



# Article The Pandemic and the Creative Performance of Cities: An Empirical Study in Portugal

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Abstract: In a pandemic and post-pandemic environment, the consequences for the creative economy have been brutal and nefarious. Thus, this study aims to measure cities' creativity performance, through a composite index, reported in the year 2021. In this sense, the results show that culture, the creative economy and enabling environment, as subdimensions of creativity, show that cities suffered a significant setback in their creative performance. However, this is currently being reversed so that creativity continues to contribute to the performance and growth of cities, whereby the formation of networks/partnerships as allies of the creative class and industries that characterise this dimension becomes even more important. This means that the creative class was one of the most affected by the pandemic, given that its activities are sustained mainly by the public, which corroborated recent studies. The study's main contribution lies in the use of the Composite Index, in which it was concluded that creativity generates employment and wealth for a country's economy. Finally, some limitations and avenues for future research were outlined.

Keywords: creative cities; pandemic; composite index; sustainable development; performance

# 1. Introduction

Recent decades have seen an intensified interest in creativity in cities from academic researchers, institutions responsible for economic development strategies [1-4], where the pandemic has further triggered the need for cities to embrace creativity as a way to mitigate the severe effects of confinements between 2020 and 2021. Indeed, previous decades have seen the transformation of cities to an economy based on intangible amenities, which go far beyond economic performance. Indeed, the previous decades have seen the transformation of cities to an economy based on intangible amenities, which go far beyond economic performance [5,6]. This means that the creative pillar of cities relies on culture, the creative class and the industries generated by this class which, when grouped together, form a favourable environment in cities to create soft amenities [7,8]. Additionally, Penco et al. [9] argued that culture, creative class, creative and cultural industries are quesitives of current city urban planning and are linked to urban entrepreneurship, which had already been argued by Hall and Hubbard [10]. Maculan, Dal Moro [11] and Walia [12] postulated that intangibility provided by creativity in cities gives rise to improvements in the urban and economic development of cities, which had already been asserted by Florida [13]. Creativity, therefore, helps improve the competitiveness of cities by increasing their vitality



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**Copyright:** © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). and regeneration [14,15]. Finally, all these amenities are enablers for attracting talented and creative people to cities [16], which allows the desertification of some cities to be tackled.

It is evident that this focus on creativity by cities, on attracting creative human capital, requires a positive articulation of regional, local and national policies, in a global effort so that benefits are generated for the urban economy as a return on the promotion of creativity, culture and the regeneration of urban spaces. Given this scenario, recent research [17] considered that these policies should integrate cultural, artistic and creative vectors (creative class and creative industries), which should also be associated with sustained urban design in the regeneration of spaces, in order to create a favourable and stimulating environment for creativity to follow an exponential path [18,19]. However, this favourable environment generated in cities suffered an unprecedented jolt with the emergence of the pandemic, which forced a total blockade to mitigate the contagion of the new coronavirus SARS-CoV-2, responsible for COVID-19, which was first identified in January 2020 in China, in the city of Wuhan, profoundly altering the daily lives of people and their cities, especially with regard to the creative class, as defined by Florida [13,20] and culture. As Montalto et al. [21] and Escalona-Orcao et al. [22] stated, creative and cultural activities were the first to close and the last to open, with a disruptive effect on them and severe effects on cities.

In this context, it is pertinent to re-measure the creativity of cities through a composite index, such as that of Rodrigues and Franco [23], based on the conceptual model also defined by them [24]. This relevance is corroborated by Montalto et al. [21] who postulated that the pandemic had made cities empty of people and culture. These authors designed a study in some cities to measure the vulnerability of cultural and creative jobs, using cultural jobs statistics from Eurostat and the Observatory of Cultural and Creative Cities; they concluded that "despite the unprecedented challenges raised by the COVID-19 pandemic, some cities are already experimenting new event formats to better reach local inhabitants and nearby communities, while ensuring the financial sustainability of cultural activities. Both national and city governments have issued a wide range of policy measures (from compensatory grants to tax reliefs) to maintain alive Europe's cultural capital, while giving cultural institutions, companies and workers the time to get prepared to post-COVID times. Proximity tourism could indeed help compensate losses from international tourism, while new cultural services that meet societal needs (educational, health, environmental ...) would help restore the European social fabric and people's *well-being*" [25] (p. 2). In other words, there is an increasing need to recognise the importance of the various axes that the creativity dimension integrates, such as culture, creative industries that promote the creative economy and the creation of a favourable environment (e.g., urban regeneration, amenities) [26–28]. Additionally, Florida et al. [29] have said that cities will increasingly become a place for cultural and civic encounters, replacing the idea of them as shopping destinations or office centres. In addition, there have been recent studies on the devastating effects of the pandemic on the creative industries [30-32], but merely conceptual. Florida and Seman [33] (p. 3) have already studied "the effects of the COVID-19 crisis on the creative economy, comprised of industries such as film, advertising, and fashion as well as creative occupations like musicians, artists, performers, and designers. We estimate losses in sales of goods and services, employment, and earnings for creative industries and creative occupations at the national, state, and metropolitan levels over the period of 1 April through 31 July 2020."

In light of the above, one perceives the existence of a gap in the literature concerning the measurement of creative performance in cities in a holistic manner and through a composite index, whereby it is postulated that this research topic remains pertinent and current, especially in a pandemic and post-pandemic environment, in which the consequences for the creative economy have been brutal and nefarious, as argued by Florida and Seman [33]. The relevance of this study meets the arguments of Flor Florida and Seman [33]; Florida [13,20] is considered the father of the creative class (3Ts), whose pillars are culture, the creative economy and the favourable environment. Therefore, this study's purpose is to measure cities' creativity performance, using a composite index, reported to the year 2021. For the OECD [34], these indexes are always useful when there is disaggregated informa-

tion and different measurement units, as is the case here. On the other hand, these indexes can be replicated, which allows variations occurring in different periods to be perceived. In this way, the index presented here is a replica of an already valid one, since the aim is to assess the role of creativity during the pandemic. The innovation of this contribution lies in the fact that it is a novel index, due to its holistic approach, which remains little used when studying cities. Therefore, this study's main contribution lies in understanding the pandemic's effects on the economy of cities, and in its creative dimension.

After the Introduction, the Literature Review, the Methodology and the Discussion of Results follow. Finally, the contributions of this study to theory and practice, suggestions for future research, conclusions and limitations are presented.

#### 2. Literature Review

Huybrechts [35], Lee and Rodríguez-Pose [36] posit that cities are centres of innovation and invention of ideas, but they are also places where most people live. In this sense, Colavitti, Usai [37] and Rodwell [38] argued that creativity in cities is a fundamental axis for people who choose to live in urban spaces to fulfil their dreams [33,34]. The same authors explain that this is justified by the fact that creativity acts as a driving vehicle that directs these people towards achieving and strengthening a common identity based on shared memories and experiences. Previous research has also reported the importance of developing creativity in cities and the associated paradigm shift, which has oriented cities towards cultural diversity, creativity, regeneration of spaces [37,38] and for greater inclusion, social responsibility and sustainability [39]. Recently, Capello et al., Cerisola, Jelinčić (2021) and Lenzi and Perucca (2020) [40–43] postulated that creativity and creative industries are also essential to stimulate inclusive regeneration of cities, the well-being of their residents, diversity and economic growth.

In these circumstances, today's cities embrace creativity as a driver for their growth, in which all stakeholders are pre-eminent to germinate a creative, vibrant, attractive and innovative environment, determining and facilitating their future competitiveness [44–46]. However, for this to be a reality, creativity is driven by three fundamental axes, which are: (1) culture [47–50], (2) the creative economy [51–55] and (3) the favourable environment [48,49,51,52,54,56,57]. In sum, for Florida [13,20], creativity relies on culture, the creative economy and the enabling environment, which are reviewed in the following paragraphs.

It is essential that culture is an integral part of economic development strategies, so that cities may benefit from the holistic relationships it generates, as with Manchester, Shanghai and Toronto, which use their creative reputation to attract human capital, businesses, inward investment and tourists [58–62]. In this context, Casadei [63] demonstrated that there are links to arts and culture specifically targeting museums, galleries, exhibitions and other cultural offerings, and also creativity; [8] states that "the cultural and creative character of cities is considered a strategic strength and opportunity that can spillover, favoring the economic system of the entire regions in which the cities are located" [8] (p. 3).

From another perspective, culture enhances the economic growth of cities and has been part of urban strategies and leveraged by urban entrepreneurship [42,62–64], where creativity plays an efficient role in urban regeneration, quality of life and innovation [43,65] and facilitates the formation of networks [44]. This means that culture has been one of the pillars of regional/local development [66] and roots urban regeneration as an opportunity to create local amenities [67–70] using their own resources [71,72].

Yum [73] (p. 176) reported that "cultural places are an environment for the diffusion of creative ideas and attracting creative people. Culture makes it possible to reinforce creativity and economic growth. Cultural places are the vital elements of the creative cities because they work as a magnet for talented people". This means that this attraction of talent to cities generates the creative class (Talent, Technology and Tolerance) advocated by Florida [74], that are engaged in creative industries, i.e., form the so-called creative economy, which includes all activities that produce creative actions and generate intangible value—the creative and

cultural industries [73,74]. For these authors and for Florida et al. and Seman [27,31], these industries include occupations associated with heritage, arts, media and functional creations, which generate jobs and wealth [75], the main features being the strength of its human capital and its imagination [76]. Associated with this class are also the new technological, media and entertainment entrepreneurs understood as creators of creative industries [77]. The importance of this inference is stressed here, as it is vital to understand the spatiality of creative work, which includes connectivity, i.e., networks/partnerships, which are key for this class of people [78].

Finally, the enabling environment is another essential factor for creativity, where Florida [13], as well as Vaz and Onofre [79], advised that creative people (creative class) are attracted to a tolerant urban climate, and are open to new ideas and new people. For Florida [13], cities with a strong density of this class will have a better economic performance, given their relevant competences to innovate, undertake and generate creative businesses. In this context, cities should be characterised by tolerance, talent and technology (3Ts) and cultural diversity to create new businesses, employment and economic growth [13,20]. However, there must be interaction between culture and the market, the economy and leisure, culture and creativity, as this is a crucial factor in the choice of location of this class, as drivers of creative and cultural industries [80–83]. This environment is designed by the strategies aimed at economic growth based on partnerships/corporations/networks [44,82,83] and by policies based on the creative class [13,20], which are based on the attractiveness of talented individuals (creative class), urban amenities (hards and softs) and the quality of life offered by cities.

As creativity is intertwined with knowledge, regional/local governments have invested in public–private partnerships (PPP) to implement measures to increase people's satisfaction, productivity, active participation, access to continuous educational offers, cultural offers and the promotion of diversity, tolerance, talent and technology (Florida's 3Ts), as a way of countering the demographic decrease seen in some places, caused by migratory flow. The same authors stated that active citizen participation and establishing PPPs are facilitators of creativity, innovation and urban regeneration.

Creativity leads to increased economic development and implies new strategies to sustain it [62,84], as a solution to circumvent the decline or stagnation of its economic growth caused by a focus on traditional economic factors and policies directed only at financial performance, forgetting the benefits generated by intangible amenities in total performance [85,86]. Already, Florida [20] had stated that the creative class has the capacity to foster job and wealth creation in cities, and that the policies to be implemented should reflect the places [87], i.e., the cities [85]. Networks are also intangible spaces for creativity, entrepreneurship and partnerships. Similarly, others [88,89] considered creative industries to be a force for innovation and economic development, which, when co-participated, supports the social development of cities. The new governance configurations of cities prioritise cultural and social resources to increase their competitive advantage and sustainability, based on innovation and creativity [90,91]. In this way, culture and creativity are predictors of development, urban entrepreneurship and are part of the political agenda of governments [92,93], who wish to combine culture, creativity and urbanism in their cities [94].

With creativity being a fundamental pillar for cities, it is important that it can be measured in terms of performance; therefore, it is necessary to take into consideration a set of indicators that assess cultural vibrancy, the creative economy and the enabling environment [95,96]. This means that the performance of cities goes far beyond the economic; thus, measuring their creative dimension is crucial [97–102], especially now, because the pandemic has changed people's behaviour and way of being, in which quality of life is a fundamental issue. This is in line with the arguments of Florida and Seman [33], namely that cities are no longer merely destinations for shopping or professional activities. However, the creative performance of cities analysed in previous research (e.g., [13,99,101–103]) has been based on indices developed for a specific geographic context, focused on large cities and with a tiny number of indicators/variables, so the development of a composite

index that encompasses the weights of culture, the creative economy and the favourable environment of cities, as reflected in a high number of indicators is essential [104,105]. In this context, Rodrigues and Franco [23] constructed a composite index for creativity, with indicators validated by the literature, which was empirically tested in the 308 Portuguese municipalities (cities and towns) with secondary data from 2018. The same index is displayed in Table 1.

Table 1. Creativity Index.

Subdimension	General Indicator	Specific Indication	Source	
Culture	Places of culture and facilities	<ol> <li>Interest and brands</li> <li>Museums</li> <li>Cinemas</li> <li>Concerts and shows</li> <li>Theatres</li> <li>Restaurants and Accommodation</li> <li>Heritage</li> </ol>	[45-47,50]	
	Cultural participation and attractiveness	<ol> <li>Tourist bed nights</li> <li>Museum visitors</li> <li>Cinema attendance</li> <li>Satisfaction with cultural amenities</li> </ol>		
Creative economy	Creativity and employment	<ol> <li>Employment in the arts, culture and entertainment</li> <li>Employment in media and communication</li> <li>Employment in ICT and high technology</li> <li>Research and Development (R &amp; D)</li> <li>Knowledge transfer</li> <li>Impact of creative industries on GNP</li> <li>Total employment in creative industries</li> <li>Territorial analysis of creative industries</li> </ol>	[45,47,49,50,54,90]	
	Intellectual property and innovation	<ol> <li>Applications for ICT patents</li> <li>Innovation in creative industries</li> <li>Application of design in the community</li> </ol>		
	Human capital and education	<ol> <li>Higher studies in arts and humanities</li> <li>Higher studies in ICT</li> <li>Creative class (talent)</li> <li>Average university rankings</li> </ol>		
Favourable environment	Openness, tolerance and trust	<ol> <li>Foreigners with higher studies</li> <li>Foreign population</li> <li>Tolerance of foreigners</li> <li>Foreigners' integration</li> <li>People's trust</li> <li>General tolerance</li> </ol>	[45,47,55]	
	Local and international connections	<ol> <li>Passenger flights</li> <li>Road access</li> <li>Direct trains to other cities</li> </ol>	-	
	Governance	(1) Quality and management		

Source: Rodrigues and Franco [23] (p. 4).

Taking into account the arguments of some researchers [31,106,107], it is important to continue measuring the impact of the pandemic on this dimension, since this sector was the most affected and also because creativity makes cities attractive, generates wealth and employment. In this sense, the composite index [23] remains current, as corroborated by Rodrigues and Franco [23] and the most recent literature [50,59,60,74,89,108]. Although the indicators in Table 1 are similar to those of the authors mentioned, the extensive literature published since 2018 highlights the relevance of this topic. Furthermore, as already mentioned, the blocking measures instituted to mitigate the pandemic have impacted all axes of society without exception. However, the cultural axis, and the creative activities may have been most affected as telework is not feasible. In this sense, it is urgent to study how the pandemic impacted the creativity dimension of cities; the compilation of economic and non-economic indicators is relevant to the improvement of urban strategies such as [109], as a means to boost the long-term sustainable growth of cities ([110], i.e., at micro and macro level [111]. Furthermore, studies on cities with networks (micro level) that act as facilitators of growth (macro level) [112] and on partnerships between all stakeholders (public, private and citizens) [113], are increasingly important.

#### 3. Methodology

# 3.1. Sample and Data Collection

This study's sample corresponds to the universe of all Portuguese cities and towns (N = 308). Geographically, Portugal splits up into 7 regions, which are: (1) North, (2) Centre, (3) Metropolitan area of Lisbon, (4) Alentejan, (5) Algarve, (6) Azores, and (7) Madeira. However, is the coastal regions have a greater density of population. The heterogeneity of population density suggests that measures associated with the creativity of cities have different repercussions and performance. Territorially, Portugal's socio-demographic data show a different demographic and surface density among its seven regions (NUT III), meaning that the development of the cities included in each is distinct and largely heterogeneous. This means that the endogenous and exogenous factors associated with them are different for each of the cities under study.

The indicators presented by Rodrigues and Franco [23] respect the criteria of clarity, simplicity, reproducibility, scientific nature, relevance, credibility, legitimacy and comparability [114,115]. These indicators were used by Rodrigues and Franco [23] for the elaboration of a composite index, which made it possible to measure the creative performance of cities. This index, by using multiple indicators, is in accordance with the findings of Kl'účik and Haluška and OECD [32,116,117], who considered that the multiplicity of indicators provides a multidimensional measurement of concepts that a single indicator cannot measure. Table 2 shows the indicators and proxies, the sources of data and their unit of measurement, in accordance with the findings of Rodrigues and Franco [23].

Therefore, the replica of that study reports to the period of September/2022, which included the total updating of the database. The final data obtained per variable reflect absolute values, and have been transformed into relative values (proxy/resident population per  $\times 1000$  inhabitants of the city) to provide a subsequent comparison between cities, regardless of their size [23].

			(I) Culture									
General Indicator: (1.1) Places of Culture and Facilities												
Specific Indicator	Variable	Ν	Proxies	Databases	Period of Reference	Unit of Measure						
			(1) Places of historical, cultural and artistic interest, such									
(A) Places of historical interest	LIC1	308	as buildings, religious structures, monuments and statues,	Tripadvisor	2022	Number						
			churches and cathedrals, bridges, towers and others									
	MA1	308	(1) Art galleries: buildings									
(B) Museums and similar	MA2	287	(2) Art galleries: exhibitions									
	MA3	308	(3) Number of museums open to the public	Pordata	2021	Number						
(C) Cinema	CIN1	308	(1) Capacity									
(C) Cintenna	CIN2	308	(2) Places									
(D) Concerts and Shows	CE1	304	(1) Number of cultural locations	Doudata	2021	Number						
(D) Concerts and Shows	CE2	179	(2) Capacity of cultural locations	Fordata	2021	Inullibel						
(E) Theatres	TEA1	308	(1) Theatres	Meloteca.com	2018	Number						
(F) Restaurants and	RAL1	308	(1) Number of hotel establishments	Dandata	2021	N						
	RAL2	266	(2) Number of rooms in hotel establishments	Pordata	2021	Number						
accommodation	RAL3	308	(3) Restaurants	Tripadvisor	2022	Number						
		(	General indicator: (1.2) Cultural participation and attractivene	ess								
	DORT1	247	(1) Total bed nights in hotel establishments			Number						
(A) Tourist bed nights	DORT2	244	(2) Proportion of foreign guests	Pordata		%						
C C	DORT3	268	(3) Total income from hotel establishments			M.EUR						
	VISM1	264	(1) Total visitors	<b>D</b>	2021							
(B) Museum visitors	VISM2	264	(2) Total foreign visitors	Pordata		Number						
C) $C$	ATENC1	308	(1) $N^{\circ}$ of spectators	D 1 /		Number						
C) Cinema attendance	ATENC2	308	(2) Ticket sales	Pordata		M.EUR						
	DCE1	147	(1) $N^{\circ}$ of spectators	<b>D</b>		Number						
(D) Concerts and shows	DCE2	147	(2) Ticket sales	Pordata	2020	M.EUR						
(E) Cultural supply	OCC1	308	(1) Total cultural premises (local authority)	Annals by								
(F) Local authority/public expenditure	(F) Local authority/public expenditure DM1 308 (1) Expenditure on cultural activities a		(1) Expenditure on cultural activities and similar	region—INE	2020	Number						
1			(II) Creative Economy									
			General indicator: (2.1) Creative Industries									
(A) Creative jobs	EC1	308	(1) Jobs in creative and cultural activities	INE	2020	Number						

 Table 2. Creativity index for Portuguese cities.

Table 2. Cont.

(I) Culture											
			General Indicator: (1.1) Places of Culture and Facilities								
Specific Indicator	Variable	Ν	Proxies	Databases	Period of Reference	Unit of Measure					
	ICPIB1	308	(1) Turnover of cultural and creative industries			EUR					
	ICPIB2	308	(2) % of creative industries in total economic activity			%					
	ICPIB3	308	(3) Expenses with staff in cultural and creative industries								
(B) Impact of creative industries on GDP	ICPIB4	308	(4) Production of cultural and creative industries	INE	2020						
	ICPIB5	308	(5) Intermediate consumption of cultural and creative industries			EUR					
	ICPIB6	308	(6) Gross added value, at market prices, of cultural and creative industries								
	ICPIB7	308	(7) Gross fixed capital formation of cultural and creative industries								
	ATIC1	308	(1) Total number of cultural and creative industries	INE		Number					
(C) Territorial analysis of			(2) Number of people employed in creative and cultural								
	ATIC2	308	companies, divided by the total of people employed in all		2020						
creative industries			economic activities and multiplied by 100;	Orum calculation		0/					
	ATIC3	308	(3) Total number of industries by city over the total of all cities (concentration) multiplied by 100	Own calculation		/0					
	ATIC4	308	(4) Density per capita of cultural and creative industries								
	mict	500	(N $^{\circ}$ of industries/resident population multiplied by 100)								
	ATIC5	308	(5) Weight of cultural and creative industries in the total								
	11100	000	industries in the city (relevance) multiplied by 100								
			General indicator: (2.2) Research & Development								
	ID1	308	(1) Firms with most expenditure on R & D activities	5		Number					
(A) Firms	ID2	308	(2) R & D expenditure of those firms	Dgeec.mec	2020	M.EUR					
	ID3	308	(3) Total resources allocated by firms to R & D areas			Number					
	TC1	308	(1) R & D units in higher education institutions	Dgeec.mec	2022						
(B) Knowledge transfer	TC2	308	(2) Total researchers in those units financed by FCT	0	2022	Number					
( )	TC3	308	(3) Higher education establishments	Pordata	2021						
	TC4	308	(4) Lecturers in higher education	Pordata	2020	Number					
			General indicator: (2.3) Intellectual property and innovation	n							

Table 2. Cont.

	(I) Culture General Indicator: (1.1) Places of Culture and Facilities												
Specific Indicator	Variable	Ν	Proxies	Databases	Period of Reference	Unit of Measure							
	PP1	308	(1) Applications for patents and similar										
(A) Patent applications	PP2	308	(2) Applications for patents from higher education institutions	INPI	2021	Number							
	PP3	308	(3) Applications for patents from other entities (III) Favourable Environment										
			General indicator: (3.1) Human capital and education										
	CC1	308	(1) Number of higher education students enrolled in arts										
	CC2	208	(2) Higher education graduates in arts and humanities	Pordata	2021	Number							
(A) Creative class (talent)	CC2	308	(2) Figher education graduates in arts and numarities (3) Number of higher education students enrolled in ICT										
(ii) creative class (alerit)	CC3	308	courses		2020								
	CC4	308	(4) Higher education graduates in ICT	Annals by region—INE		Number							
	CC5	308	(5) Higher education graduates	Develop	2021	Number							
	CC6	308	(6) Number of students in higher education	Pordata		Number							
	CC7	308	(7) Number of higher education institutions	Pordata	2021								
	CC8	308	<ol> <li>Employed population with average/high qualifications (secondary, post-secondary and higher)</li> </ol>	Torutta	2019	Number							
(B) HEIs' presence in rankings	PR1	308	(1) HEIs in rankings	Webometrics	2020								
	TOL1	308	<b>General indicator: (3.2)</b> Openness and diversity (1) Legally resident foreign population: total		2021	Number							
(A) Tolerance, social classes and young people	TOL2	308	(2) Socio-cultural heterogeneity (social classes)—employees' basic average monthly salary	Pordata	2019	Number							
	TOL3	308	(3) Young population (resident population, estimated at 31 December: 0–25 years)		2021	%							
	TOL4	308	(4) Marriages solemnized between nationals and foreigners			Number							
			General indicator: (3.3) Local and international connections										

Specific Indicator	Variable	N	(I) Culture General Indicator: (1.1) Places of Culture and Facilities Proxies	Databases	Period of Reference	Unit of Measure
(A) International connections	LI1 LI2	308 308	(1) Airports (2) Passenger arrivals by airport	INE	2021	Number
(B) Local connections	LL1	308	(1) Transport and storage companies General indicator: (3.4) Governance	INE	2020	Number
(A) Endogenous factors	FE1 FE2	308 308	<ul> <li>(1) Concluded building redevelopment (urban regeneration)</li> <li>(2) Licensed building redevelopment (urban regeneration)</li> <li>(2) Annual nonulation variation (alabel attractiveness for nonu-</li> </ul>	Annals by region—INE	2020	Number
	FE3	308	(3) Annual population variation (global attractiveness for new residents)			%

Source: adapted from Rodrigues and Franco [23].

Table 2. Cont.

#### 3.2. Data Analysis

Data analysis was performed in three main stages, with statistical treatment being carried out using IBM SPSS (version 25.0) software. Thus, Table 3 summarises the multivariate statistics used in this study.

Table 3. Multivariate statistics used.

Phase	Multivariate Statistics
1	<ul> <li>(a) The validity of 308 observations was determined, representing about five times more the variables analysed (65), where the average value (zero) of the non-imputed data was considered to avoid losing relevant information;</li> <li>(b) Due to the multiple units of measurement and reference periods, the data were normalised [32,116,118–120].</li> </ul>
2	<ul> <li>(a) Descriptive analysis (mean, standard deviation, coefficient of variation and minimum and maximum values).</li> <li>(b) The aforementioned normalisation (Z-score) transformed the mean into zero and the standard deviation into one, so that this study does not exhibit in accordance with Marôco and OECD [32,121].</li> </ul>
3	<ol> <li>The application of exploratory factor analysis (EFA) and principal component analysis (PCA) as the method adopted to construct the Composite Index.</li> <li>This provides the grouping of data that may have a similar interpretation in the sample and also the ascertainment of the main components that must be retained and the robust treatment of the data [34,117,121–123].</li> <li>This methodological option allows the determination of the weights that correspond to the importance of the variables measured by the maximum variance [123].</li> <li>The Kaiser–Meyer–Olkin (KMO) test was used, as a measure of sample adequacy, to check the acceptability of the above techniques [122,124] and the Bartlett sphericity test.</li> </ol>

Rodrigues and Franco [23] argued that Cronbach's alpha is usually used to check on the internal consistency, in this case, of the (sub) dimensions used. However, this was not presented in their study because the "correlations do not necessarily represent the real influence of the individual indicators on the phenomenon expressed by the composite indicator" [34] (p. 126). Thus, in the present study, this is also not shown.

#### 4. Results

The results presented here were returned by operationalising phases 1, 2 and 3 and are shown in Tables 4–6.

Tables 4–6 show that the KMO test is of very good quality for the culture sub-dimension (0.936), of average quality for the creative economy sub-dimension (0.732) and good quality for the enabling environment sub-dimension (0.898), following Marôco [119,123]. However, in the creative economy sub-dimension, a linear dependence was detected between some of the variables under study, i.e., they displayed a Pearson correlation coefficient of 1 [121]. As a consequence, variables ATIC3, ATIC4, ICPIB4, ICPIB5, ICPIB6, TC2 and PP3 were excluded.

Complementarily, the extraction of the h2 communalities shows that these are higher than the minimum required 0.32 [124,125] (Tables 3–5). This means that these explain 20% (0.447<sup>2</sup> = 20% (from the communalities obtained for all variables, the smallest communality is used, and its power squared is calculated)) of the variance in the culture subdimension, 31% (0.560<sup>2</sup> = 31% (Idem)) of the creative economy subdimension and 28% (0.533<sup>2</sup> = 28% (Idem)) of the enabling environment subdimension. Additionally, factor loadings for all analysed proxies are equal to or greater than 0.40, which is the minimum required [121]. Subsequently, the "weights of the factor loadings matrix after rotation were calculated, given that the square of factor loadings represents the proportion of the total unit variance of the indicator that is explained by the factor" [34,122]. Finally, the weights of the three aforementioned dimensions were calculated in the composite index to measure city creative.

ity performance. These weights result from the product between the squared standardised saturations and the value of the variance explained by each factor.

Supported by the tables displayed above (Tables 4–6), the results presented 9 essential factors impacting the creative performance of Portuguese cities during a pandemic. On the other hand, the weight of each of these factors is heterogeneous between the three subdimensions per se included within creativity. However, the total variance explained for each is significant, i.e., 81.08 for the culture subdimension, 79.44 and 76.13 for the creative economy and enabling environment, respectively. These values are explanatory and relevant to measuring creative performance [121]. Of no less importance, the commonalities of the variables encompassed in each factor are robust, demonstrating that the factors retained are adequate to describe the latent correlational structure between the variables [121].

		Results of Factor A	Exploratory Analysis	Squared Fa (Scaled to	ctor Loading Unit Sum)	Weights—Coefficients of Variables		
Variable	h <sup>2</sup>	Fac	ctor	Fa	ctor	1	Factor	
		1	2	1	2	1	2	
LIC1	0.703	0.554		0.018		1.6521		
MA1	0.962	0.893		0.047		4.2927		
MA2	0.900	0.859		0.043		3.9720		
MA3	0.882	0.856		0.043		3.9443		
CIN1	0.904	0.821		0.040		3.6284		
CIN2	0.717	0.766		0.034		3.1585		
CE1	0.920	0.882		0.046		4.1876		
CE2	0.892	0.867		0.044		4.0463		
TEA1	0.922	0.883		0.046		4.1971		
RAL1	0.938		0.763		0.376 <sup>1</sup>		3.1338 <sup>2</sup>	
RAL2	0.916		0.848		0.464		3.8709	
RAL3	0.637	0.702		0.029		2.6528		
DORT1	0.935		0.837		0.452		3.7712	
DORT2	0.447		0.658		0.279		2.3306	
DORT3	0.923		0.841		0.456		3.8073	
VISM1	0.958	0.814		0.039		3.5668		
VISM 2	0.840	0.723		0.031		2.8139		
ATENC 1	0.953	0.855		0.043		3.9351		
ATENC2	0.950	0.857		0.043		3.9535		
DCE1	0.914	0.872		0.045		4.0931		
DCE2	0.890	0.879		0.045		4.1591		
OCC1	0.796	0.788		0.036		3.3425		
DM1	0.938	0.902		0.048		4.3796		
Eigenvalue		17.027	1.550					
% Explained variance		57.386	23.691					
Total explained variance		81.077		0.917	0.083 <sup>3</sup>	Cultural venues	Hotel establishment	
						$\sum 65.98$	∑16.91	

Table 4. Culture.

**Source:** Adapted from outputs of SPSS. <sup>1</sup> RAL1:  $0.582^2/1.55 = 0.375592903$  (Results of the exploratory factor analysis of RAL1 squared divided by the eigenvalue of factor 2). <sup>2</sup> RAL1: ( $0.0.375592903 \times 0.083436508 \times 100 = 3.1338$  (Weights—coefficients of variables calculated by the result of Squared factor loading multiplied by the proportion of the eigenvalue of factor 2 in the total of this value). <sup>3</sup> RAL1:  $1.55/\sum 1.55 + 17.027 = 0.083436508$  (Proportion of the eigenvalue of factor 2 on the total eigenvalue).

 Table 5. Creative economy.

		Results of	nalysis		Squared Fa (Scaled to	actor Loadir o Unit Sum)	ıg		Weights—Coefficients of Variables					
Variable	h <sup>2</sup>	Factor				Factor					Factor			
		1	2	3		1	2	3	4	1	2	3	4	
EAE1	0.993	0.839				0.0273				1.416				
ID1	0.880			0.792				0.0434				0.720		
ID2	0.896			0.936				0.0606				1.006		
ID3	0.878			0.790				0.0432				0.717		
TC1	0.977		0.875				0.0301				0.625			
TC3	0.972		0.725				0.0206				0.428			
TC4	0.904		0.917				0.0330				0.685			
ICPIB1	0.941	0.941				0.0343				1.778				
ICPIB2	0.992				0.959				0.0670				0.722	
ICPIB3	0.578	0.904				0.0317				1.644				
ICPIB7	0.971	0.843				0.0275				1.426				
PP1	0.925		0.866				0.0295				0.613			
PP2	0.648		0.888				0.0310				0.644			
ATIC1	0.955	0.699				0.0189				0.980				
ATIC2	0.560				0.967				0.0682				0.735	
ATIC5	0.626				0.387				0.0109				0.118	
Eigenvalue		6.59	2.64	2.11	1.37									
% Explained variance		25.81	25.46	14.45	13.72									

		Table 5. (	Cont.										
		Results	of Explorato	ry Factor Analys	sis	Squared Factor Loading (Scaled to Unit Sum)				Weights—Coefficients of Variables			
Variable	h <sup>2</sup>		Fact		F	actor			Fa	actor			
		1	2	3	1	2	3	4	1	2	3	4	
Total explained variance		79.438			0.5185	0.2077	0.1660	0.1078					
									Creative Industries ∑7.24	Higher Education and R & D ∑3.00	Businesses and R & D ∑2.44	Proportion and weight of Creative Industries ∑1.58	
			Varir	nax rotation; N =	= 308; KMO = (	).73; Bartlet	t Sphericity	Test = 12,542	2.173; gl = 120; <i>p</i>	< 0.000.			
		Source: A	dapted from o	utputs of SPSS.									
		Table 6. I	Favourable en	nvironment.									
			Results o	f Exploratory Fa Analysis	ctor	Squared Factor Loading (Scaled to Unit Sum)				Weights—Coefficients of Variables			
Variable		h <sup>2</sup>	Factor			Factor				Factor			
			1	2	3	1	2	3		1	2	3	
CC1	0	.963	0.959			0.0734				5.9658			
CC2	0	.954	0.956			0.0730				5.9285			
CC3	0	.931	0.679			0.0368				2.9907			
CC4	0	.958	0.960			0.0736				5.9782			
CC5	0	.930	0.729			0.0424				3.4473			
CC6	0	.984	0.975			0.0759				6.1665			
CC7	0	.967	0.973			0.0756				6.1412			
CC8	0	.975	0.958			0.0733				5.9533			
PR1	0	.886	0.854			0.0582				4.7309			

Table 6. Cont.

		Results of Exploratory Factor Analysis			Squai (Sca	red Factor Load led to Unit Sur	ling m)	Weights-	Coefficients of Varia	bles		
Variable	h <sup>2</sup>		Factor			Factor			Factor			
	-	1	2	3	1	2	3	1	2	3		
TOL1	0.915	0.853			0.0581			4.7198				
TOL2	0.618		0.524			0.1782			1.7811			
TOL3	0.804	0.736			0.0433			3.5139				
TOL4	0.919	0.947			0.0716			5.8174				
LI1	0.533			0.579			0.2480			2.1746		
LI2	0.920	0.919			0.0674			5.4785				
LL1	0.930	0.867			0.0600			4.8760				
FE1	0.833	0.687			0.0377			3.0616				
FE2	0.823	0.785			0.0492			3.9973				
FE3	0.584		0.530			0.1823			1.8221			
Eigenvalue		12.523	1.541	1.352								
% Explained variance		45.217	17.368	13.549								
Total explained variance		76.133			0.8123	0.1000	0.0877					
								Higher education, population and transport ∑78.77	Population densities ∑3.60	Airports ∑2.17		
		Vai	rimax rotation	; N = 308; KM0	D = 0.898; Bartle	tt Sphericity Te	st = 6244.488; §	gl = 171; p < 0.000.				

Source: Adapted from outputs of SPSS.

Concerning the culture sub-dimension, two factors were obtained.

#### 4.1. Cultural Venues, with a Total Weight of 65.98 (Table 4)

Although the cultural heritage of Portuguese cities is 3.3425 (OCC1) and public expenditure on culture has a desirable relevant value (DM1 = 4.3796), justified by the support given to this sector during the periods of confinement, it can be perceived that places of culture and facilities have important contribution weights. For example, the value of art galleries reflects a focus on culture, especially when, after the confinement, people felt the need to leave their residence to attend exhibitions in art galleries (MAI1), concerts and shows (CE1; CE2) and the theatre (TEA1), mainly in larger cities. The location of these two variables is more visible in larger cities, allows us to argue that there is still an incipient impact of local cultural policies in smaller cities. In this subdimension, the significant involvement of citizens with cultural spaces in their cities is perceived since the effects of the 2020–2021 confinements exposed people to distinct routines that altered their experiences and consumption patterns. Specifically, people during the confinement began to identify more with the culture of their cities, continuing this cultural rootedness after the confinement. This means that cities now dynamically promote culture and as a way to attract local and foreign tourists to urban spaces to enhance their growth, which is reflected in the arguments of some authors [64,126]. These authors [62,64,125] postulated that when culture is invested in as a factor to stimulate economic growth, this dynamism around cultural resources is generated. However, there arises the issue of the heterogeneity of the size of cities. Veal [127] refuted that those city strategies should involve creating more theatres and shows in smaller cities so that elitism and gentrification are combated.

## 4.2. Hotel Establishments, with a Total Weight of 16.91 (Table 4)

Although the pandemic affected their activities adversely, this sector was supported by government entities to bear the costs of being closed to the public. Their managers were creative in how they managed their business. They were urban entrepreneurs in times of crisis [128]. Additionally, overnight stays and tourism revenue showed positive findings (DORT1, DORT3), and the opening of unrestricted borders and accommodation units contributed to this upturn in activity. This means that the cities studied are attractive and that the focus on the conservation and promotion of local cultural heritage has generated positive results and contributed to the brand image of these cities [129].

The results discussed here show the importance of culture for the creative performance of cities, which must still undergo urban regeneration for the creation of cultural and creative activities [82,83], by using its resources and skills to make it more attractive, by generating synergies [48,52,53,130,131] and by forming partnerships with other entities to leverage culture as one of the pillars of creativity in cities [132].

Concerning the creative economy subdimension, measured by three indicators (General indicator: (2.1) Creative Industries; General indicator: (2.2) Research and Development, General indicator: (2.3) Intellectual property and innovation), the following factors were obtained:

- 1. Creative Industries (weight of 7.24);
- 2. Higher Education and R & D (weight of 3.00);
- 3. Businesses and R & D (weight of 2.44);
- 4. Proportion and weight of Creative Industries (weight of 1.58).

The weights obtained are extremely low, which would be expected (data from 2021) in times of pandemic, as creative activities were one of the most affected by implementing pandemic mitigation measures. These harmful effects were recently identified by Adler, Florida and Seman [33,108]. However, we are currently witnessing the reversal of this situation, both by creating support mechanisms for the creative class and by resuming cultural and creative activities by municipalities. This reversal is essential because, in the pre-pandemic period, the creative and cultural industries already played a relevant role in micro and macroeconomic growth, as argued by Tukiainen [112]. This means that these

industries should again generate employment and contribute to the GDP of the regions [87], as they create economic and intangible value by including creative people with fertile imaginations who turn their ideas into creative industries [75,77].

Another area included in the creative economy is research and development, as well as universities, which also saw their research activities drastically affected by the pandemic, the effects of which were studied by Rodrigues et al. [133], (p. 1) who concluded that "*The results obtained show that this lengthy interruption had severe impacts on their activities, requiring new competences and capacities to deal with changes in a short period of time, ... "* 

Finally, for the sub-dimension favourable environment, we have the following factors:

# 4.3. Higher Education, Population and Transport (Weight of 78.77)

The factor with the highest weight and the variables included with relevant values corroborates the study of Lombardi et al. [55] highlighting the importance of higher education institutions in creating a favourable environment for the spread of creativity in cities. The profile of city residents is also important and should be linked to the cultural heritage of cities and higher education. In other words, higher education institutions are a driving force for attracting talented people with different academic backgrounds and experiences as a consequence of their cultural diversity and dynamism, and capacity for innovation [49]. Here, too, openness and tolerance are essential factors in attracting the creative class [13,134]. The pandemic also impacted higher education, with many students dropping out due to financial inability. Thus, it is argued that opening up cities to diversify their local community promotes the generation of an appropriate surrounding environment for the development of creative industries (for example, related to the amenities offered by HEIs), and thus attracts new residents to stimulate the local economy [20,134,135], as long as they are leveraged to the cultural offer as a market factor [136]. There is still evidence that investment in urban regeneration is a reality, in which regenerated spaces are set up by creative industries and entrepreneurship promoters [78,79,81]. In addition, there is a need to encourage the formation of networks/partnerships to stimulate the flow of people between cities as contributors to local economies. Mobility policies require more territorial development strategies, which could involve more strategies designed in networks/partnerships [48,113,132].

## 4.4. Population Densities (Weight of 3.6)

Population density includes the economic heterogeneity of the population and the density of the young population. The pandemic has had severe effects here, as people have seen their incomes decrease via unemployment (companies closing down), for example. Additionally, the birth strategy followed by some cities, through offers, has not stimulated families to increase their number of children.

# 4.5. Airports (Weight of 2.17)

From the existing airports in Portugal, a continuous flow of passengers, especially foreigners, was verified after the deconfinement.

Table 7 presents the results of applying the EFA to the creativity dimension, sustained on the robustness of the statistical treatment visualised in the previous tables. Thus, the weight of each subdimension analysed in the creativity dimension was ascertained.

Supported by the discussion of results per sub-dimension for 308 Portuguese cities and towns, Table 6 displays the weight of each in the creativity dimension, where culture and creative economy have a value of 37% each, and the more favourable environment presents a value of 26%. The dramatic impact of the pandemic on the creative class of cities, where for a long time, creative industries did not exercise their activity, which proved unemployment and affected the creative economy. Currently, this situation is reversed, where cultural and creative activities are spreading everywhere, as society increasingly adheres to them. These arguments corroborate the findings of Adler; Florida and Seman [33,108], who argued that this class was one of the most affected by the pandemic. In practical terms, it was

also found that creative performance in Portugal presents findings (see Table 6) which reveal that national strategies to mitigate the effects of the virus downsizing measures implemented at city level, have begun to re-emphasise creativity based on creative and cultural industries (subdimension culture and creative economy) and the generation of a favourable city environment for the attraction of these industries (more investment) and, consequently, of the creative and talented people who work in them and create jobs for others. On the other hand, the fact that citizens have been confined for so long has generated an additional willingness to soak up culture and creativity, which is reflected in the findings obtained.

Subdimensions	h <sup>2</sup>	Factor—Creativity	Calculation 1	Calculation 2	Weights
Culture	0.446	0.883	0.498841 1	(0.498841/1.351061) × 100	37%
Creative Economy	0.772	0.884	0.499972 <sup>2</sup>	$(0.499972/1.351061) \times 100$	37%
Favourable Environment	0.810	0.742	0.352248 <sup>3</sup>	$(0.352248/1.351061) \times 100$	26%
Sum			1.351061		
Eigenvalue		1.56			
% Explained variance		52.09			
Total explained variance		52.09			
Varimax Rotation;	N = 308; KMC	) = 0.607; Bartlett Sphericity	7 Test = 299.642; gl = 3;	$p < 0.000$ ; $h^2 > 0.32$ ; loadings > 0.4	0.

Table 7. Exploratory Factor Analysis of the Creativity Dimension and Weights.

**Source:** Adapted from outputs of SPSS.  $^{1}$  (0.883 $^{2}$ /1.56) = 0.498841.  $^{2}$  (0.884 $^{2}$ /1.56) = 0.499972.  $^{3}$  (0.742 $^{2}$ /1.56) = 0.352248.

No less important is the fact that creativity in a city is not only confined to the standardised application of the perspective advocated by Florida [33,108], since there are no cities with endogenous and exogenous characteristics, with soft and hard, social and cultural amenities that are also standard and common. Attempts to apply the "Florida recipe" as a magic formula to overcome the harmful effects of globalisation, the recent financial crisis, the demographic decline of some regions and the exponential urban development have resulted in deep criticism of this author by the scientific community. On the other hand, the pandemic has exacerbated the limitations of Florida's theory, such as gentrification; therefore, cities must be endowed with the flexibility to counteract them.

As far as creative performance in Portugal is concerned, the findings obtained reveal that cities in Portugal have had the ability and resilience to reuse their intangible resources to circumvent their stagnation and pandemic effects, giving them a new meaning in terms of use and purpose, as well as the aggregation of these to their tangible resources to obtain economic and non-economic added value. Associated with these city amenities (resources) are the networks formed in cities as a beneficial synergy of cities' creative performance. These strategies that boost creativity and its inherence in urban networks are also a driving vehicle for urban regeneration in cities to be stimulated by urban entrepreneurship, which involves a focus on the design of a creative economy in which creative industries, culture and the existence of attractive urban spaces play the main role in improving economic growth. It should also be noted that the pandemic has reinforced the need to increase the soft and hard amenities of cities, in which gentrification is beginning to be overcome when the creative class begins to move to rural areas, seeking their well-being in the face of the blocking measures.

#### 5. Conclusions and Implications

In recent years, most Portuguese cities have suffered the impacts of a financial and economic crisis, a declining population and a high unemployment rate. Consequently, a lack of motivation for its reconstruction in terms of intangible amenities (e.g., attractiveness and innovation) has been presented. In this scenario, the European Union took up the challenge of launching common strategies for revitalising cities, of which Portugal was no exception. However, the pandemic experienced brought profound changes to this new vision of cities, so the result obtained on the creative performance of cities was severely affected as this includes activities that involve the public and people, so from the moment the country entered into various blockades, they ceased entirely for an extended period of time. This cessation, even temporarily, caused disruptive effects on the entire creative class and creative industries, whether they are associated with culture, education or tourism. Everywhere, there have been closures of creative businesses, causing unemployment and decreasing wealth in local economies. Under these circumstances, there is an urgent need to reverse this situation so that cities can once again become poles of attraction for talented people who create critical added value due to their creativity.

The main contribution of this study is based on the use of a composite index and understanding how creativity in cities has been affected by the pandemic, as this is increasingly a focus for making cities attractive for people, business and investment and enables urban revitalisation and regeneration, as well as contributing to local economic growth. Additionally, the existence of networks in cities has allowed the understanding of cities as a node of connectivity, whose created relationships involve all city actors with a common goal: improving the holistic performance of cities. This means that networks are an aid to solving the urban problems that cities currently face due to the synergies and externalities that intra and inter-generated ties provide in urban spaces, especially in turbulent environments such as the one generated by the pandemic. On the other hand, the importance of cities creating overall and added value, being attractive to people and businesses and having a vibrant urban environment was demonstrated in this research. This attractiveness is associated with the benefit of the existence of networks as promoters of intangibility in cities around creativity, which has a cultural heritage as a catalyst for economic growth.

On the other hand, cities have had the ability and resilience to reuse their intangible resources to circumvent their economic and population stagnation or decline, giving them a new meaning in terms of use and purpose, as well as the aggregation of these to their tangible resources to obtain economic and non-economic gains. Associated with these city amenities (resources) are the networks formed in cities as a beneficial synergy of the cities' creative performance. These strategies that drive creativity and its inherence in urban networks are a driving vehicle for urban regeneration in cities to be stimulated by urban entrepreneurship. In sum, the creative performance of cities has been leveraged by the bet on the conception of a creative economy, in which creative industries, culture and the existence of attractive urban spaces rescue the main role in improving their economic growth, whose effects are reflective in the macro, micro and meso creative performance of a country. Moreover, this capacity and resilience have been demonstrated in the pandemic, where cities reinvent themselves to offer their citizens creative activities.

As with any study, this one is not without limitations. The first relates to the geographical context where the study was conducted. The second is inherent to the fact that the performance of cities is not only measured by creativity. Additionally, the size of cities was not considered represents the third limitation. These limitations suggest future studies, such as conducting studies in other countries; studies on the intelligence dimension, urban sustainability, and urban mobility, for example; and research that separates cities and towns into rural and non-rural areas by population density. Although this study is a replication of previous research and, as such, a limitation, this does not mean that it is not innovative, given that it uses a novel composite index to measure the creativity of cities and takes into account the effects of the pandemic. Recent studies measure this performance for Florida's 3Ts, for the fashion industry, for instance. In contrast, the study presented here reports robust evidence on culture, the creative economy and the enabling environment in a holistic manner.

In short, the study presented here showed that pandemics will continue to be a reality and that the experiences gained from the most recent one should be used to advantage in the future to avoid such disruptive effects on society in general.

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