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**Article**

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## Spatial analysis of cultural activities in the microregions of Minas Gerais<sup>☆</sup>

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### Abstract

This paper aims at the evaluation of cultural activity aspects from the 66 microregions of the state of Minas Gerais by creating a comparable index, the DPCA, and by detecting spatial patterns in this index using Exploratory Spatial Data Analysis (ESDA). To study the aspects of cultural activities we calculated the DPCA index using factorial analysis. The database used was the Basic Municipal Information developed by IBGE. The methodology enables the construction of a Development Potential of Cultural Activities (DPCA) index composed by three factors that allow us to evaluate the aspects of cultural activities: one comprising cultural activities and structure, one comprising means of access to culture and another comprising cultural management. Some conclusion that can be highlighted is the low result of the Development Potential of Cultural Activities (DPCA) for 64 from the 66 microregions. Regarding the ESDA, we find cultural clusters when the calculus are performed for PDAC individually and for a comparison with the GDP.

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*JEL classification:* Z10; R10

*Keywords:* Exploratory Spatial Data Analysis; Cultural economics; Minas Gerais

### Resumo

Este trabalho teve por objetivo avaliar aspectos da atividade cultural das 66 microrregiões do estado de Minas Gerais a partir da criação de um índice comparativo, o PDAC, e detectar os padrões espaciais do referido potencial das atividades culturais no estado. O estudo dos aspectos da atividade cultural foi realizado utilizando a análise fatorial. Esta foi implementada tomando por base o anexo cultural da Pesquisa de Informações Básicas Municipais do IBGE. A introdução da questão espacial foi realizada a partir da Análise Exploratória de Dados Espaciais (AEDE). Como principais resultados destacam-se a formação de três fatores, que em conjunto formam o Potencial de Desenvolvimento das Atividades Culturais (PDAC) e que permitem avaliar os aspectos da atividade cultural: um de atividades e estrutura cultural, um de meios de acesso e outro de gestão cultural. Outro resultado que merece a atenção é o baixo Potencial de Desenvolvimento das Atividades Culturais (PDAC) de 64 das 66 microrregiões do estado. Em relação

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a AEDE ressalta-se a formação de clusters culturais quando analisada a variável PDAC individualmente e comparativamente com o PIB.

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*Palavras-chave:* Análise Exploratória de Dados Espaciais; Economia da Cultura; Minas Gerais

## 1. Introduction

Since the early theories about the mankind, still in the classic period – Greece and Rome – the culture has been seen as the expression of man, what they were able to see in nature and were able to feel. Although many centuries have passed, this classic thinking endured, being reproduced by several intellectuals. Thinking the cultural issue as an economic phenomenon is more recent, and began to be formalized in the end of the 18th century.

Adam Smith, as David Ricardo, did not understand culture as an economic industry, in other words, be able to generate income and profit. Alfred Marshall, in 1819, in his *Principles of Economics* affirmed that it was impossible to evaluate objects as painting from the great masters or rare coins; they are unique objects in their kind, so there are no equal or rival goods (Benhamou, 2007).

The economics neglected for almost two centuries the so-called cultural economics. It started to be studied and spread in the 1960s with the seminal work of Baumol and Bowen (1966). Blaug (2001) makes a comprehensive literature review regarding the cultural economics field and concludes that the studies are more empirical than conceptual.

*The Journal of Cultural Economics* can be seen as an incentive to research in this field, as the journal can spread it into the Economics, however, this discussion is still too limited to the Anglo-Saxon countries. The analysis of this industry is still very limited in Brazil.

Until the 1960s the cultural industry was not considered to be able to generate flows of income and employment. Then, as the studies of culture as an economic phenomenon were formalized, it was able to see it as a strategic industry with 7% of World GDP in 2006 as estimated by the World Bank. Furthermore, according to Soares (2008) the cultural industry grows in higher rates than the economy as a whole.

In Brazil, in 1998 the Ministry of Culture hired the Fundação João Pinheiro (FJP)<sup>1</sup> to do the first survey of cultural economics in Brazil (FJP, 1998). From this report, we can see that workers in the cultural industry are 30% better paid than other workers; moreover, the industry grows in higher rates than the Brazilian economy. Bertini (2008) highlights that not only the cultural industry pays better, but also it has generated more employment in general than other industries, according to the Ministry's research. These results are corroborated by the Instituto Brasileiro de Geografia e Estatística (IBGE) research called “*Sistema de Informação e Indicadores Culturais 2003-2005*” (IBGE, 2007).

According to Gomes (2008), the cultural industry is growing and, besides, there has been an increase in productivity. This process tends to be maintained for the next few decades, hence, more productive individuals with more free time and higher income, will have more access to leisure and entertainment.

In Brazil, to our knowledge, there is no scientific work that deals with the cultural issue in a microregional level for Minas Gerais state.<sup>2</sup> It is noteworthy that the Minas Gerais state was the first one in the country with laws covering cultural issues, even though it was only cultural heritage at the time.

This paper aims to implement a spatial analysis of cultural activities for each microregion of Minas Gerais through the construction of a synthetic index that is able to aggregate relevant information regarding characteristics of cultural activities. Furthermore, we analyze the spatial structure of the index, detecting possible formation of spatial patterns.

This paper is divided into four more parts. Firstly, we do a literature review on the so-called ‘cultural economics’ which allows us to contextualize the subject and refer the choice of variables used. Secondly, we present the dataset used. Thirdly, both methodologies used are presented, first the Factorial Analysis and then the Exploratory Spatial Data Analysis, each with their results. In short, we could verify the formation of three factors that explain the cultural activities: one factor of cultural activities and structure, one related to means of access to culture, and a third factor

<sup>1</sup> An agency of the Minas Gerais government for social and economic research.

<sup>2</sup> We are not considering the survey from Fundação João Pinheiro that basically treated the information in national or municipal level.

related to culture management. Moreover, there was the formation of cultural clusters in the state. Finally, the final considerations are made.

## 2. Cultural economics

This section emphasizes some themes that are important to line off the study of cultural economics. To better understand the cultural economics field the first step is to delimit the scope of study and present the definition about the topic, as well as to let it explicit which definition we are using in this paper. Secondly, we highlight the economic analysis of the cultural industry, once as noted by several authors, it has been neglected for quite some time. Finally, we show the connection between the topic and regional development, in special, to the Brazilian case. Ergo, approaching these three issues it will be possible to evidence essential aspects to the understanding of cultural development features.

### 2.1. *Delimitation and conceptualization of cultural economics*

Before we start any discussion regarding cultural economics it is necessary to delimit it. However, to understand what the cultural economics is, we need to know what culture is. Although we have a common sense of what, in general, culture is, its definition according to UNESCO (2005) and Choi, Papandrea and Bennet (2007, p. 317) is: “the entire spirit of a people in terms of its values, actions, works, institutions, and sites”

As it is a broad term, and presents in its concept intangible questions, such as values and actions, it is consensus among economists, as we can see in the several studies, to delimit the cultural study to its manifestations such as arts, movies and popular demonstrations, for example.

Throsby (2001) affirms that there are two ways of using the term culture. The first one is anthropological or sociological. It describes the attitudes, beliefs, morals, behaviors, values and practices that are common or shared by a group, being it political, geographical or religious. The features that define these groups can be understood as ‘substantives’ in form of signs, symbols, texts, languages, artifacts and oral or written traditions. One of the main functions of cultural manifestation of such groups is to establish, or at least to try to establish, a distinct identity. Therefore, this definition is useful to examine the role played by cultural factors in the economics performance and in the relation between culture and development.

The second definition, which will be used in this paper, has a more functional orientation denoting certain activities that are undertaken by people. The product of such activities is related to the intellectual/creativity, moral, and artistic aspect of human life. In this sense, the word seems more like an adjective rather than a noun, as for example ‘cultural goods’. To be more precise, the author suggests three characteristics for these activities: (a) involve some sort of creativity in their production; (b) generation and communication of symbols that make sense; (c) the product have, even if in potential, some sort of intellectual property. These characteristics, however, are not sufficient to provide a functional definition of cultural goods and services. Nevertheless, they can be used as a first step for a more clear definition.

### 2.2. *Culture and economics*

As stated in the introduction, culture has been neglected for almost two centuries as a productive industry. However, since the 1960s, economists have been studying the culture, creating then a new field for research. The first work was the book by Baumol and Bowen, in which they studied the live show economics, entitled ‘Performing Arts: The Economic Dilemma’, published in 1966. Later, there were the studies by Gary Becker, whose work concerns the consumption and its increase over time due to the appreciation, and Alan Peacock that paves the way for the study of the cultural economics. (Benhamou, 2007).

The economic analysis of culture for Benhamou (2007) is due to three factors: the emergence of a propensity to generate flows of income or employment, the necessity to evaluate cultural decisions and in the theory aspect, the evolution of political economics.

According to Bertini (2008), beyond the substitution of common production factor for creative human capital – i.e., a new allocation of the production factors in which the creative human capital is more valued than land and capital – there is also the increasing demand of activities to escape from the stress of life in urban centers. It is noteworthy that such activities generate income, flows of inputs (employment) affecting, therefore, the national product.

### 2.3. Regional aspects

An important debate that comes to light is the regional questions and how this industry can contribute to the regional development. According to [Diniz \(2009\)](#) the productions and consumption of artistic-cultural goods induce the regional development, once there are direct and indirect effects. The former, is related to the generation of employment and income, as well as the attraction of firms and workers to the region. The latter, is related to the production of intangible goods that are connected to the identity of a region.<sup>3</sup>

[Markusen and Schrock \(2006\)](#) point to the diversification of local economies from the introduction of artistic activities that can contribute to the economic development from increasing exports and the substitution of imports, generating multiplying intern effects.

[Markusen and King \(2003\)](#) study regional development associated to the idea of artistic work. In the same line, [Markusen et al. \(2008\)](#) work with the regional development issue associated to the cultural industry'. This term is developed by the authors from the work by [Hesmondhalgh \(2002\)](#) and [Markusen et al. \(2008\)](#), who tries to create a concept that can be used and understood broadly, filling the gap of a clear and transparent definition that there is in the conceptualization, differentiation and comparison between culture and creativity. On the other hand, [Cassiolato \(2008\)](#) affirms that one must think in terms of creative industry in detriment of cultural industry.

The discussion of cultural economics is still incipient in Brazil, with few research centers dedicated to this field of study, especially considering regional questions. However, the discussion of culture themes in economics is increasing. One important contribution was the publication of the book of Françoise Benhamou translated to Portuguese in 2007. The book of Alfredo Bertini from 2008, discusses some specific cases from Brazil. It is also possible to highlight the books of Paul Tolila ([Tolila, 2007](#)), also translated to Portuguese and the work of [Valiati and Florissi \(2007\)](#), [Reis \(2002, 2006\)](#) and [Reis et al. \(2008\)](#).

From 2008 ahead it is possible to notice in Brazil, based on the number of papers presented in meetings and conferences, that the theme is gaining ground in the economic debate. We can cite some works such as [Silva et al. \(2008\)](#), [Bem and Giacomini \(2008, 2009\)](#), [Duarte and Menezes \(2008\)](#), [Valiati \(2008\)](#), [Diniz and Machado \(2009\)](#), [Santana and Menezes \(2009\)](#), [Porsse et al. \(2009\)](#), [Diniz \(2009\)](#), and [Ferreira Neto et al. \(2012\)](#) that make a regional approach of the cultural issue. It is important to stress however, that none of them, although working at regional aspects, at any moment, try to verify or compare regions regarding these cultural regional characteristics.

Summing up, there are several issues raised by the authors that points towards relevant questions. It is possible to highlight a few, such as: (i) generation of employment and income, discussed by [Benhamou \(2007\)](#), [Bertini \(2008\)](#), [Diniz \(2009\)](#), [Porsse et al. \(2009\)](#) and [Ferreira Neto et al. \(2012\)](#); (ii) production and consumption of artistic and cultural goods, discussed by [Markusen and Schrock \(2006\)](#), [Diniz \(2009\)](#), [Porsse et al. \(2009\)](#), [Duarte and Menezes \(2008\)](#), [Santana and Menezes \(2009\)](#) and [Diniz and Machado \(2009\)](#); (iii) regional development, discussed by [Markusen and King \(2003\)](#), [Markusen and Schrock \(2006\)](#) raising questions related to the diversification of local economies and artistic activities, [Markusen et al. \(2008\)](#) arguing about creative and cultural industry, beyond others, such as [Valiati \(2008\)](#), [Bem and Giacomini \(2008, 2009\)](#), [Silva et al. \(2008\)](#) and [Tatsch et al. \(2009\)](#).

Finally, this paper tries to fill in a gap in the literature by analyzing the cultural aspects in spatial terms, and therefore, comparing several regions, in our case, the microregions of Minas Gerais. We have no knowledge that a work that does the same for Brazil or any other country has been developed so far.

### 3. Database

In this paper we will use as dataset the supplement of culture from the “*Pesquisa de Informações Básicas Municipais – MUNIC de 2006*” ([IBGE, 2006](#)). MUNIC has been made since 1999 and do a detailed survey of municipal information such as structure, dynamics, functioning of institutions, among others. The data collection took place between September/2006 and March/2007 investigating the 5564 existing municipalities until December 31, 2006. The data was collected using two questionnaires.

<sup>3</sup> In this sense, the REDESIST – Rede de Pesquisa em Sistemas e Arranjos Produtivos e Inovativos Locais – developed works ([Redesist, 2008](#)) related to cultural Local Productive Arrangements in the state of Rio de Janeiro. From these works we can cite the one of [Matos and Borja \(2008\)](#) in which the map the cultural activities in Rio de Janeiro, and point to some difficulties, such as definition and data, that can mask the results.

Table 1  
Synthesis of the variables used in the model.

Main issues	Authors	Variables in dataset*
Generation of flows of income and employment	<ul style="list-style-type: none"> <li>• Benhamou (2007)</li> <li>• Bertini (2008)</li> <li>• Diniz (2009)</li> </ul>	PMC, SNC, LMC, LMPC, FMC, FdMC, T, G, G_T
	<ul style="list-style-type: none"> <li>• Porsse et al. (2009)</li> <li>• Ferreira Neto et al. (2012)</li> <li>• Markusen and Schrock (2006)</li> </ul>	CUR_1, CUR_2, CUR_3, TUR, CONC, FEST, FEIRA, EXP, GA, JORN_1, RFM, NET, TV, EST, CLUB_1 CIN, SHOP, CLUB_1
Production and consumption of cultural and artistic goods	<ul style="list-style-type: none"> <li>• Diniz (2009)</li> </ul>	
	<ul style="list-style-type: none"> <li>• Porsse et al. (2009)</li> <li>• Duarte and Menezes (2008)</li> <li>• Santana and Menezes (2009)</li> <li>• Diniz (2009)</li> <li>• Markusen and King (2003)</li> </ul>	PMC, SNC, LMC, LMPC, FMC, FdMC, FcEF, FcEM, FcES, FcPG, T, G, G_T, JORN_1, RM, RCOM, NET, TV, FEST, FEIRA, CONC, EXP, CENCULT, BIBPUB, MUS, TEAT
Regional development	<ul style="list-style-type: none"> <li>• Markusen and Schrock (2006)</li> <li>• Markusen et al. (2008)</li> <li>• Duarte and Menezes (2008)</li> </ul>	
	<ul style="list-style-type: none"> <li>• Valiati (2008)</li> <li>• Bem and Giacomini (2008, 2009)</li> <li>• Silva et al. (2008)</li> <li>• Tatsch et al. (2009)</li> </ul>	

Source: The authors.

\* Variables definition are in [Appendix A](#).

The municipal information are available as ‘amount of’ or in simple ‘yes’ or ‘no’ questions. In this kind of dataset we have two restraints: (a) there is no variance between the variables; and (b) they do not allow us to use multivariate analysis’ techniques. Hence, we chose to use the variables in a microregional level. Beyond that, according to the authors in the theory section, the use of microregion shows itself appropriate since the phenomenon of cultural activities is not limited to municipal space, once there is a regional spreading of these activities. As the municipalities are geographically close to each other, the intensity of microregional circulation of workers, goods, income, among others is bigger. This can be seen as an engine to push the regional development of cultural activities.

There were several variables available, from which we extracted 35 variables that better represented the factors as cultural activities, cultural management, means of access to culture and cultural structure ([Appendix A](#)). The dataset shows that regarding management, several microregions do not have any law or municipal funding for cultural as a whole or cultural heritage. Concerning the employers, most of them have at least High-School Education and half of the workers have superior education.

The means of access data are more regular and less dispersed. We can highlight the variables of number of TVs, or broadcasters and the number of libraries that have a small mean and a bigger dispersion among the microregion.

The choice of the variables for the construction of the Development Potential of Cultural Activities tried to represent the issues raised in the theoretical section such as: production and consumption of cultural goods, regional identity, correlation between introduction of cultural activities and economic development, generation of employment and income, and cultural industry following the studies of [Diniz \(2009\)](#), [Markusen and Schrock \(2006\)](#), [Markusen and King \(2003\)](#), [Markusen et al. \(2008\)](#) and [Cassiolato \(2008\)](#), in which such issues are extensively discussed. Hence, in [Table 1](#) we explicit how these main issues already discussed are related with the variables in dataset.

## 4. Results

To study the potential of activities or cultural industry in the microregions of Minas Gerais, we use the factorial analysis. On the other hand, to do the spatial analysis of the cultural activities potential we use Exploratory Spatial Data Analysis, ESDA. This section is divided in two. The first, presents the factorial analysis methodology and results, while the second presents the ESDA techniques and their results.

### 4.1. Development Potential of Cultural Activities

#### 4.1.1. Factor analysis

The factor analysis is a statistics technique that differs from dependence techniques, and is used to identify similar characteristics (factors) in a set of variables that are correlated, seeking a more parsimonious set without losing significant information. Therefore, the factors are used to maximize the power of explanation of a determinate set and not to forecast (Perobelli et al., 1999; Johnson and Wichern, 2002; Hair et al., 2005; Melo and Parré, 2006).

There are two purposes on the usage factor analysis: the first tries to group the variables according to a pattern of similarities of profile, while the second tries to group to delineate patterns of variation of the characteristics and according to Andrade (1989) allows us to distinguish factors that can be interpreted as stages of economic development.

In the factor analysis model, each variable is the linear combination of common factors that will explain part of the variance of each variable plus a deviation that sums the portion of the non-explained total variance (Rezende et al., 2007). The estimative of common variances between the variables is denominated communality. It varies between zero and one, and the closer it is to one, the more the variable explains (Andrade, 1989; Johnson and Wichern, 2002; Hair et al., 2005).

Andrade (1989) describes four steps that must be followed to determine the factor analysis model<sup>4</sup> correlation matrix, extraction of initial factors, rotation of the factors and calculus of factor score.

The statistic tests used at factor analysis are the Kaiser–Meyer–Olkin test (KMO) and the Barlett Test of Sphericity (BTS). The former examines the data adjustment, considering all the variables at once. The latter, tests the hypothesis that the correlation matrix is an identity matrix.

Then, to determine the index of latent Development Potential of Cultural Activities, the following steps are done: (a) with the matrix of variables normalized, we multiply the value of each of the new variables by the corresponding factor loading, and when summing the variables, the factor scores are formed; (b) we weight the factor score by the explained variance to get the Development Potential of Cultural Activity (DPCA).

#### 4.1.2. Results

Applying the factor analysis we obtained the index Development Potential of Cultural Activity (DPCA). Firstly, we reduced the number of variables used in the model from 35 to 20, as they adhere better to the model, as we can see in Table 2 that presents the communalities of the used variables. To avoid heterogeneity problems due to the difference between regions of the state, as detailed in Appendix B, we used intensive variables. If we do not use intensive variables we can have spurious correlation between the variables of interest and the area or population of the regions.

Usually, we use the factors which the eigenvalue is higher than one, however, due to the variables in the dataset, and basing ourselves in Table 1, we chose to concentrate the variables in three factors. Then, the first factor represents the cultural activities and cultural structure, the second factor features the means of access to culture and the third the cultural management. Hence, we assume that these factors, which aggregate the variables in the dataset, represent properly the issues regarding generation of flows of income and employment, factors one and three; production and consumption of cultural-artistic goods, factors one and two; and regional development, factors one, two, and three.

The model explains as whole 77.016% of total variance (Table 2). Applying the KMO test to access all the variables at once we have a result of 0.882, which according to Perobelli et al. (1999) can be considered a very good level of adjustment of the variables to the model. This result not only enables the use of factor analysis, but also makes it recommended. The BTS test was also applied and the result was 1547.291, with significance level equal to zero.

In Table 2 it is possible to notice that the factors are sorted from the highest eigenvalue to the lowest. The communalities are in general high, and only two of them are below 0.60, but above 0.40, evidencing an appropriate degree of

<sup>4</sup> For more details see: Haddad (1988), Perobelli et al. (1999), Haddad (1988), Hair et al. (2005), and Rezende et al. (2007).

Table 2  
Communalities, loadings, eigenvalue and variance.

	Variables	Communalities	Loadings	Eigenvalue	% of variance	% cumulative
1	Cultural Tourism	0.818	0.812	11.898	34.730	34.730
	Cultural Contests	0.610	0.591			
	Cultural Festivals	0.756	0.728			
	Cultural Fairs	0.772	0.680			
	Cultural Exposition	0.805	0.735			
	Arstitic Groups	0.882	0.726			
	Published News	0.777	0.698			
	Public Libraries	0.856	0.630			
	Museums	0.791	0.806			
	Theaters	0.854	0.827			
	Cultural Centers	0.529	0.664			
	Movies	0.615	0.679			
2	FM Radios	0.495	0.605	2.362	21.873	56.603
	Community Radio	0.659	0.776			
	Internet	0.654	0.702			
	TV	0.856	0.780			
3	Emp. Fund. Edu.	0.940	0.930	1.144	20.413	77.016
	Emp. High School	0.907	0.823			
	Emp. Sup. Edu.	0.914	0.941			
	Func. Post. Grad.	0.914	0.839			

Source: The authors.

explanation of each of them. Regarding the factor loadings of the rotated model, [Rezende et al. \(2007\)](#) affirms that the coefficients on the columns represent the relation between each variables and their respective factor.

Ergo, from [Table 2](#), regarding the factors we can affirm that:

- 1 Factor 1 has 34.730% of total variance of the model. This factor concentrates information of cultural activities and cultural structure, so it was named ‘Cultural Activities and Structure’. It is composed by 12 variables, all positively related to it. All the variables are next to or above 0.60.
- 2 Factor 2, which concentrates information on means of access to culture and activities related to it, has 21.873% of total variance of the model. It was named ‘Means of Access to Culture’ and is composed by 4 variables, all positively related to it in a level higher than 0.60.
- 3 Factor 3, concentrates the information of cultural management in the microregion and was named ‘Cultural Management’. It has 20.413% of total variance of the model and is also composed by 4 variables, all positively related to it in a level higher than 0.80.

To better visualize the factors, we present them in [Figs. 1–3](#). As there are too many values close to each other, we decided to create seven categories in which not only the factors, but also the index created, the DPCA, could be classified. Hence:

- ELP – Extremely Low Potential – 0–10%;
- VLP – Very Low Potential – 10–26%;
- LP – Low Potential – 26–42%;
- MEP – Medium Potential – 42–58%;
- HP – High Potential – 58–74%;
- VHP – Very High Potential – 74–90%;
- EHP – Extremely High Potential – 90–100%;

In [Fig. 1](#) we can notice that the highest values for factor 1, which represents ‘Cultural Acitivites and Structure’ are more concentrated below Belo Horizonte, from an imaginary line lined off just above the microregion. It is also possible to see some agglomerations of both, low and medium values. A more heterogeneous pattern is noteworthy.



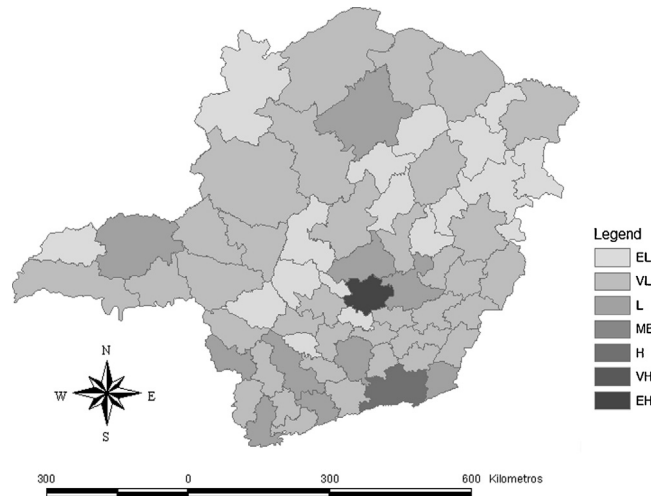


Fig. 1. Map of factor ‘Cultural Activities and Structure’ of Minas Gerais’ microregions.

Source: The authors.

Fig. 2 emphasizes the lowest values in general for the state regarding the factor ‘Means of Access to Culture’. The highest values are in the regions Zona da Mata, Campo das Vertentes, Sul/Sudoeste and Região Metropolitana, highlighting Belo Horizonte (the highest value), Juiz de Fora, Manhuaçu, Itabira and Varginha. It is possible to notice that this is the factor with the highest potential, in other words, there is more concentration of microregions with medium or bigger values than the average.

The map with the third factor which represents the ‘Cultural Management’ (Fig. 3) shows a more homogeneous pattern if compared to factors one and two. The microregions of Belo Horizonte (second highest value), Caratinga (highest value), Montes Claros and Uberlândia stand out from the other. We can notice that these microregions are isolated and some patterns of agglomeration of small values seem to appear.

Observing figures one to three it is possible to do some inference regarding the particularities of each factor that will form the Development Potential of Cultural Activities (DPCA). It is important to highlight their spatial distribution and the microregions’ distribution concerning the seven categories. For factor 1, there is a concentration of the result in the lowest categories. Focusing in the variables that constitute this factor it is possible to infer that there is a heterogeneous spreading of cultural equipments in the state, such as: museums, theaters, cinemas, and cultural centers.

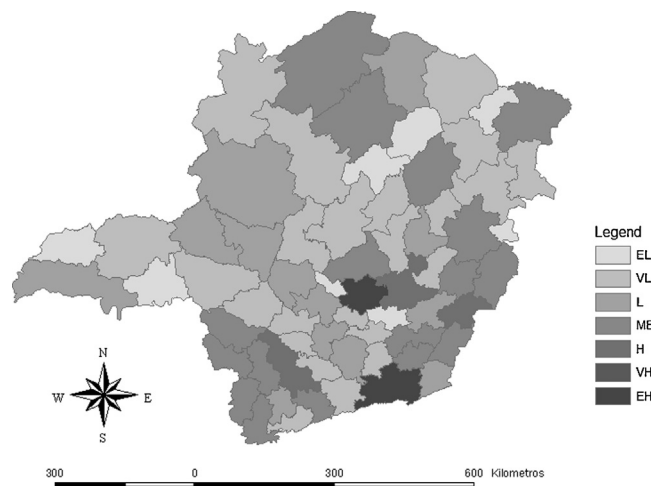


Fig. 2. Map of factor ‘Cultural Activities and Structure’ of Minas Gerais’ microregions.

Source: The authors.

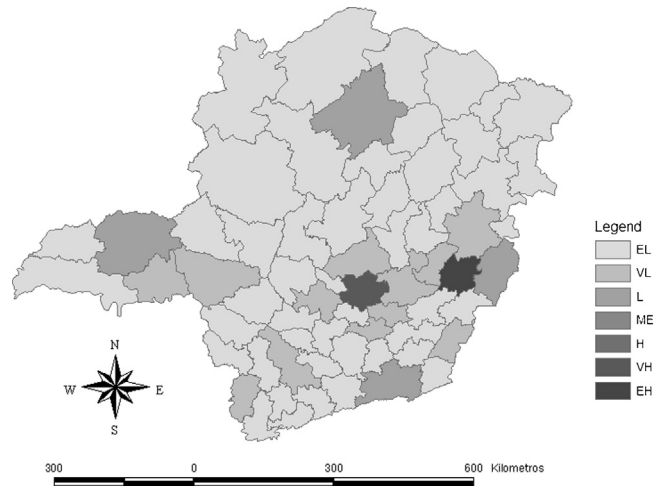


Fig. 3. Map of factor 'Cultural Management' of Minas Gerais' microregions.

Source: The authors.

On the other hand, factor 2 is the one that shows more concentration in the highest categories, in other words, the ones above the average. It is interesting to notice that in terms of spatial dispersion this is the factor that presents the most homogeneous results in the state. Therefore, observing the variables that are in this factor it is possible to affirm that they are more accessible to all microregions in the state. This is the same to say that, with the increase in the income of households and the income classes' movement in the country, items such as access to internet and TV are more accessible too, ergo, the access to cultural activities in the state became more homogeneous.

As for factor 3, about cultural management, the homogeneity in the lower categories is a picture of the structure, still heterogeneous in the sector. This is explained because the cultural industry, in terms of formal organization and public administration, for example, is still incipient. Thus, we can verify that microregions with more participation in the state's GDP stand out, for example.

The Development Potential of Cultural Activities (DPCA) was constructed by the addition of the factor scores weighted by the variance. From the raw index, to make it easy to analyze the results, we calculated the index as percentage – we considered the lowest value equal to zero and the highest equal to 100%, the others were obtained by interpolation (Table 3).

The results point toward a low value of the DPCA calculated. From the 66 microregions, only two present a DPCA higher than 50%. From the others, 51 have a DPCA lower than 25%, and 11 microregions have a DPCA between 25% and 50%. Hence, to better group the microregions we used the classification outlined above, in which we classify the DPCA in seven categories: Extremely Low, Very Low, Low, Medium, High, Very High and Extremely High.

We can observe, then, that 17 microregions have an extremely low potential, and from these, most are in the regions Jequitinhonha and Norte de Minas. 36 microregions, more than half, have a very low potential, and 11 have a low potential. This means that, 64 out of 66 microregions present low Development Potential of Cultural Activities. From the two remaining, one has a high potential and one an extremely high potential.

Therefore, we highlight that the microregions' status regarding cultural activities is below the expected, mainly due to the fact that Minas Gerais has a 'cultural law'. It is noteworthy, however, that microregions such as Ouro Preto, Diamantina and São João Del Rei, that are known for their great historical and cultural heritage collections, have low DPCA; Uberlândia, Barbacena and Ipatinga, microregions with high economic impact in the state, also have low DPCAs. This might be due to the fact that, the dataset is limited, and the analysis in this paper is considering the spatial unity as microregions and not the municipality itself.

Fig. 4 shows the Development Potential of Cultural Activities. By adding the three factors previously outlined, we can see that some of their patterns in some way remains, being factor 1 the one that most contributes to such patterns. The microregions of Belo Horizonte and Juiz de Fora stand out from the others. In the region Triângulo Mineiro and in the region Norte de Minas, the microregions Uberlândia and Montes Claros, respectively, also stand out. It is also

Table 3  
Development Potential of Cultural Activities – classification.

Microregion	DPCA%	DPCA-C	Microregion	DPCA%	DPCA-C
GRAO MOGOL	0.00	ELP	ALFENAS	16.84	VLP
BOCAIUVA	0.78	ELP	BARBACENA	17.15	VLP
PEDRA AZUL	1.92	ELP	PARACATU	17.25	VLP
UNAI	2.77	ELP	FRUTAL	17.57	VLP
PECANHA	2.88	ELP	ARAXA	18.08	VLP
MANTENA	3.73	ELP	ANDRELANDIA	18.22	VLP
ARACUAI	4.25	ELP	PATROCINIO	18.51	VLP
NANUQUE	4.58	ELP	GOVERNADOR	19.12	VLP
			VALADARES		
PARA DE MINAS	6.15	ELP	ALMENARA	19.21	VLP
CAMPO BELO	6.15	ELP	JANUARIA	19.22	VLP
TRES MARIAS	6.53	ELP	CONSELHEIRO	19.40	VLP
			LAFAIETE		
ITAGUARA	6.63	ELP	AIMORES	20.65	VLP
PIUI	6.67	ELP	ITAJUBA	20.72	VLP
ITUIUTABA	6.75	ELP	UBA	21.21	VLP
BOM DESPACHO	7.80	ELP	DIVINOPOLIS	21.30	VLP
DIAMANTINA	7.84	ELP	PONTE NOVA	22.82	VLP
TEOFILO OTONI	8.51	ELP	PASSOS	23.02	VLP
GUANHAES	10.67	VLP	MURIAE	23.06	VLP
CURVELO	11.54	VLP	VICOSA	23.28	VLP
CONCEICAO DO	11.73	VLP	POCOS DE CALDAS	23.59	VLP
MATO DENTRO					
PIRAPORA	12.40	VLP	POUSO ALEGRE	26.81	LP
JANAUBA	13.40	VLP	SAO JOAO DEL REI	28.18	LP
LAVRAS	13.49	VLP	CATAGUASES	28.43	LP
PATOS DE MINAS	13.56	VLP	UBERLANDIA	29.03	LP
UBERABA	14.32	VLP	MONTES CLAROS	29.10	LP
FORMIGA	14.41	VLP	SETE LAGOAS	29.15	LP
OURO PRETO	14.83	VLP	CARATINGA	31.02	LP
CAPELINHA	14.90	VLP	SAO SEBASTIAO	31.74	LP
			DO PARAISO		
SALINAS	15.01	VLP	ITABIRA	34.35	LP
IPATINGA	15.76	VLP	SAO LOURENCO	34.59	LP
MANHUACU	16.37	VLP	VARGINHA	36.12	LP
SANTA RITA DO SAPUCAI	16.56	VLP	JUIZ DE FORA	63.29	HP
OLIVEIRA	16.82	VLP	BELO HORIZONTE	100.00	EHP

Source: The authors.

remarkable that the regions Sul de Minas, Região Metropolitana and Zona da Mata concentrate most microregions with the highest values of DPCA.

The map of DPCA (Fig. 4) initiates the ESDA analysis. As pointed out by Almeida et al. (2005), one of the first steps to sense a cluster formation is through the visualization of maps in the case of raw index, and then, we can use the appropriate spatial statistics in order to verify the formulated hypothesis.

One variable that might be related to the Development Potential of Cultural Activities is the Gross Domestic Product (GDP). Analyzing the correlation between the DPCA and GDP we find out a 76,72% of correlation, which can be seen as a relevant one. Fig. 5 exhibits a scatter plot between the log of GDP (%)<sup>5,6</sup> and the log of DPCA (%). We can highlight the grouping of microregions, while three stand out. Belo Horizonte with the highest GDP and DPCA;

<sup>5</sup> Obtained as the DPCA (%).

<sup>6</sup> Another variable that could be highly related to DPCA is the HDI. From the Municipal-HDI available at PNUD (2009) – the Atlas de Desenvolvimento Humano do Brasil (Brazilian Human Development Atlas) of PNUD, we calculated three Microregional-HDI, one by the average, the second by a weighted average and third using the HDI of the town that name the microregion. The correlation level was low, 17%, 26% and 35%, respectively. Therefore, we did not do more detailed analysis.

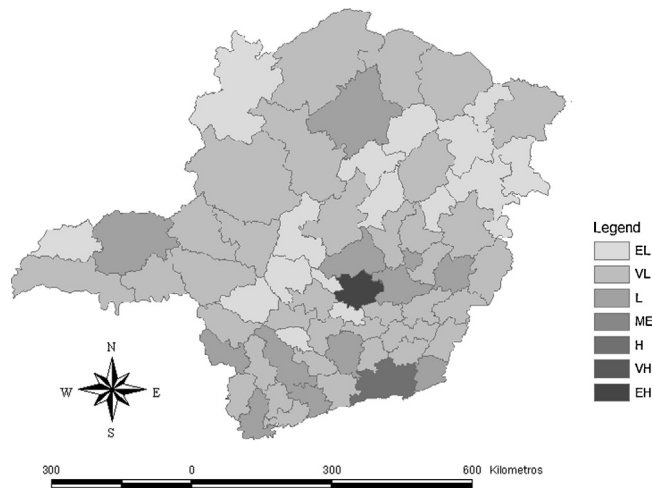


Fig. 4. Map of Development Potential of Cultural Activities of Minas Gerais' microregions.

Source: The authors.

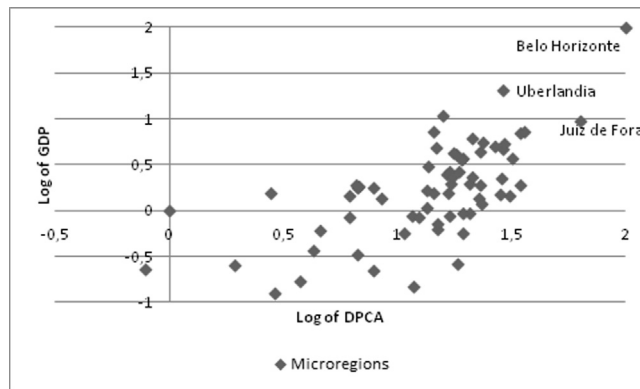


Fig. 5. Scatter plot of the log of DPCA versus the log of GDP.

Source: The authors.

Uberlândia with the second GDP and a intermediate position in the DPCA classification; and Juiz de Fora, the second highest DPCA and the third highest GDP.

#### 4.2. Exploratory Spatial Data Analysis

The ESDA analysis allows us to describe the spatial distribution that can reveal spatial patterns, expose spatial regimes, and other kinds of spatial instability, besides identifying atypical observations. This technique has the advantage of treating the spatial effects (Anselin, 1996; Varga, 1998; Le Gallo and Ertur, 2003; Gonçalves, 2005).

Messner et al. (1999) and Perobelli et al. (2007) affirm that rigorously significant grouping cannot perceive by the naked eye, hence there is the tendency to bias the analysis in order to find pattern even if the data are random. Therefore, according to Anselin (1995), the methods we will use allow us to extract measures of spatial and local autocorrelation, and via quantitative instruments it is possible to investigate the influence of spatial effects.

In this paper we use: (a) the Moran's  $I$ ,<sup>7</sup> which is a statistic that tests the hypothesis of spatial randomness; (b) Moran Scatter Plot<sup>8</sup>, which is according to Anselin (1996) a tool that allows us to visualize and identify the degree of

<sup>7</sup> More detail in Almeida et al. (2005), Le Gallo and Ertur (2003), Gonçalves (2005) and Perobelli et al. (2007).

<sup>8</sup> More details in Anselin (1996), Gonçalves (2005) and Perobelli et al. (2007)

Table 4  
Spatial weight matrices.

Matrices	Moran's <i>I</i>	<i>P</i> -value*
$k = 5$	0.095	0.0496
$k = 6$	0.1177	0.0224
$k = 7$	0.1053	0.0211

Source: The authors using GeoDa™.

\* Empirical Pseudo-significance based on 10,000 permutations.

Table 5  
Probability transition matrices.

	$k = 5$	NS (%)	HH (%)	LL (%)	HL (%)	LH (%)
$k = 6$	NS	98.00	1.33			0.67
	HH	66.67	33.33			
	LL			100.00		
	HL				100.00	
	LH					100.00
	$k = 7$	NS (%)	HH (%)	LL (%)	HL (%)	LH (%)
$k = 6$	NS	94.34			5.66	
	HH		100.00			
	LL			100.00		
	HL				100.00	
	LH					100.00

Source: The authors using GeoDa™.

instability in the spatial association through the Moran's *I*. It also allows us to interpret the Moran's *I* as the coefficient in the regression of  $W_y$  against  $y^9$ ; and (c) Local Indicators of Spatial Association – LISA – that Anselin (1995) defines as any statistics that satisfies two criteria: (i) the LISA brings, for each observation, indication of significant spatial agglomeration of similar values neighboring this observation and (ii) the sum of LISAs for all observations is proportional to the global index of spatial association.

To do the Exploratory Spatial Data Analysis (ESDA), it is necessary to use a spatial weight matrix. Almeida et al. (2005) and Gonçalves (2005) suggest that the decision of which matrix to use to be based on a table such as Table 4.

In this table it is showed the Global Moran's *I* for each matrix and their probability value. To choose the best neighborhood matrix we must look at its significance. If all matrices are significant, we must choose the one that has the highest value for the Moran's *I* statistic. Therefore, as we can see in Table 4, in this paper we will use the  $k = 6$  matrix as it is significant and has the highest value.

Perobelli and Haddad (2006), to test the strength of the chosen spatial weight matrix, suggest that we use a probability transition matrix. The strength is guaranteed when using a  $k$  neighbor matrix, even if the spatial weight matrix were changed, the regions remain in the same situation (Le Gallo and Ertur, 2003; Perobelli and Haddad, 2006).

Table 5 presents two probability matrices to test the chosen spatial weight matrix's strength, once, as pointed out, the correct choice is important as it will impact the results. From the results, it is possible to affirm that as the results vary little, the  $k = 6$  neighbor matrix is robust and has consistent results.

#### 4.2.1. Univariate analysis of the Development Potential of Cultural Activities index

The first spatial analysis that is done is the univariate one, i.e., how the neighbor's DPCA spatially relates to the DPCA of a determined microregion. After verifying some patterns from Fig. 4 and choosing an appropriate spatial weight matrix, we have to construct a Moran Scatter Plot (Fig. 6).

<sup>9</sup> In the Moran Scatter Plot the results when plotted are standardized.

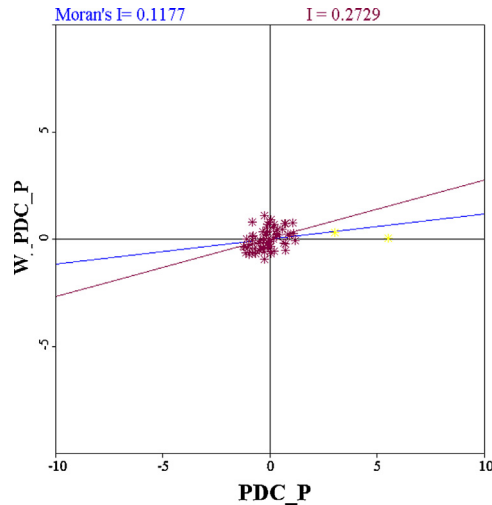


Fig. 6. Univariate Moran Scatter Plot.

Source: The authors.

From Fig. 6 we can assert that the value of the global Moran’s  $I$  is 0.1177, and from Table 4 we know that its  $P$ -value is 0.0224, therefore, significant at a 5% level. It is possible to notice that there are two leverage points, Juiz de Fora and Belo Horizonte. If removed, the Moran’s  $I$  become 0.2729. Furthermore, most data have a positive autocorrelation.

The cultural clusters map, Fig. 7, shows some spatial association regarding the Development Potential of Cultural Activities. We notice the formation of a Low–Low cluster (LL) = Low DPCA surrounded by Low DPCA – formed by the microregions of Salinas, Pedra Azul, Aracuaí, Téofilo Otoni, Nanuque, Capelinha, Diamantina and Curvelo. It is possible to say that the LL cluster is located in the regions of Minas Gerais that have the lowest GDP and per capita GDP (Appendix C). Another relevant observation is that the HDI of these regions are also low. Ergo, using variables such as GDP and HDI we could pick up issues inherent to growth (and demand capacity) and development, these issues being determinant to the cultural issues discussed in this paper.

There is only one High–High cluster (High DPCA with neighbors with high DPCA) formed by the microregion of Conselheiro Lafaiete. Also, there are three High–Low cluster (High DPCA surrounded by low DPCA). The first is at the border of the LL cluster, and is formed by the microregion of Almerara; the second, is formed by the microrregions of

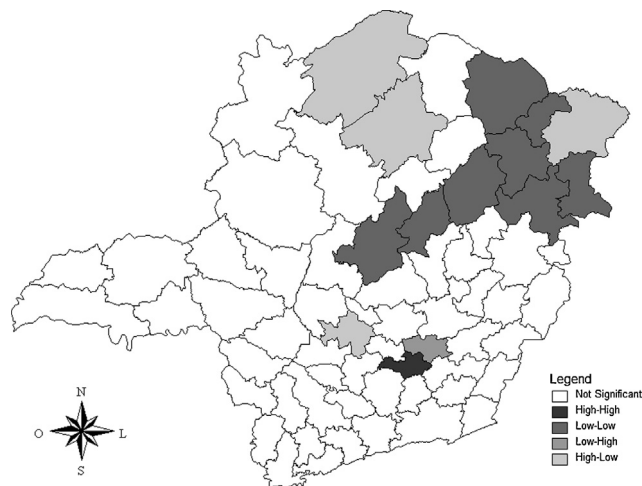


Fig. 7. Cultural clusters’ map.

Source: The authors.

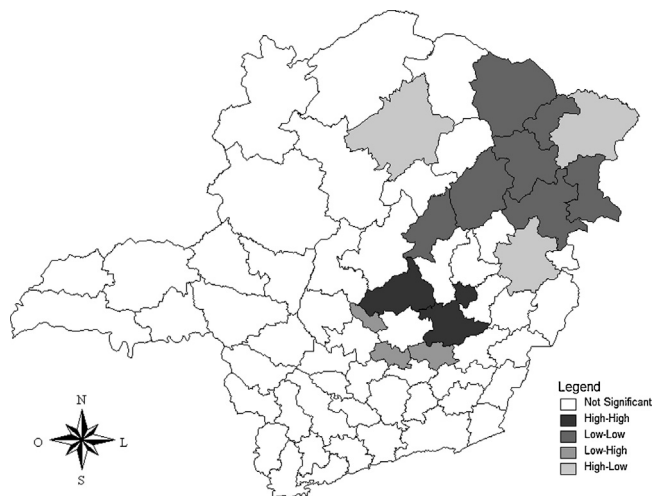


Fig. 8. Cultural clusters' map of influenced by GDP.

Source: The authors.

Januária and Montes Claros; and the third, is formed by the microregion of Divinópolis. Finally, there is one Low–High cluster – spatial unities with Low DPCA neighbored by High DPCA – formed by the microregion of Ouro Preto.

#### 4.2.2. Bivariate analysis of the Development Potential of Cultural Activities index versus Gross Domestic Product

In this section we try to verify how much the neighbors' GDP influences the Development Potential of Cultural Activities in a determined microregion. Such analysis complements the analysis previously done, and focus on the idea that a region with a high GDP, for example, can have in its characteristics better possibilities of access to culture, better and/or bigger availability of cultural equipments. It is important to highlight that the contrary is also true. Thus, it is worthy a bivariate analysis comparing the DPCA with the neighbors' GDP.

In the bivariate clusters' map, considering the Development Potential of Cultural Activities versus the GDP, presented in Fig. 8, it is possible to notice that there is the formation of a Low–Low cluster by the microregions that compose the Vale do Mucuri and Jequitinhonha regions, except Almenara, plus the microregions of Peçanha and Salinas. There is one High–High cluster formed by the microregions of Itabira and Sete Lagoas; three single-region High–Low cluster formed by Almenara, Montes Claros and Governador Valadares. Finally, there are also two Low–High clusters, one formed by the microregion Pará de Minas and the other by the microregions Itaguara and Ouro Preto.

In this context of bivariate analysis it is important to highlight that Belo Horizonte's GDP influences the clusters formed in the state's central region. As previously stated the regions with the Low–Low clusters have the worst GDP and GDP per capita.

## 5. Final remarks

This paper was intended, by using regional analysis technique, to study empirically the cultural activities as an economics and spatial phenomenon. Thus, we aimed to evaluate the development potential of such activities in the microregions of Minas Gerais state in Brazil and to evaluate the possible formation of agglomeration of such latent potential. Firstly, we used the factor analysis, that as stated by Perobelli et al. (1999) and Rezende et al. (2007) it was important to the study, as it allowed us to do a logic and satisfactory analysis, as a group, of a set of variables that are distinct but with a certain degree of correlation. The Development Potential of Cultural Activities (DPCA), drawn from three factors, Cultural Activities and Structures, Means of Access to Culture and Cultural Management, amounted to 77.016% of explanation of the proposed model. The calculus of the latent Development Potential of Cultural Activities allowed us to construct a ranking for the states' microregions regarding such issue. The development of the cultural activities of a region is also a phenomenon that is likely to be influenced by the development of cultural activities in neighboring regions. Therefore, it was necessary to test it.

Distributing the data spatially, we observed the possible formation of cultural agglomeration. In order to prove this hypothesis, secondly, we dedicated to the study of the Exploratory Spatial Data Analysis (ESDA). Using this technique we were able to analyze the DPCA as a variable spatially dependent, which was confirmed in the paper. Furthermore, we were able to notice the formation of cultural clusters in Minas Gerais, which vary depending on the lagged variables, DPCA or GDP. When, spatially lagging the GDP we observe the formation of new clusters while maintaining most of the existing clusters from when we spatially lagged the DPCA.

Ergo, both techniques used were important to the proposed study. Firstly, the DPCA showed low values of almost every microregion in Minas Gerais. Secondly, testing the spatial dependence hypothesis of the culture and its possible agglomeration, we cannot reject such hypothesis using ESDA techniques such as the Moran Scatter Plot and the clusters' map.

Taking the results presented in the clusters' map considering only the DPCA and the DPCA versus GDP, we can highlight that there is a corridor in the North of Minas Gerais where both the DPCA and the GDP are low. Moreover, the region surrounding Belo Horizonte benefit from the high GDP as well as the high DPCA of this microregion. These results, as they show themselves, not only reinforce the importance of the space in the cultural activities and its relations, but also can be used to point toward a direction where possible cultural corridors and cultural hubs can be further developed.

Once the literature discusses the cultural issue and its relation to the generation of employment and income, diversification of local economies, and, therefore, as one of the components of promoting regional development, the usage of factor analysis allows us to verify the structure of generation of income and employment in the cultural industry for the states' microregions, for example. On the other hand, the spatial distribution of such results is an instrument of cultural planning in a state scope. Therefore, this paper allowed us to understand the cultural issue in the Minas Gerais state under a hierarchical and spatial point of view.

By approaching the cultural activities for the microregions of Minas Gerais state we aimed to evidence the role of geographic and institutions' proximity. As debated in the literature, this proximity will promote more contacts, people circulation, and consequently, knowledge. As pointed out by [Benhamou \(2007\)](#), the cultural and artistic activity not only is motivated, but also dependent on such interaction among people. Besides, mapping the issues inherent to cultural activities (e.g. structure, means of access and management) can facilitate the cooperation between the spatial unities regarding the realization of cultural activities, for example. The dynamization of this industry can be explored as a vector to regional development, hence generating flows of income and employment.

This paper demonstrates the spatial relations between cultural activities, or of the Development Potential of Cultural Activities in Minas Gerais state. Possible advances are the extrapolation of Minas and consider Brazil as a whole, to further study inherent issues regarding each factor, moreover, to verify the spatial issues in these factors that compose the DPCA. Although we would expect similar results to the one from DPCA, new insights and better indexes for public policy formulation could be verified.

#### Appendix A. Variables description and their usage in the model.

Variables	Description
PMC	Municipalities in the microregion with Cultural Municipal Policy in relation to the total amount of MG.
SNC	Municipalities in the microregion with knowledge of the National System of Culture in relation to the total amount of MG.
LMC	Municipalities in the microregion with Municipal Law of Culture in relation to the total amount of MG.
LMPC	Municipalities in the microregion with Municipal Law of Heritage in relation to the total amount of MG.
FMC	Municipalities in the microregion with Municipal Fund of Culture in relation to the total amount of MG.
FdMC	Municipalities in the microregion with Municipal Foundation of Culture in relation to the total amount of MG.
FcSI	Amount of government employees in the microregion with No Formal Education in relation to the total amount of MG.
FcEF <sup>a</sup>	Amount of government employees in the microregion with Fundamental Education in relation to the total amount of MG.



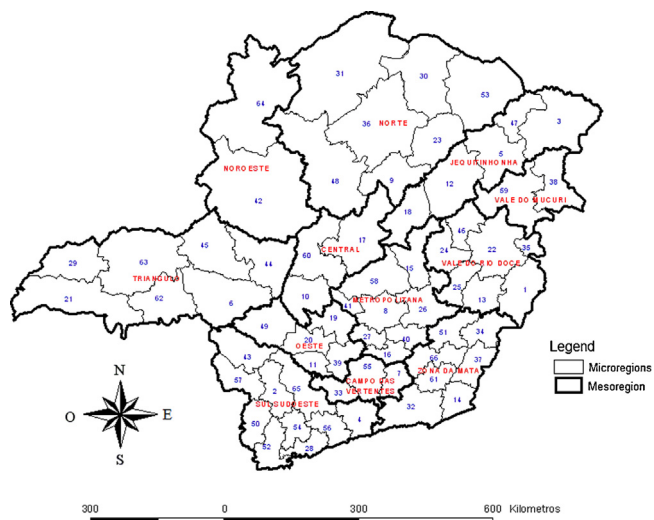
## Appendix A (Continued)

Variables	Description
FcEM <sup>a</sup>	Amount of government employees in the microregion with High-School Education in relation to the total amount of MG.
FcES <sup>a</sup>	Amount of government employees in the microregion with Superior Education in relation to the total amount of MG.
FcPG <sup>a</sup>	Amount of government employees in the microregion with Post-Graduation in relation to the total amount of MG.
T	Total amount collected in the microregion in relation to the total amount of MG.
G	Total amount spent in culture in the microregion in relation to the total amount of MG.
G.T	Total amount spent divided by the total amount collected in the microregion in relation to the total amount of MG.
CUR.1	Quantity of Courses Type 1 in the microregion in relation to the total amount in MG
CUR.2	Quantity of Courses Type 2 in the microregion in relation to the total amount in MG
CUR.3	Quantity of Courses Type 3 in the microregion in relation to the total amount in MG
TUR <sup>a</sup>	Quantity of Cultural Tourism activities in the microregion in relation to the total amount of MG.
CONC <sup>a</sup>	Quantity of Cultural Contest in the microregion in relation to the total amount in MG
FEST <sup>a</sup>	Quantity of Cultural Festivals in the microregion in relation to the total amount in MG
FEIRA <sup>a</sup>	Quantity of Cultural Fairs in the microregion in relation to the total amount in MG
EXP <sup>a</sup>	Quantity of Cultural Exposition in the microregion in relation to the total amount in MG
GA <sup>a</sup>	Quantity of Artistic Groups in the microregion in relation to the total amount in MG
JORN.1 <sup>a</sup>	Quantity of Published News in the microregion in relation to the total amount in MG
RFM <sup>a</sup>	Quantity of Fm Radios in the microregion in relation to the total amount in MG
RCOM <sup>a</sup>	Quantity of Community Radios in the microregion in relation to the total amount in MG
NET <sup>a</sup>	Quantity of Internet Provider in the microregion in relation to the total amount in MG
TV <sup>a</sup>	Quantity of TV Broadcasters in the microregion in relation to the total amount in MG
BIBPUB <sup>a</sup>	Quantity of Public Libraries in the microregion in relation to the total amount in MG
MUS <sup>a</sup>	Quantity of Museums in the microregion in relation to the total amount in MG
TEAT <sup>a</sup>	Quantity of Theaters in the microregion in relation to the total amount in MG
CENCULT <sup>a</sup>	Quantity of Cultural Centers in the microregion in relation to the total amount in MG
EST	Quantity of Stadiums in the microregion in relation to the total amount in MG
CIN <sup>a</sup>	Quantity of cinemas in the microregion in relation to the total amount in MG
SHOP	Quantity of Shopping Centers in the microregion in relation to the total amount in MG
CLUB.1	Quantity of Recreational Clubs in the microregion in relation to the total amount in MG

Source: The authors.

<sup>a</sup> Used in the final model.

## Appendix B. Maps of Minas Gerais' meso and microregions.



**Appendix C. Minas Gerais' mesoregions.**

Mesoregion	Microregion	Geocode	GDP <sup>a</sup>	GDP/POP <sup>a</sup>	HDI
Norte de Minas	BOCAIUVA	9	8.968E+09	5634.98	0.691
	GRAO MOGOL	23			
	JANAUBA	30			
	JANUARIA	31			
	MONTES CLAROS	36			
Noroeste de Minas	PIRAPORA	48	3.847E+09	10802.57	0.757
	SALINAS	53			
	PARACATU	42			
	UNAI	64			
	ALMENARA	3			
Jequitinhonha	ARACUAI	5	2.883E+09	4153.12	0.659
	CAPELINHA	12			
	DIAMANTINA	18			
Vale do Mucuri	PEDRA AZUL	47	2.178E+09	5883.08	0.677
	NANUQUE	38			
	TEOFILO OTONI	59			
Vale do Rio Doce	AIMORES	1	1.71E+10	10769.78	0.736
	CARATINGA	13			
	GOVERNADOR VALADARES	22			
	GUANHAES	24			
	IPATINGA	25			
	MANTENA	35			
	PECANHA	46			
Metropolitana	BELO HORIZONTE	8	1.083E+11	17182.5	0.795
	CONCEICAO DO MATO DENTRO	15			
	CONSELHEIRO LAFAIETE	16			
	ITABIRA	26			
	ITAGUARA	27			
	OURO PRETO	40			
	PARA DE MINAS	41			
	SETE LAGOAS	58			
	BOM DESPACHO	10			
	Central Mineira	CURVELO			
TRES MARIAS		60			
ARAXA		6			
FRUTAL		21			
ITUIUTABA		29			
Triângulo Mineiro	PATOS DE MINAS	44	3.933E+10	18978	0.809
	PATROCINIO	45			
	UBERABA	62			
	UBERLANDIA	63			
	CAMPO BELO	11			
Oeste de Minas	DIVINOPOLIS	19	1.087E+10	11781.31	0.789
	FORMIGA	20			
	OLIVEIRA	39			
	PIUI	49			
	ALFENAS	2			
	ANDRELANDIA	4			
	ITAJUBA	28			
Sul/Sudoeste de Minas	PASSOS	43	3.185E+10	12930,1	0.785
	POCOS DE CALDAS	50			
	POUSO ALEGRE	52			
	SANTA RITA DO SAPUCAI	54			
	SAO LOURENCO	56			
	SAO SEBASTIAO DO PARAISO	57			
	VARGINHA	65			
	BARBACENA	7			

## Appendix C (Continued)

Mesoregion	Microregion	Geocode	GDP <sup>a</sup>	GDP/POP <sup>a</sup>	HDI
Campo das Vertentes	LAVRAS	33	5.123E+09	9382.47	0.775
	SAO JOAO DEL REI	55			
	CATAGUASES	14			
	JUIZ DE FORA	32			
Zona da Mata	MANHUACU	34	1.996E+10	9213.81	0.762
	MURIAE	37			
	PONTE NOVA	51			
	UBA	61			
	VICOSA	66			

Source: IBGE; PNUD.

<sup>a</sup> In R\$.

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