | | | | | | | | | | |
| % PE in synthetic | 0.3077 | 0.2854 | 0.0611 | 1 | | | | | | | | | | | |
| Capital | 0.6329 | 0.4350 | -0.0223 | 0.2793 | 1 | | | | | | | | | | |
| Persons employed (PE) | 0.0020 | 0.1167 | 0.3949 | 0.0959 | -0.1541 | 1 | | | | | | | | | |
| $n+g_A+d$ | 0.0500 | 0.0958 | -0.0375 | -0.0248 | 0.0129 | 0.1318 | 1 | | | | | | | | |
| Clusters | -0.0368 | -0.1646 | -0.2752 | 0.1314 | 0.0702 | 0.2220 | -0.0574 | 1 | | | | | | | |
| S-diversity | 0.5878 | 0.5720 | 0.1019 | 0.3190 | 0.1742 | 0.0561 | 0.0823 | -0.0179 | 1 | | | | | | |
| NS-diversity | -0.3167 | -0.3446 | -0.0857 | -0.0865 | -0.1768 | 0.1404 | -0.0017 | 0.3699 | -0.4307 | 1 | | | | | |
| Competition | -0.0061 | -0.0433 | 0.2315 | -0.0599 | 0.1335 | -0.2164 | -0.0282 | -0.3702 | -0.2984 | 0.0090 | 1 | | | | |
| Accessibility | 0.5597 | 0.4366 | 0.0530 | 0.3182 | 0.2725 | 0.1891 | 0.0304 | 0.1616 | 0.5314 | -0.2474 | -0.4352 | 1 | | | |
| R&D expenditures | 0.6110 | 0.5432 | 0.3262 | 0.3033 | 0.3831 | 0.2589 | 0.0155 | -0.0023 | 0.5783 | -0.2581 | -0.2159 | 0.5627 | 1 | | |
| Tertiary education | 0.4925 | 0.5305 | 0.1532 | 0.1535 | 0.3588 | 0.1085 | -0.0315 | 0.0462 | 0.3926 | -0.2815 | -0.1964 | 0.3554 | 0.5292 | 1 | |
| Creative class | 0.5945 | 0.4946 | 0.2224 | 0.2841 | 0.4249 | 0.1136 | -0.0139 | 0.0501 | 0.5104 | -0.1702 | -0.2222 | 0.5930 | 0.5983 | 0.4768 | 1 |

## 6. CONTRIBUTION OF CREATIVE SERVICE INDUSTRIES TO THE PRODUCTIVITY OF EUROPEAN REGIONS

### *6.1. Direct contribution*

In 2008 and in 2009, creative industries generated 7.8% of the production and 7.9% of the employment in the 250 regions of 24 countries under analysis (Table 4). Labour productivity in creative industries was 1.2% lower than the European average, and this was due to the behaviour of creative manufacturing: 41.1% below the European average. This result agrees with the argument exposed by BOIX *et al.* (2013) that creative manufacturing is basically "making" but not "creation", and their suggestion of focusing exclusively on services. About 88% of the production and 79% of the persons employed in creative industries corresponded to the creative service industries (Table 4). Labour productivity in CSI is 9.1% more than the European average, which in practice means that doubling the relative contribution of CSI on the total employment will raise the average productivity of European regions in about 0.6%, which is a modest contribution.

Labour productivity of European regions is highly correlated (Pearson correlation) with the percentage of persons employed in CSI (0.61), capital intensity (0.63), related diversity (0.59) and accessibility (0.56). Correlation is particularly low with the percentage of persons employed in analytical knowledge (0.12), the total number of persons employed (0.002), $n+g_A+d$ (0.05), the percentage of firms clustered in the region (-0.04), and the proxy for competition (-0.006) (Table 3).

*Table 4. Production, employment and productivity in creative industries in the 250 regions of the sample.*

| | Percentage production (GDP) | Percentage persons employed | Productivity (Total =100) |
|---|---|---|---|
| Total - All NACE activities | 100.0 | 100.0 | 100.0 |
| Total creative industries | 7.8 | 7.9 | 98.8 |
| Creative manufacturing* | 1.0 | 1.6 | 58.9 |
| Creative services | 6.8 | 6.2 | 109.1 |

* Manufacture of textiles, wearing apparel, leather and related products (NACE Rev.2 13-15), and Printing and reproduction of recorded media (NACE Rev.18).

Source: Elaborated from Eurostat

### *6.2. Econometric analysis and total contribution*

The econometric estimation of the theoretical model (equation 12) will measure total contribution (direct and indirect) of CSI to the productivity of the European regions. In regressions, data on labour productivity belongs to 2009 and the rest of variables to 2008, which is indeed similar to measure the output variable at the end of the year and the production factors at the beginning of the year. This solves the problem of simultaneity in the endogenous model and avoids the use of IV/GMM with the subsequent problems derived from instruments and identification. Since some problems of non-normality and heteroskedasticity are present, the model is estimated using Robust OLS[11].

In table 5 we present results for the estimation. Column 1 presents the results for the full model. Collinear variables were removed in step by step regressions, and the results of the parsimonious estimates are presented in column 2. As predicted by the

[11] As a measure of control, the model was estimated using labour productivity for 2008 and considering CSI exogenous and endogenous. Additional instruments for CSI were the regionalized expenditures in culture and the number of UNESCO heritage places (the instrument proved to be exogenous in Hansen test, and not weak in Anderson test). The results considering CSI as exogenous were very similar to those using productivity for 2009, whereas in endogenous estimates using GMM the coefficient raised to 0.10.

theoretical model, higher shares of persons employed in creative service industries impacts positively on the productivity of the region: a doubling of the percentage of persons employed in CSI increases average labour productivity by 6.5%% (Table 5, column 2).

Assuming that the direct contribution of CSI calculated in Table 4 (0.6%) can be compared with the total estimated contribution (6.5%), the indirect contribution of CSI providing evolutionary services to the rest of the economy explains 5.9% of the differences of productivity across the European regions (about 91% of the total contribution of CSI).

The estimated contribution of CSI is far to be as strong as the simple correlation of 61% (Table 4), as well as from the estimated coefficients of about 40% in DE MIGUEL et *al.* (2012) and BOIX et *al.* (2013) (those authors used as dependent variable the GDP per capita, slightly different of the GDP per worker although both can be compared). The explanation of the smaller coefficient in our estimates is that the percentage of persons employed in CSI is highly correlated not only with labour productivity but also with capital intensity (43%), S-diversity (57%), and accessibility (43%), variables that also are highly correlated with productivity[12]. Capital and accessibility were not included by these authors, and as we can see a better specification moderates the size of the estimated coefficients.

Regarding the rest of variables, other three are statistically significant at 5% (Table 5, column 2): the capital investment rate presents an elasticity of 28% (quite standard in this type of models), S-diversity shows an extremely high elasticity of 150%, and accessibility presents a coefficient of 13%. The rest of variables are

[12] Productive diversity is one of the main determinants of the concentration of creative industries. See Lazzeretti et al. (2012) for a more detailed explanation.

statistically non-significant at 10% in step by step estimations, and in many cases the estimated coefficients tended to zero.

*Table 5. Basic estimates. Variables in logarithms. OLS Robust.*

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Constant | 8.0455 | 7.6589 | 7.8670 | 7.5696 | 7.4969 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Percentage of jobs in creative services | 0.0427 | 0.0653 | 0.0556 | 0.0510 | 0.0606 |
| | (0.138) | (0.020) | (0.055) | (0.060) | (0.028) |
| Percentage of jobs in analytic knowledge | 0.0002 | | | | |
| | (0.984) | | | | |
| Percentage of jobs in synthetic knowledge | -0.0750 | | | | |
| | (0.483) | | | | |
| Capital investment rate | 0.2802 | 0.2854 | 0.2723 | 0.2773 | 0.2722 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Number of persons employed | 0.0131 | | | | |
| | (0.528) | | | | |
| $n+g_A+d$ | -0.0041 | | | | |
| | (0.807) | | | | |
| Number of clusters | -0.0767 | | | | |
| | (0.168) | | | | |
| S-diversity | 1.7817 | 1.5100 | 1.3436 | 1.4677 | 1.4219 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| U-diversity | 0.2699 | | | | |
| | (0.380) | | | | |
| Competition (Firms per worker) | 0.0863 | | | | |
| | (0.003) | | | | |
| Accessibility | 0.1944 | 0.1358 | 0.1139 | 0.1303 | 0.1140 |
| | | (0.000) | (0.000) | (0.000) | (0.000) |
| R&D expenditures on GDP | | | 0.0447 | | |
| | | | (0.059) | | |
| Percentage of people with tertiary education | | | | 0.0710 | |
| | | | | (0.000) | |
| Creative class on active population | | | | | 0.1151 |
| | | | | | (0.051) |
| Shapiro-Wilk | 5.807 | 5.951 | 6.221 | 6.479 | 5.837 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Breusch Pagan | 5.77 | 5.10 | 6.23 | 5.00 | 4.58 |
| | (0.016) | (0.023) | (0.126) | (0.025) | (0.032) |
| VIF | 1.68 | 1.59 | 1.76 | 1.62 | 1.75 |
| LM-Error | 34.79 | 62.70 | 64.99 | 62.99 | 71.00 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LM-Error Robust | 0.19 | 7.45 | 9.306 | 7.51 | 11.02 |
| | (0.655) | (0.006) | (0.002) | (0.006) | (0.001) |
| LM-Lag | 64.87 | 73.57 | 71.95 | 74.99 | 76.74 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LM-Lag Robust | 30.28 | 18.32 | 16.26 | 19.51 | 16.70 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| LM-SLX | 50.62 | 22.56 | 21.26 | 25.30 | 22.86 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| R2 | 0.7031 | 0.6782 | 0.6852 | 0.6829 | 0.6823 |
| Observations | 250 | 250 | 250 | 250 | 250 |

*6.3. Sensibility to competing explanations*

We contrasted the sensibility of the percentage of persons employed in CSI to what we can consider competing explanations in the literature: the effect of science, highly educated human capital, and the creative class. These effects are measured for 2008 through the expenditures in R&D on GDP, the percentage of people older than 25 years with tertiary education, and the percentage of creative class (ISCO 1 and 2) on active population (Table 5, columns 3 to 5).

Into the three cases we can accept both CSI and the alternative explanations with a statistical significance of no more than 6%, although the share of variance that the model explains does not change in a significant way. The estimated coefficient of the percentage of persons employed in CSI slightly reduces in the three cases, but remains always above 5%. The estimated coefficients for competing explanations are: 4% for the percentage of expenditures in R&D on GDP, 7% for the share of people in tertiary education, and 11% for the creative class.

Since CSI and the rest of explanations are interrelated (persons employed in CSI tend to have higher levels of education and work in more creative occupations), it would be appropriate to separate the effects. However, Eurostat data doesn’t allow this separation for CSI.

*6.4. Sensibility to spatial effects*

Previous estimates can be biased if productivity in regions is affected by other regions. LM spatial tests on the OLS estimates (Table 5) suggest the existence of spatial processes between regions affecting the productivity of regions. The way of introducing spatial effects in estimates has become a controversial issue (see Gibbons and Overman 2012, and Corrado and Fingleton 2012). Our goal here is not to produce the best spatial explanation, but contrast sensitivity of the CSI effect on productivity in the presence of a spatial process.

A first explanation for spatial effects can be the existence of country-specific elements affecting productivity, such as national regulations or national economic policy. Table 6 (column 1) presents the estimates of a fixed effects model. The coefficients do not vary significantly, the F-test rejects joint fixed effects (F=1.23, p=0.224) and spatial dependence persists.

Having discarded the explanation at the country level, the spatial effects on the productivity of a region are more likely originating in neighbouring regions[13], and the intensity of the effect must depend on the size of the emitting region. The matrix of spatial contacts includes the GDP of first-order neighbouring regions (the rest of cells are 0) and is row-standardized. In order to test for competing spatial specifications, we follow LeSage and Pace (2009) and use Bayesian model comparison to jointly compare the different alternatives[14]. Posterior Bayesian probabilities for models are: Spatial Autoregressive Model SAR = 0.79, Spatial Error Model SEM = 0.12, Spatial Durbin Error Model SDEM = 0.06, Spatial Durbin Model SDM = 0.02, and Spatial Exogenous Variables Model SLX = 0.01. SAR model show higher probabilities. Table 6 (column 3) presents Bayesian estimates for the heteroskedastic SAR model, differentiating the

[13] See Koch (2008) and Fischer (2009) for theoretical justification of the spatial version of the endogenous growth models. LeSage and Pace (2009) provides empirical justification.

[14] Le Sage and Pace (2009) provide detailed explanation of the procedure. The most relevant advantages of Bayesian comparison are that it compares the entire profile of density (not only in a point like traditional tests), and allows integrating all models in a single comparison avoiding individual comparisons model by model. Bayesian estimates of SAR, SDM, SEM and SDEM models, and Bayesian model comparison have been performed using LeSage's Econometric Toolbox for Matlab.

direct effect (within-region), indirect effect (between-regions) and the total effect (the sum of both). Within-region effects of CSI on productivity are 5.6%, close to the estimates of the non-spatial model, whereas the total effect rises slightly until 8.6% as a consequence of indirect spillover effects from CSI transmitted through the productivity of neighbouring regions[15].

*Table 6. Spatial models. Variables in logarithms*

| | (1) | (2) | (3) | | | |
|---|---|---|---|---|---|---|
| | Fixed effects | OLS Robust | Bayesian SAR* | | | |
| | | | Coefficient | Direct | Indirect | Total |
| Constant | | 0.7073 | 4.1342 | | | |
| | | (0.000) | (0.000) | | | |
| Percentage of jobs in creative services | 0.0662 | 0.0786 | 0.0544 | 0.0565 | 0.029 | 0.0861 |
| | (0.010) | (0.021) | (0.001) | (0.001) | (0.012) | (0.002) |
| Capital investment rate | 0.3022 | 0.2211 | 0.2553 | 0.2652 | 0.1374 | 0.4027 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| S-diversity | 1.5055 | 1.2294 | 0.4283 | 0.4451 | 0.2312 | 0.6763 |
| | (0.000) | (0.000) | (0.020) | (0.021) | (0.040) | (0.024) |
| Accessibility | 0.1406 | 0.0425 | 0.076 | 0.079 | 0.041 | 0.1205 |
| | (0.000) | (0.421) | (0.000) | (0.000) | (0.004) | (0.000) |
| W1*Productivity (ρ) | | | 0.3629 | | | |
| | | | (0.000) | | | |
| W1*Percentage of jobs in creative services | | -0.0180 | | | | |
| | | (0.635) | | | | |
| W1* Capital investment rate | | 0.1034 | | | | |
| | | (0.064) | | | | |
| W1* Related diversity | | 0.3657 | | | | |
| | | (0.395) | | | | |
| W1*Accessibility | | 0.1361 | | | | |
| | | (0.051) | | | | |
| Shapiro-Wilk | | 5.738 | | | | |
| | | (0.000) | | | | |
| Breusch Pagan | | 8.09 | | | | |
| | | (0.004) | | | | |
| VIF | | 2.86 | | | | |
| F test on fixed effects | 1.23 | | | | | |
| | (0.224) | | | | | |
| LM-Error | 40.62 | 69.33 | | | | |
| | (0.000) | (0.000) | | | | |
| LM-Error Robust | 2.89 | 1.08 | | | | |

[15] See in LeSage and Pace (2009) the comments about the interpretation of indirect effects in the SAR model since the rate direct/indirect is fixed for all the exogenous variables. See Gibbons and Overman (2012) for a general criticism on the limitations of the estimations of spatial SAR, although there is not any explicit criticism to the Bayesian procedure. SAR also has been estimated using Robust GMM with WX, W2X as instruments, and the results are quite similar (the total effect of CSI rises to about 0.10).

| | | | |
|---|---|---|---|
| | (0.000) | (0.299) | |
| LM-Lag | 60.32 | 75.54 | |
| | (0.000) | (0.000) | |
| LM-Lag Robust | 22.60 | 7.29 | |
| | (0.000) | (0.007) | |
| R2 | 0.6798 | 0.7073 | 0.6626 |
| Observations | 250 | 250 | 250 |

* Results for 10,000 replications, using LeSage's Econometric Toolbox for Matlab . See LeSage and Pace (2009) for a detailed explanation of the Bayesian model estimation and the interpretation of SAR models. The reader can observe than there are four columns for the Bayesian SAR model. This is due to the fact that the spatial autoregressive model SAR contains the spatial lag of the dependent variable and this causes that the derivative of $y$ with respect to $X$ is not usually $\beta$ but the matrix $S_r(W) = (I - \rho W)^{-1}\beta$, where $I$ is the identity matrix, $\rho$ the autoregressive parameter and $W$ the matrix of spatial contacts. This characteristic requires to compute the total impact in the correct way (the procedure to compute the effects is detailed in LeSage and Pace 2009, chapter 2). The "total impact" can be separated in "direct impact", which is a within-region effect similar to $\beta$ in non-spatial models, and the "indirect impact" that is similar to an spillover generated in neighbouring regions (across-region effect).

## 7. CONCLUSIONS

The main contribution of this study has been to analyse the effect of creative service industries (CSI) on labour productivity of the regions of the European Union. Given the relevance of the creative industries in the recent debate on economic policy (DCA 1994; DCMS 1998 and 2001; COOKE and LAZZERETTI 2008; DE PROPRIS *et al.* 2009; POTTS 2009; EUROPEAN COMMISSION 2010; UNCTAD 2010), it is important to clarify what are their real effects on the economy of the regions. The hypothesis was that CSI offer evolutionary services that increase the capacity of generation and combination of ideas for the whole economy of the region, resulting in increased production of innovations through the generation of new products or varieties, which in turn raises productivity. The article proposes an analytical framework based on the endogenous growth theory that is contrasted for a sample of 250 regions in the European Union in 2008. Previous studies measuring the contribution of creative industries have not focused specifically on services and productivity (DOLFMAN *et al.* 2007; POTTS 2008; FLORIDA *et al.* 2008), and have provided only partial evidence based on empirical models biasing the results upward (DE MIGUEL *et al.* 2012; BOIX *et al.* 2013).

The empirical results showed that a doubling of the share of persons employed in CSI in the European regions increases average labour productivity by 8.6 %: about 5.6% comes from within the region, and regions also benefit from CSI in neighbouring regions due to spatial spillovers transmitted through the productivity of neighbouring regions, raising labour productivity by another 3%. More than 90% of the total effect is not explained by the higher productivity of CSI but rather because CSI provides evolutionary services to the rest of the economy in the form of spillovers.

Differences of productivity across the regions of the European Union also are explained because of differences in capital intensity, specialized inter-sector encounter (S-diversity) and connectivity. Indeed, estimated elasticities for capital intensity (40%) and diversified specialization (67%) are much higher than for CSI. The inclusion of these variables, highly correlated with productivity and CSI at the same time, moderates the relative effect of CSI, which in DE MIGUEL et *al.* (2012) and BOIX et *al.* (2013) arrived to about 40% due to the misspecification of their empirical models. When the results were compared with those for competing theories: R&D, tertiary education, and creative class, we found that CSI is compatible with these explanations, which are indeed partially overlapped with CSI, and that the effects on productivity of all these explanations are more or less similar.

From this study, it follows that a way to raise productivity is through increased specialization in creative industries, although the effect is limited. This result is in line with POTTS (2009) “innovation model” and with the assumptions of Romer-Jones model. From the mechanics of Romer-Jones endogenous model, the prediction is that changes in the share of persons employed in CSI only temporarily affect the growth rate of productivity, modifying the final level of productivity, although this is coherent with many policy objectives. For some profiles of regions, CSI can provide a better alternative than other traditional policies based on analytical and synthetic bases, such as scientific policy or human capital policy. CSI does not propose a *hard* path to productivity, based on the radical implementation or development of new activities, but a *soft*, *natural* or *evolutionary* path providing services and symbolic spillovers to the development, reinvention or evolution of other activities already present in each region.

From a critical point of view, we can argue that, at the light of our results, effects of higher specialization in CSI are more limited than those of capital intensification, S-diversity and accessibility, and concentrating policies on these factors could lead to higher returns and, indirectly, favour greater specialization of the region in creative industries. Indeed, a critical issue is how easy is to increase the regional specialization in CSI in order to raise productivity and through which mechanisms can be done (COOKE and LAZZERETTI 2008; RAUSELL *et al.* 2011; LAZZERETTI *et al.* 2012; DE MIGUEL *et al.* 2012) Another issue is whether research must focus on CSI as a whole on in concrete parts of the sector. The little evidence on this respect (BOIX *et al.* 2013) suggest that all the activities (sub-sectors) within CSI are correlated positively with the GDP per capita, although the correlation is less intense in sectors such as broadcasting, design and photography, and arts, entertainment and recreation.

In addition, the convenience of increasing the symbolic base of regions in order to rise their productivity, needs to be contextualized in a wider research programme providing evidence about how CSI affects and are affected by other economic parameters, such as wealth, employment and unemployment, social inclusiveness, ecological sustainability, as well as other non-directly economical parameters.

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