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**ABSTRACT**

This paper compares the total impact of cultural and creative industries (CCIs) on per capita income of countries, regions and municipalities. We estimate the total effects of CCIs in 78 developed and developing countries in 5 continents, in 275 European regions and in 518 municipalities in the European region of Valencia, using data obtained from multiple databases and nonparametric local linear least squares. The average effects of CCIs are positive in the three territorial scales, in both low- and high-income locations, and increase in conjunction with increases in development, with high and very high developed places showing greater impacts. CCIs are, thus, a powerful resource for improving the well-being of rich and poor places at all geographic scales; however, they also act as a double-edged sword, as they increase inequalities between places.

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Cultural and creative industries; income; development; well-being; inequality

## 1. Introduction

The United Nations Educational, Scientific and Cultural Organization (UNESCO 2013, 2) defines cultural and creative industries (CCIs) as 'those sectors of organized activity that have as their main objective the production or reproduction, the promotion, distribution or commercialization of goods, services and activities of content derived from cultural, artistic or heritage origin'. In a complementary way, the European Parliament (2016:10) defines CCIs as: 'those industries that are based on cultural values, cultural diversity, individual and/or collective creativity, skills and talent with the potential to generate innovation, wealth and jobs through the creation of social and economic value, in particular from intellectual property'.

One of the most important dimensions by which wealth, economic value and well-being are assessed is per capita income (OECD 2018), usually measured through the gross domestic product (GDP) per capita. The study presented in this paper measures the total impact of CCIs on the per capita income of places comparing different territorial scales of analysis: countries, regions and cities, and discusses how it is affected by the levels of development of places.

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General evidence on the total impact of CCIs on the per capita income of places is limited. Indeed, the topic has only been examined in a few studies (Rausell, Marco, and Abeledo 2011; De Miguel et al. 2012; Boix, De Miguel, and Hervás 2013; Marco, Rausell, and Abeledo 2014). Those exclusively involved European regions and point estimates. Beyond those studies, no broad data on the total effects of CCIs on the per capita income of countries or localities exists, reflecting an important gap in the empirical literature on CCIs. Moreover, scholars have failed to draw conclusions on whether the impact measurement is affected by the scale of the analysis and the development conditions of the places, because such a comparison has never been made. This constitutes another important gap in the knowledge, which mainly affects well-being and development strategies potentially based on CCIs.

In this study we want to know whether the measurements of the total impact of CCIs on the per capita income differ substantially at each scale of analysis (country, region, city) and whether this impact follow homogenous or heterogeneous patterns within each scale of analysis.

The causal relationship between CCIs and the income of places implies the hypothesis that the average impacts would reflect the same indications and trends and would be within a comparable range for all territorial scales. Certainly, rejection of this hypothesis – or widespread evidence of negative impacts – would lead to a rethink of CCI-based policies. Conversely, solid favourable evidence for all scales would provide important support to policies that address CCIs. We also establish the hypothesis that the impacts are heterogeneous within each scale, although it is difficult to establish a priori if they follow defined patterns. A greater impact of CCIs in places with a lower stage of development would undoubtedly imply a reduction in inequalities between places, while a greater impact in more developed places would lead to the conclusion that CCIs increase inequality between places.

To answer the research questions, an analytical model was estimated for three territorial scales for which data were available: a sample of 78 countries in 2014; 275 regions in 29 European countries in 2008; and 518 municipalities in the European region of Valencia (Spain) in 2015 and 2016.

The data for this study were obtained from multiple databases: United Nations Conference on Trade and Development (UNCTAD), World Intellectual Property Organization (WIPO), Lazzeretti, Boix, and Sánchez (2018), Penn World Table, the World Bank, Eurostat, Orbis (Bureau Van Dijk), Spanish National Institute of Statistics, Spanish Tax Agency, and Spanish National Institute of Social Security. Data source limitations made it necessary to use different years and slightly different empirical definitions of CCIs in this analysis, which enabled a comparison of the sensitivity of the results to the composition of the construct.

The estimates were carried out using the local linear least squares (LLLS) method. The LLLS method is a nonparametric flexible approach that avoids most of the constraints of parametric estimators, providing not only average estimates but also place-specific estimates (Henderson and Parmeter 2015; Racine and Hayfield 2020).

This paper makes three contributions to the literature. First, it presents and compares for the first time simultaneous measurements of the total impact of CCIs on per capita income for three scales of analysis: countries, regions and municipalities, allowing general conclusions to be drawn about these effects and whether they are affected by the scale or the unit of analysis. Second, it presents evidence that the impact of CCIs on per capita income of places are heterogeneous and depends on the development conditions of the places. Third, in contrast to previous research, for which estimates were based on empirical models, we introduce a theory-based analytical model that provides the relevant variables for the estimation, thereby correcting the problem of omitted variables from previous works and providing a causal framework and unbiased impact measurements.

The paper is organized as follows. The next section provides a brief review of the literature on the impacts of CCIs on per capita income and related variables. The third section includes a description of the data. In the fourth section, the methodology is explained. The fifth section provides a comparative study of the impact of the CCIs on the per capita income of countries, regions and municipalities. Finally, the sixth section concludes the paper, introduces some critical remarks and highlights implications for future research.

## 2. The impact of cultural and creative industries (CCIs) on the per capita income of places

### 2.1. Nature and type of impacts

The impacts of the CCIs on income can be direct and indirect (Boix and Rausell 2018). Direct impacts, which are the most immediate and visible, are measured by the income directly produced or consumed by the CCIs. However, other impacts of CCIs are indirect, that is, the effects they have on the rest of the economic system (Boix and Soler 2017). The sum of the direct and indirect effects comprises the total impact, which can be negative, neutral or positive (Potts and Cunningham 2008; Boix and Rausell 2018).

A negative impact can be due to a low growth rate of total factor productivity in CCIs (Baumol and Bowen 1965; Potts and Cunningham 2008), to CCIs being underused and other activities making better use of resources at certain stages of the development process (Lazzeretti, Boix, and Sánchez 2018) or to the precariousness of the labour relations model that seems to accompany CCIs (Hesmondhalgh 2010).

Neutral impacts basically involve any direct effect of CCIs that is proportional to the share of CCIs in the economy.

Positive impacts can be due to growth effects and evolutionary changes (Potts and Cunningham 2008). The first type – growth effects – results from the role CCIs play as growth drivers, activating demand or supply-side expansion. Demand-side effects result directly from the expenditures in CCIs, and indirectly from backward-linked industries supplying goods and services to CCIs and income induced effects. Supply-side growth effects come directly from the CCIs own production, and indirectly from other mechanisms:

(a) Multiplier effects generated by the industry life cycle (Boix and Rausell 2018), and industry spillovers disperse through supply chain linkages into other sectors (Bakhshi and McVittie 2009; UNCTAD 2010).
(b) Knowledge spillovers by exporting new ideas to the rest of the economy or by facilitating the adoption, retention and absorption of new ideas and technologies (Potts and Cunningham 2008; Yu et al. 2014; Bakhshi and McVittie 2009).

(c) Amenity influences, attracting skilled and educated people and qualified firms to the area (Florida, Mellander, and Stolarik 2008; Lee 2014).

The second type of positive effect resulting from CCIs is evolutionary change. CCIs are part of a process of economic evolution, and their role is to provide evolutionary services to the innovation system, facilitating change of the entire economic system, resulting in evolutionary change. In this case, all the impact is indirect (Potts and Cunningham 2008).

## 2.2. Measurement approaches and empirical evidence

UNESCO (2012) identifies two approaches to measuring the effects of CCIs on the economy. The first approach is through its contribution or direct impact on GDP, employment or other variables. Findings on the direct contribution of CCIs to the global GDP and income range from 3% in EY (2015) to 7% in Quartesan, Romis, and Lanzafame (2007). CCIs' direct contribution to the GDP varies depending on the location and the definition of CCIs applied (see UNCTAD 2010). Definitions biased towards copyright activities (e.g. Howkins 2007; WIPO 2014) reflect greater contributions than definitions biased towards cultural activities (e.g. EY 2015).

The second approach focuses on the measurement of the total impact – direct and indirect – of CCIs on the economy, which can be done through input-output analysis and econometric modelling of production and demand functions.

Input-output analysis is a well-known method in which an increase in spending in CCIs produces short-run multiplier effects on the economy (output, added value, employment, taxes) due to their interdependencies with other activities and to induced income processes. Input-output has been used to evaluate the impacts of CCIs in some countries and regions (CEBR 2017; SGS 2013; CRD 2018), obtaining total multipliers of the added value that usually oscillate between 2 and 3. This method also has many limitations (See UNESCO 2012). Its greatest restriction for comparative studies is the difficulty in obtaining input-output tables with territorial and sectoral detail.

Econometric modelling has fewer restrictions on finding comparable data, which makes it more suitable for wide-range comparative studies. It has been used to quantify the total impact of CCIs on the GDP per capita in Rausell, Marco, and Abeledo (2011), De Miguel et al. (2012), Boix, De Miguel, and Hervás (2013) and Marco, Rausell, and Abeledo (2014). These papers are characterized by: (1) the use of samples from multiple European regions, (2) they used econometric estimates based on empirical models with few controls, and (3) they obtained extremely high elasticities for the GDP per capita according to the contribution of CCIs to labour. Rausell, Marco, and Abeledo (2011) found that an increase of 1% in the share of creative industries was associated with about a 0.4% increase in GDP per capita in the Spanish regions. For a sample covering most regions in the EU, De Miguel et al. (2012), Marco, Rausell, and Abeledo (2014) and Boix, De Miguel, and Hervás (2013) demonstrated elasticities between 0.39% and 0.44%. As observed by Boix and Soler (2017), these high elasticities can be attributed to the misspecification of the empirical models, which reflects the need for robust theoretical models.

Other econometric studies have focused on different variables closely related to the GDP per capita, such as labour productivity, total factor productivity, wages or sales, as well as other scales and economic areas. They uncovered total impacts that were positive, although much more moderate than those of the previously cited studies. Hong et al. (2014) indicated elasticities of the total factor productivity to the specialization in CCI employees of about 0.04% for China's provinces. Boix and Soler (2017) and Boix, Peiró, and Rausell (2021) found elasticities for the impact of CCI services on labour productivity in the European regions ranging from 0.04 to 0.14%. Lee (2014) revealed impacts of the CCIs of 0.047% to 0.066% on the wages of the United Kingdom travel-to-work areas. For the cities in the Miami metropolitan area, Yum (2016) indicated elasticities for city sales relative to the number of CCI firms ranging from 0.048% to 0.074%.

Due to the data limitations, it is difficult to separate direct and indirect impacts in econometric analyses, and those have usually focused on measuring the total impacts. An exception is Boix and Soler (2017) who indicated that, in the case of creative service industries, the indirect impact represents 90% of the total impact on labour productivity.

Some of these papers discuss the implications or sensitivity of the results pertaining to the empirical definition of the CCIs and the partial correlations between GDP per capita or labour productivity and individual CCI sectors. Boix, De Miguel, and Hervás (2013) and Boix and Soler (2017) found robust evidence that only creative service industries have a positive and relevant effect on differences in wealth between EU regions, whereas the aggregated effect of the so-called creative manufacturing industries tends to be null or negative. Boix, De Miguel, and Hervás (2013) disaggregated the correlations of individual creative service sectors with the GDP per capita of European regions, finding a positive correlation for all creative service sectors.

## 3. Methodology

### *3.1. Model*

To obtain the total effects of the CCIs on the GDP per capita, an econometric estimate of an equation for GDP per capita was used. In a basic identity, the GDP per capita (GDP divided by population $P$) can be separated into two components: labour productivity (GDP divided by labour $L$) and the ratio of labour to population (L/P):

$$GDP/P = (GDP/L) \cdot (L/P) \tag{1}$$

Taking logarithms:

$$\ln(GDP/P) = \ln(GDP/L) + \ln(L/P) \tag{2}$$

The effect of the CCIs is introduced through the productivity term. Boix and Soler (2017) measured CCIs' impact on productivity using an adjusted version of a semi-endogenous growth model adapted from Jones (1995, 2001).

The model departs from a multiplicative production function $Y = K^{\propto}(AL_Y)^{1-\propto}$, where $Y$ is the output, $A$ is labour-augmenting technology (knowledge stock), $K$ is capital, and $\alpha$ is output elasticity of capital. 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 ($L_Y$), so that $L = L_A + L_y$. The ideas and designs produced by the creative sector are used by an intermediate sector to transform creative capital into intermediate goods, and then the final sector uses the intermediate goods and labour to produce final goods. The increase in product variety raises productivity by allowing the spread of intermediate production more thinly across a larger number of activities, each being subject to diminishing returns and, hence, yielding an increased average product when operated at a lower intensity.

The general solution of Jones (2001) for the simplest version of the model for a path of balanced growth and a moment of time $t$ can be written as a log-linear equation for the steady state:

$$\ln\left(\frac{GDP}{L}\right) = b\ \ln\delta + b\lambda\ \ln s_R + \ln s_y + a\ln s_k - a\ln(n + g_A + d) + b\lambda\ \ln L - b\ \ln g_A \tag{3}$$

in which the labour productivity (GDP/L) for a year $t$ depends on the rate at which new ideas are created (δ), the share of persons employed in the creative sector ($S_R$), the share of persons employed in the rest of the economy ($S_Y$), the intensity of capital per worker ($S_K$), the population growth rate ($n$) and the rate of depreciation of capital ($d$). In the equation, λ measures the existence of scale economies, $a = \alpha/(1-\alpha)$, and $b = 1/(1-\phi)$, where $\alpha$ is the output elasticity of capital, and $\phi$ measures productivity (returns) in the production of ideas. The term $g_A$ represents the growth rate of the ideas (See Boix & Soler [2017] for more detail about the derivation of the model).

Substituting the labour productivity term [3] in equation [2], we obtain:

$$\ln\left(\frac{GDP}{P}\right) = b\ \ln\delta + b\lambda\ \ln s_R + \ln s_y + a\ln s_k - b\ \ln g_A + b\lambda\ \ln L - a\ln(n + g_A + d) + \ln\left(\frac{L}{P}\right) \tag{4}$$

### 3.2. Estimation

Initial tests on the data revealed non-normality, heteroscedasticity and nonlinearity. The Hsiao, Li, and Racine (2007) test suggested that a nonparametric specification would better capture the nature of the data than parametric specifications.[1]

The estimation of the total effects of CCIs on the income (GDP per capita) was performed using the local-linear least-squares estimator (LLLS) method (Henderson and Parmeter 2015). LLLS is a nonparametric method based on generalized product kernels. Nonparametric kernel regressions are based on the estimation of a flexible functional form, in which the dependent variable ($y$) is described by a set of explanatory variables ($X$), and $m(.)$ is an unknown smooth function capturing the conditional relationship between the left- and right-hand side variables in the model. The LLLS estimator is computed using nearby observations in both the left- and right-hand side of the equation, and then these fits are linked to construct the global function:

$$y_i = m(X_i) + u_i, i = 1, 2, \ldots n \tag{5}$$

The LLLS method avoids most of the constraints and strong assumptions of the parametric estimators and, consequently, offers some advantages over traditional parametric methods (see Henderson and Parmeter 2015). The LLLS estimator requires neither a predefined functional form nor a distribution of the error term. Therefore, it does not require normality, and it captures nonlinearities in any part of the distribution. The LLLS technique is based on the values of similar observations in a bandwidth and still produces consistent and asymptotically normal estimations when spatial dependency is present in the data (see McMillen 2010; Jenish 2012).

Furthermore, the LLLS approach provides an estimate, or gradient, for each observation and each variable. Accordingly, it is feasible to report the estimated effects for the mean, the median, quantiles or groups of regions selected by the researcher and based on specific characteristics, allowing for a more detailed analysis than possible when employing parametric methods.

Following recent contributions using the LLLS estimator in a similar context (Boix, Peiró, and Rausell 2021), we used a Gaussian kernel and least squares cross-validation (LSCV) for the bandwidth (see Henderson and Parmeter 2015). For the estimation we used the NP package in R (Racine and Hayfield 2020).

Although our analytical model is supply-oriented and there is no simultaneity between CCIs and GDP per capita, we have verified that there is no endogeneity between the CCIs and the GDP per capita derived from the nature of the data. There are not specific endogeneity tests for LLLs so that we tested the endogeneity and the adequacy of the instruments in a parametric estimation using Wu-Hausman, weak instruments and Sargan tests. We also compare the goodness of fit of the LLLs estimator versus the Su and Ullah (2008) instrumental variables estimator as suggested by Henderson and Parmeter (2015). If there was evidence of endogeneity, the estimates from the Su and Ullah (2008) instrumental variables model would be used.

## 4. Data

### *4.1. Units of analysis*

The units of analysis used in this paper met three basic conditions of scalability, comparability-replicability and representativeness. First, they corresponded to the three scales of analysis: national, regional and local. Second, sufficient and comparable data were available to allow the same theoretical model to be applied with the same variables. Third, they were representative of a broad economic reality (e.g. developed and developing, rural and urban, etc.).

The national sample covered 78 countries from the 5 inhabited continents and with different levels of development (from low to very high) in 2013 and 2014 (Figure 1). The coverage was good for Europe, America, Eastern and Southeastern Asia, and Australia-New Zealand; the coverage was poor for the rest of Asia and, in particular, for Africa.

The sample of regions included 275 NUTS 2 regions[2] in the 28 countries of the EU (including the United Kingdom) plus Norway (Figure 2). All regions of the 29 countries, except the French overseas areas, were included. This encompassed high and very high-, middle- and low-income regions. We chose the year 2008 because it offered the best coverage related to number of regions due to previous reworkings of the database, and the data were less distorted by the effect of the 2008 crisis, in comparison to data from later

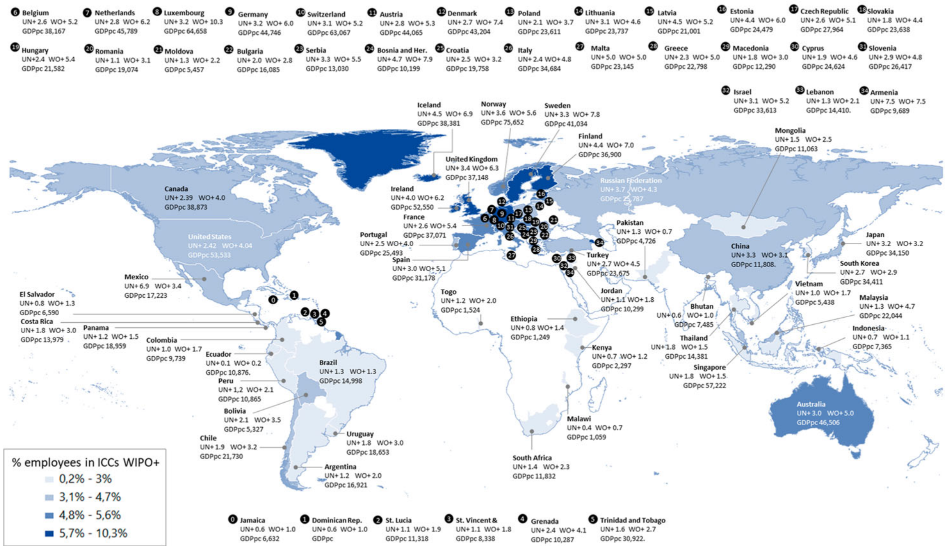


**Figure 1.** Percentage of employees in CCIs over total employment in 78 countries. Year 2014. UN+ = UNESCO classification of CCIs. WO+ = WIPO classification of CCIs. Source: Elaboration from Lazzeretti, Boix, and Sánchez (2018) and the World Bank.

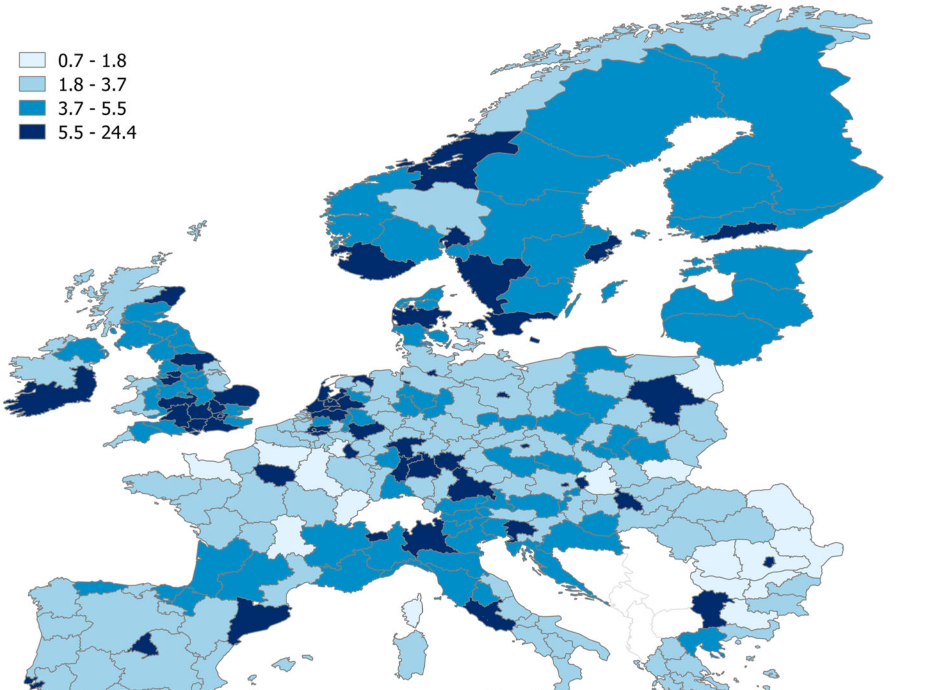


**Figure 2.** Percentage of employees in CCIs (creative services) over total employment in 275 European regions. Year 2008. Source: Elaboration from Boix, Peiró, and Rausell (2021) and Eurostat.

years. Regions cannot be subdivided into provinces (NUTS 3) because Eurostat data do not allow it for most variables.

The sample of municipalities included 518 of the 545 municipalities in the region of Valencia (Comunidad Valenciana). We excluded 37 micro-municipalities because of the lack of income data. Valencia is a European region located on the eastern coast of Spain and is a representative middle-income region, with an income equivalent to 93% of the European average and 97% of the European median. The data were available for the years 2015 and 2016. The sample contains many small municipalities and, as a sensitivity analysis we also estimated the model only for municipalities with more than 10,000 inhabitants.

The units of analysis and datasets that we used have two limitations. First, the availability and granularity of the statistics prohibit using exactly the same definition of CCIs at all scales of analysis, as well as using data from the same years. Second, the sample of countries was self-selected to include only those countries for which sufficient information on employment in cultural or intellectual property activities was available, and thus, the results must be interpreted with due caution. The regional and local scales do not have the problem of self-selection, although they correspond to European countries and, therefore, represent a specific geoeconomic area.

However, the units of analysis also have some virtues. The most interesting is that when comparing different scales, each with high internal heterogeneity, and using different definitions for CCIs and different years for each scale, a certain randomness is introduced into the experiment. This enabled us to extend much further in our conclusions than previous research allowed.

### 4.2. Data sources and elaboration of variables

According to the analytical model (Section 3), the dependent variable is the GDP per capita. The explanatory variables include the stock of CCIs measured as the percentage of people employed in CCIs, the share of persons employed in noncreative industries, capital stock per employee, the growth rate of ideas, total employment, the composite term $n + g_A + d$ and the ratio of employees by population.

The correlation matrix describing the relationships among the variables are provided in Appendix 2.

#### 4.2.1. The GDP per capita

The GDP per capita is a proxy variable for income and wealth flow and one of the fundamental dimensions of well-being.

GDP data for countries and regions comes from the World Bank and Eurostat, and is defined as the sum of primary incomes distributed by resident producer units, that is, the 'compensation of employees, plus taxes less subsidies on production and imports, plus gross mixed income, plus gross operating surplus' (OECD 1993, 19).

The data for the municipalities are elaborated by the Spanish National Institute of Statistics (INE) on the basis of personal income tax returns. The data include compensation of employees and mixed income but do not directly capture all the gross operating surplus. This difference should be considered when comparing the results of the municipalities with those of countries and regions.

The average GDP per capita of the countries in the sample in the year 2014 was $23,600, ranging from $1059 for Malawi to $75,600 for Norway. The average global GDP per capita for the same year was less than $11,000. The difference shows a bias towards developed and developing countries, although the less developed are also represented. For regions, the average GDP per capita in the year 2008 was €25,450, ranging from €7500 for Severozapaden (Bulgaria) to €126,700 for inner London. For municipalities, the income data came in the form of an income index. The average income index was about €9400 in 2015 and about €9600 in 2016; it ranged from €5300 to €15,600.

#### *4.2.2. Measurement of the CCIs*

The stock of creative industries ($s_R$) has been measured using the share of persons employed in creative industries over total employment, as requested by the model (equation (4)).

Measurement of CCIs is extremely difficult (UNCTAD 2010; UNESCO 2012). The current statistical classifications (ISIC Rev. 4) require a level of detail at a minimum of a two-digit (Boix, De Miguel, and Hervás 2013) but preferably at a four-digit level of detail (Oxford Economics 2013). This level of detail is difficult to find for developing and less developed countries. Even for developed countries, a two-digit breakdown without gaps for all sectors is difficult to obtain at subnational levels.

Databases of labour statistics with at least two-digit information do not exist for every country in the world. Therefore, the percentage of people employed in CCIs was taken from Lazzeretti, Boix, and Sánchez (2018). Due to data restrictions, they elaborated on two indicators (Table 1): an indicator of CCIs more biased towards cultural activities (based on UNESCO Institute for Statistics data, 2009 and 2014) and another more biased towards intellectual property activities (based on WIPO data, 2014).

For regions, the percentage of people employed in CCIs over total employment was obtained departing from the database of 250 regions developed by Boix and Soler (2017) and expanded to 275 regions by Boix, Peiró, and Rausell (2021), based on Eurostat Labour Force Survey (LFS). Boix and Soler (2017) employed a balanced definition of CCIs, including both creative services and creative manufacturing, although the authors argued that only creative service activities constitute CCIs (see also Boix, De Miguel, and Hervás 2013; UNESCO 2009; WIPO 2014). Consequently, we used creative services as the definition for CCIs but also provided detail for creative manufacturing (Appendix 1).

Data for municipalities came from the Spanish National Institute of Social Security (INSS) and were available at two digits. We used the same definition of CCIs used for the regional scale, although some four-digit sectors used in UNESCO and WIPO definitions were also added using data from the System of Analysis of Iberian Balances (SABI). As in the previous scale, we focused on CCIs as creative services, although we also provided a measurement for creative manufacturing (Appendices 1 and 2).

The details for the ISIC Rev. 4 codes for each scale are depicted in Table 1. The core part of activities, which is common in all definitions for all scales of analysis, includes the following: book and publishing; motion picture with video and television; programming and broadcasting activities; advertising; specialized design activities; photography; creative, arts and entertainment activities; and libraries and archives.

**Table 1.** ISIC Rev. 4 codes for cultural and creative industries.

| Cultural and creative industries | UNESCO | WIPO and OHIM Core | European regions | Municipalities |
|---|---|---|---|---|
| Manufacture of wearing apparel | | | 14 (m) | 14 (m) |
| Manufacture of leather and related products | | | 15 (m) | 15 (m) |
| Printing and reproduction of recorded media | | 18 | 18 (m) | 18 (m) |
| Other manufacturing (jewellery, music instruments, games and toys) | 3211, 3220 | | 3211 (m) | 3211 (m), 3220 (m), 3240 (m) |
| Wholesale and retail trade of: other household goods; computers, peripherals and software; music, audio, video books and newspapers in specialized retail stores; second hand goods | 4649 (pc), 4761, 4762, 4774 (pc) | 4649 (pc), 4651, 4741, 4761, 4762 | | 4742, 4761, 4762 |
| Publishing activities | 5811, 5813, 5819, 5820 (pc) | 58 | 58 | 58 |
| Motion picture, video and television programme production, sound recording and music publishing activities | 59 | 59 | 59 | 59 |
| Programming and broadcasting activities | 60 | 60 | 60 | 60 |
| Computer programming, consultancy and related activities | | 62 | 62 | 62 |
| Information service activities | 6391, 6391 | 6312, 6391 | 63 | 6391 |
| Architectural and engineering activities and related technical consultancy | 7110 (pc), 7220 | | 71 | 71 |
| Research and experimental development | 7220 | | 72 | 72 |
| Advertising and market research | 7310 (pc) | 7310, 7320 (pc) | 73 | 73 |
| Design, photography and other professional, scientific, and technical activities | 7410, 7420 | 7410, 7420, 7490 (pc) | 74 | 74 |
| Rental and leasing activities of cultural goods | 7722 | 7722, 7729 (pc) | | 7722 |
| Photocopying, document preparation, and other specialized office and business support activities | | 8219, 8299 (pc) | | |
| Higher education and cultural education | 8530 (pc); 8542 | | | 8542 |
| Creative, arts and entertainment activities | 90 | 90 | 90 | 90 |
| Libraries, archives, museums and other cultural activities | 91 | 9101 | 91 | 91 |
| Activities of professional membership organizations (inc. Copyright collecting societies) | | 9412 (pc) | | |

(m) = creative manufacturing, included as a category different from CCIs; (pc) = partial codes as described in UNESCO and WIPO.

Figures 1–3 illustrate the geographical distribution of CCIs in the three scales. The percentage of people employed in CCIs over total employment in the countries of the sample was 2.4% according to the UNESCO data, and 3.8% according to the WIPO data. Figure 1 shows higher values for CCIs in the European countries and North America. For regions, the percentage of people employed in CCIs (creative services) over total employment was 4.5%. CCIs does not follow any defined spatial pattern, although their contribution was greater in highly urbanized regions (Figure 2). For municipalities, the percentage of people employed in CCIs (creative services) over total employment was about 3%, ranging from 0.1% to 65.5% (from 0.5% to 9.6% for the municipalities of more than 10,000 inhabitants); it did not show a defined territorial pattern (Figure 3).

### *4.2.3. Remaining variables*

The rest of variables are defined as follows:

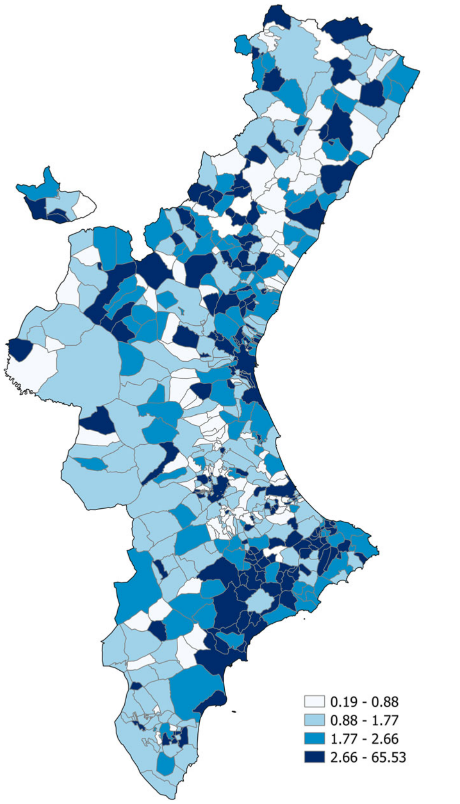


**Figure 3.** Percentage of employees in CCIs (creative services) over total employment in 518 municipalities in the region of Valencia (Spain). Year 2016. Elaboration from INSS.

(a) The share of persons employed in noncreative industries ($S_Y$) included the percentage of persons employed in noncreative manufacturing and services over total employment. Agriculture, mining and construction were not included in order to avoid perfect collinearity in the estimates. The data came from the World Bank (countries), Eurostat (regions) and INSS (municipalities).
(b) The sources of capital stock per employee ($S_K$) data for countries were the World Bank, the International Monetary Fund and Penn World Table. For the European regions, the capital stock data were elaborated following the perpetual inventory method using Eurostat regional capital flows and national depreciations and then divided by the number of employees in the LFS. For the municipalities, the capital stock data were adjusted by multiplying the regional stock of capital per employee of each sector (FBBVA & IVIE 2020) by the number of employees by sector-municipality and then consolidating the results by municipality.
(c) Total employment was measured as the total number of employees. The sources of data were the World Bank (countries), Eurostat LFS (European regions) and the Spanish INSS (municipalities).
(d) The growth rate of ideas ($g_A$) was measured using the annual average growth rate of patent applications. The ratio was calculated year by year and then averaged. For

countries, data from between 1990 and 2014 were obtained from the World Bank and WIPO. For regions, data from the European Patent Office from between 1990 (the first year available in Eurostat with enough number of regions) and 2008 were used. For the municipalities, the data for 1991–2016 came from the Spanish Patents and Trademarks Office, European Patent Office, United States Patent and Trademark Office and World International Property Organization.

(e) The composite term $n + g_A + d$ came from the resolution of the endogenous growth model (see Boix and Soler 2017). It included the growth rate of the population ($n$), the growth rate of ideas ($g_A$) and the depreciation rate ($d$). The periods for each territorial scale were similar to those we used for the growth rate of ideas. The growth rate of population was measured using the annual average growth rate of the working age population (15 to 64 years). The data were taken from the World Bank (countries), Eurostat (regions) and INE (municipalities). The depreciation rate for countries was taken from Penn World Table and OECD. Depreciation data were not available for regions and municipalities, so that factor was measured using OECD data of consumption of fixed capital by country.

(f) The ratio for employment by population was developed using data from The World Bank (countries), Eurostat (regions) and Social Security (municipalities).

#### *4.2.4. Instrumental variables*

The instruments we use for CCIs were: (a) countries: the number of UNESCO World Heritage sites per capita in the country; (b) regions: the number of UNESCO World Heritage sites per capita in the region and the public expenditures in culture in the country divided by the number of employees in Arts, entertainment, recreation and other services (NACE groups R-U); (c) municipalities: per capita assets of cultural interest in the municipality. The data came from UNESCO, Eurostat and the Ministry of Culture and Sports of Spain, respectively.

## 5. Total impacts of the cultural and creative industries (CCIs)

### *5.1. The average total impact of the CCIs on the GDP per capita is positive and economically significant at all territorial scales*

Table 2 contains the detail of the estimates for the CCIs. Complete tables of estimates can be found in Appendix 1. Endogeneity problems were only detected in the estimation for the entire sample of municipalities, for which the results of the IV estimator were also presented. Since the data are expressed in logarithms, the coefficients are interpreted as elasticities, that is, as the relative effect of an increase of the percentage of CCIs on the GDP per capita of places.

The average and median impact of CCIs on the GDP per capita is positive at all scales and the size of the coefficients implies a high response of the GDP per capita to changes in CCIs. The results imply that a 1% increase in CCIs increases the GDP per capita of countries by about 0.13% (UNESCO) and 0.19% (WIPO) average, the GDP per capita

**Table 2.** Results of the estimates.

| | Countries | | EU regions | Valencian municipalities | |
|---|---|---|---|---|---|
| | (1) LLLS UNESCO CCIs | (2) LLLS WIPO CCIs | (3) LLLS CCIs services | (4) NP-IV[a] CCIs services | (5) LLS Municipalities > 10,000 inhabitants CCIs services |
| Mean | 0.1278* | 0.1882* | 0.1716* | 0.0498* | 0.0909* |
| | (0.015) | (0.000) | (0.000) | (0.026) | (0.000) |
| Median (2nd quartile) | 0.1180* | 0.2231* | 0.1470* | 0.0412* | 0.0851* |
| | (0.029) | (0.000) | (0.001) | (0.057) | (0.000) |
| *Percent positive and negative elasticities*[b] | | | | | |
| Positive | 100 | 85.9 | 95.6 | 81.6 | 77.5 |
| Positive and significant | 69.2 | 80.1 | 93.8 | 53.7 | 75.5 |
| Negative | 0 | 14.1 | 4.4 | 18.4 | 22.5 |
| Negative and significant | 0 | 12.8 | 3.6 | 9.3 | 20.4 |
| *Percentiles (PE) of GDP per capita (group average)* | | | | | |
| Low income ($PE_0$ – $PE_{25}$) | 0.0990* | 0.0975 | 0.1544* | 0.0451* | 0.0780* |
| | (0.047) | (0.109) | (0.000) | (0.017) | (0.000) |
| Medium income ($PE_{25}$ – $PE_{50}$) | 0.1177* | 0.2375* | 0.1622* | 0.0497* | 0.0796* |
| | (0.048) | (0.003) | (0.000) | (0.009) | (0.000) |
| High income ($PE_{50}$ – $PE_{75}$) | 0.1776* | 0.2806* | 0.1670* | 0.0531* | 0.1233* |
| | (0.027) | (0.016) | (0.000) | (0.004) | (0.000) |
| Very high income ($PE_{75}$ – $PE_{100}$) | 0.1286* | 0.1442 | 0.2044* | 0.0513* | 0.0799* |
| | (0.058) | (0.110) | (0.000) | (0.035) | (0.000) |
| *Human Development Index rank (group average)* | | | | | |
| Low human development | 0.0899* | −0.2072* | | | |
| | (0.056) | (0.000) | | | |
| Medium human development | 0.0786 | 0.1390* | 0.0898* | | |
| | (0.134) | (0.039) | (0.000) | | |
| High human development | 0.1196* | 0.2577* | 0.1805* | | |
| | (0.040) | (0.002) | (0.000) | | |
| Very high human development | 0.1541* | 0.2012* | 0.1763* | | |
| | (0.036) | (0.042) | (0.000) | | |
| $R^2$ | 0.97 | 0.99 | 0.97 | 0.80 | 0.99 |
| OBS | 78 | 78 | 275 | 1036 | 196 |

Detail of the coefficients for cultural and creative industries (CCIs) and breakdown of the coefficient by GDP per capita quantiles and by United Nations Human Development Index rank. The dependent variable is the GDP per capita in power purchasing parity. All the variables are in logarithms. The tables of the regressions with all the variables can be found in Appendix 1.

*Statistically significant at 10%. Probabilities are in parenthesis. Standard errors estimated using wild bootstrap.

[a]Nonparametric Instrumental Variables estimation based on Su and Ullah (2008) and Henderson and Parmeter (2015).

[b]Following Henderson and Parmeter (2015), the gradient ($g_i$) is considered statistically significant when: $g_i \pm 2$ SE.

of regions by about 0.17% average, and the GDP per capita of municipalities by about 0.05% (entire sample) and by 0.09% (municipalities of more than 10,000 inhabitants).

These results are remarkable, if we consider that they come from three different samples, scales and definitions. They confirm a regularity in the causal effects of the CCIs on per capita income and that they are indeed positive and significant on average.

Both definitions of CCIs, the culture-based (UNESCO) and the intellectual property (WIPO), have positive and economically significant average effects on the income of countries. However, the average effect is 47% higher when the definition is based on intellectual property. The elasticity for regions is 0.17%, almost identical to that of countries in the WIPO definition.

These elasticities are lower than those observed by De Miguel et al. (2012), Boix, De Miguel, and Hervás (2013) and Marco, Rausell, and Abeledo (2014), close to 0.40%. They are closer to the elasticities of CCIs on productivity estimated in Boix and Soler (2017) and Boix, Peiró, and Rausell (2021).

### 5.2. The individual impact is mostly positive but can also be negative for some places

One benefit of LLLs is that produces observation-specific estimates of each variable. This allowed us to determine in which places the impacts of the CCIs were positive and negative. In Table 2, we calculated the percentage of places (countries, regions, municipalities) in each estimation for which the gradient of the CCIs was positive and the percentage for those that were negative.

The impacts were positive for about 86% of the countries in the sample (80% statistically significant) using the WIPO classification, and for 100% using the UNESCO classification (although in the latter case, they were only statistically significant for 69%). The impact of creative services was positive in almost 96% of the European regions (almost 94% statistically significant) and in 77%–81% of Valencian municipalities (statistically significant in 54%–75% of the cases).

In the rest of the cases, the impact was negative: in up to 14% of the countries, 4% of the regions and up to 22.5% of the municipalities. In those locations, a higher contribution of CCIs in the economy would reduce the GDP per capita, so increasing the contribution of CCIs would not be an appropriate policy.

### 5.3. Places benefit differently from CCIs depending on their level of development

Table 2 contains the average estimated impact of the CCIs on GDP per capita divided, by income groups and levels of development. Income groups are formed by dividing the GDP per capita of each sample into quartiles. The level of development comes from the national and subnational United Nations Human Development Index (HDI), which measures income, health and education.[3] Both allows to divide the sample into four groups: low, medium, high and very high income (GDP per capita), and low, medium, high and very high human development.

The analysis of income and development groups revealed that the average impacts of the CCIs on GDP per capita increased as we moved from the lower income and development groups to the higher income and development groups (Table 2).

For countries, elasticities increased from about 0.10% average for the lower income quartile to about 0.13%–0.14% average for the higher income quartile. For European regions, CCIs (creative services) elasticity was about 0.15% average for the lower income regions and increased to 0.20% average for the higher income regions. A similar trend was observed for the municipalities of Valencia. The elasticity of CCIs (creative services) was 0.045% average for the municipalities with the lowest income, reaching 0.051% average in the highest income quartile.

This trend is much more marked for the levels of development based on the HDI. For countries, CCIs elasticities increased from about 0.09% to 0.15% (UNESCO CCIs) and from about −0.21% to 0.20% (WIPO CCIs). For European regions, CCIs elasticity was about 0.09% for medium developed regions (no European region was classified as low development) and increased to about 0.18% for the higher developed regions.[4]

It should also be noted that, in some cases the average impact was greater in the high income and developed group than in the top income group. Furthermore, we find countries (e.g. South Africa, Indonesia) and regions (e.g. North Portugal) with low and medium levels of development that show higher than average impacts of CCIs on the GDP per capita.

## 6. Conclusions and policy implications

In this paper we measured and compared the total impact of CCIs on the per capita income of places for three territorial scales of analysis: countries, regions and municipalities. It is the first time that these impacts have been measured for a broad set of countries and for municipalities and compared with those of the regions.

Based on our findings, we can conclude that: the impact of CCIs on the GDP per capita of places is economically significant on all three territorial scales; that the patterns and trends of the impact are similar on the three scales; and that the impacts are non-linear and heterogeneous within each scale and related to the levels of development of the places.

Based on these results, we can affirm that, in average, policies based on an increase in the share of CCIs increase per capita income or GDP of places and provide a complementary or alternative instrument in the development processes of places.

However, the sign and size of the local impact depends on the characteristics of the place, this is, on the local conditioning. This implies that policies based on CCIs have 'black swans' and are not going to have positive effects in all places; they may be negative or neutral in some places. Moreover, they will have a greater impact in some places than in others. A smart strategy, therefore, implies a fine tuning to the characteristics of each territory.

It is important to note that, as Buitrago and Duque (2013) intuited in their book *The Orange Economy*, the impact of CCIs tends to be positive and economically significant for developing places and even for some less developed areas. In our results, the effect of the CCIs was not small for the medium- and low-developed countries and regions. However, the average impact was significantly larger for high and very high developed places. Thus, CCIs act like a double-edged sword. They serve as an instrument for the development of places but, for the first time, we report that, in average, they also increase inequalities between places, favouring on average the most developed places. Despite this fact, we also found that some places with medium and low levels of development may show high responses to CCIs. Different reasons can explain this behaviour (see Cooke and Lazzeretti 2008; Cooke and Lazzeretti 2018; Lazzeretti, Boix, and Sánchez 2018; Capello and Perucca 2017) that basically depend on the local conditioning, this is, conditions of the environment in which the CCIs interact with the rest of the socioeconomic system.

This research has some limitations, and the results can be interpreted critically. As discussed in the data section, the greatest limitation is the availability and quality of the data, especially in most of Africa and part of Asia. The comparison between different scales, definitions and years partially covers this handicap and allows us to go a little further in the conclusions.

Two additional common criticisms are to what extent the results can be interpreted as causal and whether other controls (e.g. specialization, diversity, density, urbanization and so on) should be added to the estimates. The analytical model in the third section establishes the mechanism through which the CCIs impact GDP per capita, in which there is no simultaneity and endogeneity between CCIs and GDP per capita, and provides variables for the estimates. In addition, residual endogeneity arising from the data was tested and corrected when necessary (municipalities). Since the model is causal, the estimates can be interpreted as causal, and the use of additional controls outside the model can alter the causal paths, distorting the results (See Pearl and Mackenzie 2018). Furthermore, the use of three representative cases involving different scales, definitions and periods introduces a certain randomness in the experiment, reinforcing the causal interpretation of the trends.

We suggest four directions for future research. First, we recommend improvements in the quality and coverage of the data and in the incorporation of time series in order to follow the impacts of the CCIs over a period of time. A second direction is the measurement of impacts for more places for which data may exist, such as metropolitan areas in the United States or municipalities in other regions. A third direction is to advance in the definition of interventions and counterfactuals, which represent an additional step in causal interpretation (Pearl and Mackenzie 2018) and provide relevant information on the effects of simulated changes in CCIs on the income of places. Lastly, the comparative analysis of the effects of CCIs should be expanded to other dimensions of well-being, such as health, environment, education or life satisfaction.

## Notes

1. See the results in Appendix 1. The test compares the parametric specification estimated via ordinary least squares (OLS) with the nonparametric scenario.
2. Eurostat's Nomenclature of Territorial Units for Statistics.
3. The categories for countries came from UNDP for 2014. For the regions, the categories are assigned applying the ranks used by UNDP in 2008 to the Subnational Human Development Index 4.0 (Source: Global Data Lab). The HDI is not available for municipalities. The coincidence between GDP per capita quantiles and HDI ranks is below 40%.
4. If regional gradients are analysed by country, the incremental patterns described into this section also holds for most European countries. The exceptions would be Germany and the Netherlands.

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## References

Bakhshi, H., and E. McVittie. 2009. "Creative Supply-Chain Linkages and Innovation: Do the Creative Industries Stimulate Business Innovation in the Wider Economy?" *Innovation: Management, Policy & Practice* 11: 169–189. doi:10.5172/impp.11.2.169

Baumol, W., and W. Bowen. 1965. "On the Performing Arts: The Anatomy of Their Economic Problems." *American Economic Review* 55: 495–502.

Boix, R., B. De Miguel, and J. Hervás. 2013. "Creative Service Business and Regional Performance: Evidence for the European Regions." *Service Business* 7 (3): 381–339. doi:10.1007/s11628-012-0165-7

Boix, R., J. Peiró, and P. Rausell. 2021. "Creative Industries and Productivity in the European Regions. Is There a Mediterranean Effect?" *Regional Science Policy & Practice*. doi:10.1111/rsp3.12395.

Boix, R., and P. Rausell. 2018. "The Economic Impact of the Creative Industries in the European Union." In *Drones and the Creative Industry*, edited by V. Santamarina-Campos, and M. Segarra-Oña, 19–37. Cham: Springer.

Boix, R., and V. Soler. 2017. "Creative Industries and Regional Productivity." *Papers in Regional Science* 96 (2): 261–279. doi:10.1111/pirs.12187

Buitrago, P., and I. Duque. 2013. *The Orange Economy: An Infinite Opportunity*. Washington: Inter-American Development Bank.

Capello, R., and G. Perucca. 2017. "Cultural Capital and Local Development Nexus: Does the Local Environment Matter?" In *Socioeconomic Environmental Policies and Evaluations in Regional Science*, edited by H. Shibusawa, K. Sakurai, T. Mizunoya, and S. Uchida, 103–124. Singapore: Springer.

CEBR. 2017. *Contribution of the Arts and Culture Industry to the UK Economy*. London: Centre for Economics and Business Research Ltd.

Cooke, P., and L. Lazzeretti. 2008. *Creative Cities, Cultural Clusters and Local Economic Development*. Cheltenham: Edward Elgar.

Cooke, P., and L. Lazzeretti. 2018. *The Role of Art and Culture for Regional and Urban Resilience*. New York: Routledge.

CRD. 2018. *Ohio's Creative Economy: The Economic Impact of the Arts and Creative Industries 2018*. Bowling Green: Center for Regional Development Bowling Green State University.

De Miguel, B., J. Hervás, R. Boix, and M. De Miguel. 2012. "The Importance of Creative Industry Agglomerations in Explaining the Wealth of the European Regions." *European Planning Studies* 20 (8): 1263–1280. doi:10.1080/09654313.2012.680579

EY. 2015. *Cultural Times: The First Global Map of Cultural and Creative Industries*. France: EY.

FBBVA and IVIE. 2020. *El Stock y los Servicios del Capital en España y su Distribución Territorial y Sectorial (1964–2017)*. Valencia: IVIE.

Florida, R., C. Mellander, and K. Stolarik. 2008. "Inside the Black Box of Regional Development: Human Capital, the Creative Class and Tolerance." *Journal of Economic Geography* 8: 615–649. doi:10.1093/jeg/lbn023

Henderson, D., and C. Parmeter. 2015. *Applied Nonparametric Econometrics*. New York: Cambridge University Press.

Hesmondhalgh, D. 2010. "User-generated Content, Free Labour and the Cultural Industries." *Ephemera* 10 (3/4): 267–284.

Hong, J., W. Yu, X. Guo, and D. Zhao. 2014. "Creative Industries Agglomeration, Regional Innovation and Productivity Growth in China." *Chinese Geographical Science* 24 (2): 258–268. doi:10.1007/s11769-013-0617-6

Howkins, J. 2007. *The Creative Economy: How People Make Money from Ideas*. London: Penguin Books.

Hsiao, C., Q. Li, and J. Racine. 2007. "A Consistent Model Specification Test with Mixed Categorical and Continuous Data." *Journal of Econometrics* 140 (2): 802–826. doi:10.1016/j.jeconom.2006.07.015

Jenish, N. 2012. "Nonparametric Spatial Regression Under Near-Epoch Dependence." *Journal of Econometrics* 167: 224–239. doi:10.1016/j.jeconom.2011.11.008

Jones, C. 1995. "R&D-Based Models of Economic Growth." *The Journal of Political Economy* 103 (4): 759–784. doi:10.1086/262002

Jones, C. 2001. *Introduction to Economic Growth*. New York: WW Norton and Company.

Lazzeretti, L., R. Boix, and D. Sánchez. 2018. "Entrepreneurship and Creative Industries in Developing and Developed Countries." In *Creative Industries and Entrepreneurship: Paradigms in Transition from a Global Perspective*, edited by L. Lazzeretti, 35–57. Cheltenham: Edward Elgar.

Lee, N. 2014. "The Creative Industries and Urban Economic Growth in the UK." *Environment and Planning A* 46: 455–470. doi:10.1068/a4472

Marco, F., P. Rausell, and R. Abeledo. 2014. "Economic Development and the Creative Industries: A Mediterranean Tale of Causality." *Creative Industries Journal* 7 (2): 81–91. doi:10.1080/17510694.2014.958383

McMillen, D. 2010. "Issues in Spatial Data Analysis." *Journal of Regional Science* 50 (1): 119–141. doi:10.1111/j.1467-9787.2009.00656.x

OECD. 1993. *The System of National Accounts, 1993 – Glossary*. Paris: OECD.

OECD. 2018. *OECD Regional Well-Being: A User's Guide*. Paris: OECD.

Oxford Economics. 2013. *The Economic Impact of the Creative Industries in the Americas*. Oxford: Oxford Economics.

Pearl, J., and D. Mackenzie. 2018. *The Book of Why: The New Science of Cause and Effect*. London: Penguin.

Potts, J., and S. Cunningham. 2008. "Four Models of the Creative Industries." *International Journal of Cultural Policy* 14 (3): 233–247. doi:10.1080/10286630802281780

Quartesan, A., M. Romis, and F. Lanzafame. 2007. *Cultural Industries in Latin America and the Caribbean: Challenges and Opportunities*. Washington: Inter-American Development Bank.

Racine, J., and T. Hayfield. 2020. *The np Package*. https://cran.r-project.org/package=np

Rausell, P., F. Marco, and R. Abeledo. 2011. "Sector Cultural y Creativo y Riqueza de las Regiones: en Busca de Causalidades." *Ekonomiaz* 78: 67–89.

SGS. 2013. *Valuing Australia's Creative Industries*. Sydney: SGS & Creative Industries Innovation Centre University of Technology Sydney.

Su, L., and A. Ullah. 2008. "Local Polynomial Estimation of Nonparametric Simultaneous Equations Models." *Journal of Econometrics* 144: 193–218. doi:10.1016/j.jeconom.2008.01.002

UNCTAD. 2010. *Creative Economy Report 2010*. Geneva: UNCTAD.

UNESCO. 2009. *The 2009 UNESCO Framework for Cultural Statistics*. Quebec: UNESCO Institute for Statistics.

UNESCO. 2012. *Measuring the Economic Contribution of Cultural Industries*. Geneva: UNESCO.

UNESCO. 2013. *What do We Mean by the Cultural and Creative Industries? Section for the Diversity of Cultural Expressions, Document No. 11*. Geneva: UNESCO.

UNESCO. 2014. *Summary Report of the 2013 UIS Cultural Employment Metadata Survey*. Montreal: UNESCO Institute for Statistics.

WIPO. 2014. *WIPO Studies on the Economic Contribution of the Copyright Industries*. Geneva: WIPO.

Yu, W., J. Hong, Y. Zhu, D. Marinova, and X. Guo. 2014. "Creative Industry Clusters, Regional Innovation and Economic Growth in China." *Regional Science Policy and Practice* 6 (4): 329–347. doi:10.1111/rsp3.12051

Yum, S. 2016. "The Economic Growth of Creative Industries in the Miami Metropolitan Area." *Creative Industries Journal* 9 (2): 130–145. doi:10.1080/17510694.2016.1206358

## Appendices

**Appendix 1.** Results of the estimates.

| | Countries | | | | EU regions | | Municipalities | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LLLS UNESCO CCIs | | LLLS WIPO CCIs | | LLLS CCIs services | | LLLS CCIs services | | NP Instrumental Variables (Su and Ullah 2008) CCIs services | | LLLS municipalities with more than 10,000 inhabitants CCIs services | |
| | Mean | Median | Mean | Median | Mean | Median | Mean | Median | Mean | Median | Mean | Median |
| Cultural and creative Industries (% on total employees) | 0.1278 | 0.1180 | 0.1882 | 0.2231 | 0.1716 | 0.1470 | 0.0365 | 0.036 | 0.0498 | 0.0412 | 0.0909 | 0.0851 |
| | (0.015) | (0.029) | (0.000) | (0.000) | (0.000) | (0.001) | (0.030) | (0.046) | (0.026) | (0.057) | (0.000) | (0.000) |
| Creative manufacturing (% on total employees) | | | | | 0.0227 | 0.0099 | −0.0134 | −0.0186 | −0.0138 | −0.0183 | 0.0001 | 0.0201 |
| | | | | | (0.794) | (0.648) | (0.058) | (0.189) | (0.254) | (0.168) | (0.000) | (0.000) |
| Rest of manufacturing and services (% on total employees) | 0.957 | 1.0145 | 0.8223 | 0.8371 | 0.073 | 0.0122 | 0.1482 | 0.1194 | 0.1454 | 0.1136 | 0.0247 | 0.0182 |
| | (0.000) | (0.001) | (0.001) | (0.000) | (0.566) | (0.647) | (0.011) | (0.566) | (0.170) | (0.006) | (0.005) | (0.2021) |
| Capital stock per employee | 0.6008 | 0.5964 | 0.5273 | 0.521 | 0.3928 | 0.4108 | 0.164 | 0.1468 | 0.1687 | 0.1513 | 0.0758 | 0.1145 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.021) | (0.001) | (0.060) | (0.001) | (0.179) | (0.000) |
| Employees | 0.0455 | 0.0473 | 0.0463 | 0.0372 | 0.0129 | 0.023 | −0.0364 | −0.0298 | −0.0366 | −0.0294 | −0.0985 | −0.1096 |
| | (0.005) | (0.009) | (0.000) | (0.016) | (0.703) | (0.628) | (0.015) | (0.035) | (0.000) | (0.000) | (0.000) | (0.000) |
| Growth rate of ideas | −0.0114 | −0.0113 | −0.0437 | −0.044 | 0.0363 | 0.0334 | −0.0037 | 0.0082 | 0.0041 | 0.0100 | −0.1439 | −0.2429 |
| | (0.504) | (0.518) | (0.281) | (0.340) | (0.002) | (0.296) | (0.726) | (0.005) | (0.005) | (0.001) | (0.062) | (0.000) |
| $n + g_A + d$ | 0.0827 | 0.0922 | 0.1697 | 0.1564 | 0.0282 | 0.0132 | −0.0272 | −0.0854 | −0.0392 | −0.0845 | 0.3073 | 0.5187 |
| | (0.222) | (0.078) | (0.000) | (0.000) | (0.984) | (0.911) | (0.339) | (0.066) | (0.403) | (0.059) | (0.000) | (0.000) |
| Employees per capita | 1.0653 | 1.1284 | 1.176 | 1.2499 | 0.6494 | 0.7034 | 0.1056 | 0.0972 | 0.1116 | 0.1004 | 0.1822 | 0.1576 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.006) | (0.014) | (0.000) | (0.000) | (0.000) |
| Dummy year | No | | No | | No | | Yes | | Yes | | Yes | |
| Jn statistic (Hsiao, Li, and Racine 2007) | 1.445 | | 1.2101 | | 4.7307 | | 7.6046 | | | | 3.3131 | |
| | (0.037) | | (0.022) | | (0.000) | | (0.000) | | | | (0.000) | |
| Weak instruments | 5.776 | | 7.632 | | 4.465 | | 11.990 | | | | 2.288 | |
| | (0.019) | | (0.001) | | (0.012) | | (0.000) | | | | (0.132) | |
| Wu-Hausman | 0.072 | | 0.026 | | 1.875 | | 20.260 | | | | 0.046 | |
| | (0.789) | | (0.873) | | (0.172) | | (0.000) | | | | (0.830) | |
| Sargan | | | | | 1.457 | | | | | | | |
| | | | | | (0.227) | | | | | | | |
| $R^2$ | 0.97 | | 0.99 | | 0.99 | | 0.82 | | 0.80 | | 0.99 | |
| Observations | 78 | | 78 | | 275 | | 1036 | | 1036 | | 196 | |

The dependent variable is the GDP per capita in power purchasing parity. All variables are in logarithms. Probabilities in parenthesis. $n$ = population growth rate; $g_A$ = growth rate of ideas; $d$ = capital depreciation rate.

## Appendix 2. Correlation matrices. Variables in logarithms.*

### A) Countries. Unesco classification.

| | Rest | GDPpc | Capital | ngd | Lpc | L | Ideas |
|---|---|---|---|---|---|---|---|
| CCI | 0.48 | 0.6 | 0.55 | -0.43 | 0.16 | -0.06 | 0.11 |
| Rest | | 0.81 | 0.82 | -0.35 | 0.12 | -0.15 | 0.09 |
| GDPpc | | | 0.93 | -0.33 | 0.35 | -0.01 | 0.16 |
| Capital | | | | -0.39 | 0.17 | -0.12 | 0.09 |
| ngd | | | | | -0.08 | 0.21 | 0.03 |
| Lpc | | | | | | 0.13 | 0.17 |
| L | | | | | | | 0.44 |

### B) Countries. WIPO classification.

| | Rest | GDPpc | Capital | ngd | Lpc | L | Ideas |
|---|---|---|---|---|---|---|---|
| CCI | 0.52 | 0.67 | 0.64 | -0.43 | 0.18 | -0.16 | 0.09 |
| Rest | | 0.79 | 0.81 | -0.34 | 0.09 | -0.17 | 0.08 |
| GDPpc | | | 0.94 | -0.33 | 0.35 | -0.04 | 0.14 |
| Capital | | | | -0.38 | 0.19 | -0.14 | 0.08 |
| ngd | | | | | -0.1 | 0.2 | 0.03 |
| Lpc | | | | | | 0.12 | 0.16 |
| L | | | | | | | 0.44 |

### C) European regions.

| | GDPpc | Capital | ngd | Lpc | Rest | Ideas | CMan | L |
|---|---|---|---|---|---|---|---|---|
| CCI | 0.71 | 0.44 | 0.16 | 0.39 | -0.27 | 0.1 | -0.08 | 0.26 |
| GDPpc | | 0.83 | 0.3 | 0.47 | -0.16 | -0.1 | -0.35 | 0.05 |
| Capital | | | 0.19 | 0.16 | -0.06 | -0.19 | -0.52 | -0.1 |
| ngd | | | | 0.23 | 0.14 | 0.04 | -0.06 | 0 |
| Lpc | | | | | -0.12 | 0.07 | -0.04 | 0.13 |
| Rest | | | | | | -0.04 | -0.23 | 0.12 |
| Ideas | | | | | | | 0.2 | 0.18 |
| CMan | | | | | | | | 0.23 |

### D) Municipalities of Valencia.

| | Rest | L | Ideas | ngd | CCI | CMan | GDPpc | Capital |
|---|---|---|---|---|---|---|---|---|
| Lpc | 0.3 | 0.53 | 0.33 | 0.28 | -0.48 | -0.32 | 0.09 | -0.16 |
| Rest | | 0.44 | 0.34 | 0.41 | -0.19 | -0.3 | 0.1 | 0.05 |
| L | | | 0.76 | 0.8 | -0.27 | -0.28 | -0.08 | -0.25 |
| Ideas | | | | 0.86 | -0.07 | -0.05 | 0.04 | -0.15 |
| ngd | | | | | 0.01 | -0.07 | 0 | -0.2 |
| CCI | | | | | | 0.29 | 0.16 | 0.09 |
| CMan | | | | | | | -0.1 | 0.03 |
| GDPpc | | | | | | | | 0.17 |

GDPpc = GDP per capita; CCI = cultural and creative industries; CMan = creative manufacturing; Rest = rest of manufacturing and service sectors; Capital = capital stock per employee; L = employees; g = growth rate of ideas; ngd = $n+g_A+d$; Lpc = employees per capita.

*White cells are statistically nonsignificant at 10%.