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## Research on the Region Optimization for Culture Industry Development Based on the Correspondence Analysis

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**Abstract:** Currently, culture industry development shows obvious spacial characteristics, in line with the space selection and distribution the cultural industry agglomeration, competitiveness and efficiency improvement is give full consideration. This study constructs a set of region selection evaluation index system, based on the correspondence analysis method selects the data from 30 provinces and cities in China to carry an empirical analysis. The results show that the cultural industry distribution has to follow China's regional cultural industry layout strategy. Giving priorities to the cultural industry in some regions with maturation conditions and such areas as value-added pole promote the cultural industry development nationwide by means of the industry diffusion and spread effects.

**Key words:** Corresponding analysis, culture industry, region selection

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### INTRODUCTION

The 10th New Year BBS of China's culture industry was held in Peking University January 2013 and the Chinese culture industry annual development report (2013) worked out by Beijing University Institute of Cultural Industry was published at the same time. The report shows that the output value of China's culture industry reached 4 trillion Yuan in 2012 and the proportion in China's GDP is also further enhanced and the pulling function for social and economic development is gradually enhanced too. According to the urgent request of the change of the trend and the mode of China's economic development, the report expected that China's cultural industry will meet a new period of comprehensive rapid development in 2013. The Twelfth Five Year Planning set the demand that the cultural industry scale will double than 2010 by the year 2015. Meanwhile, the new future urbanization development goal will provide important historical opportunity for the cultural industry. When the label of "industrial towns" or "manufacturing city" was torn off, how to find a new positioning for healthy development has become a key problem for a city in the future and the driving force of cultural industry onto development of urban transformation is also worth waiting.

The development of cultural industry in China has risen to the high degree of the strategic industry. The Eighteenth Congress of the CPC Report pointed out that China will strengthen its soft power and continue its cultural reform and development and will make the culture

industry to become the national economic backbone industry. Therefore, our main problem at present is how to develop the cultural industry. The national grand plan stimulate the local government to actively participate in the development of cultural industry in China, so many provinces and cities have also put forward the goals of strong cultural province and cultural city. The added value of culture industry in ChangJiang River Delta will increased to 8% from now accounting for 5% of GDP by year 2020.

Any industry development has its own internal law, such as the industry life cycle, factor endowment conditions, market demand and internal technical progress and so on; only under the action of these laws can the industry make some achievement. From the angle of economic geography, the industry has obvious spatial distribution difference in life cycle, industrial develop factor, market space and technical progress, especially in such big a country as China there are great difference in economic development, natural conditions, social conditions and other aspects in the eastern, central and western. So in the development of cultural industry, the local government must pay attention to the space characteristics of cultural industry and fully understand the advantages and disadvantages in the development of cultural industry and also fully understand the relative advantages and disadvantages in the development of culture industry and other industries, then establish reasonable planning of culture industry development to avoid unnecessary waste of investment.

Based on the above consideration, combined the space characteristics of the development of cultural industry, this paper firstly establish a set of regional selection index of the development of cultural industry according to the necessary internal and external conditions for the development of cultural industry, then conducted empirical analysis on the feasibility and dominant factors of cultural industry development in 31 provinces of China based on the corresponding analysis method. The structure of this paper is as follows: the first part is the literature review, the second part is the formulation of space layout index system of the culture industry, the third part is an empirical test based on the correspondence analysis and the fourth part is analysis and countermeasures based on the empirical results.

### LITERATURE REVIEW

With the global development of cultural industry recent years, the effect on promoting economic growth and enlarging employment has made cultural industry increasingly prominent in economic development. The development of cultural industry has become hot research spot in China since the first planning of cultural industry development was put forward in 2009. Because any form of cultural industry is a result of people's cultural practice production in a certain geographic and the development of social cultural productive forces and this makes culture has obvious regional difference, so the study of culture industry must pay attention to the characteristics of spatial distribution of the culture industry (Hu, 2009). From the space characteristics of cultural industry development, scholars firstly focus on the relationship between regional economic development and the cultural industry. Chen *et al.* (2010) using cointegration analysis empirically test the relationship between the cultural industry in China and economic development in Hunan province and concluded that there exactly exists some relationship between the development of cultural industry and economic growth but the promoting effect is not obvious enough. Taking the Yangtze River Delta in China as research sample and selecting the panel data of 14 cities, Wang and Gu (2009) empirically analyzed and concluded that the cultural industry played an important role in economic development in the Yangtze River Delta, including human capital and capital inflow are important factors of promoting effect of the development of culture industry effecting onto the economic growth. Due to the importance of cultural industry onto the regional economic development, scholars considered that the development of culture industry in China is imperative. In order to make full preparation for the development of

cultural industry, scholars analyzed the current space characteristics of cultural industry in China from three angles of the cultural industry space agglomeration, the spatial distribution of cultural industry competitiveness and space difference of development efficiency of cultural industry.

Due to the cultural industry showing obvious characteristics of spatial agglomeration (Scott, 1997), China's scholars has paid intensive study on the degree of agglomeration of cultural industry and the influence factors. Yuan (2010) using provincial panel data in China from 2005 to 2008 made empirical analysis on the economic geography and industrial policy factors of impacting China's culture industry agglomeration and concluded that from capital perspective the support to cultural industrial agglomeration mostly came from governmental finance capital while the commercial financial services didn't play a role in promoting for cultural industry agglomeration. The market demand factors, regional urbanization level and regional culture enterprise quantity has obvious positive correlation with agglomeration of cultural industrial. The degree of agglomeration of cultural industry in the coastal areas and the area of rich historical cultural resources is very high. Lei *et al.* (2012) further using the provincial panel data from 2005 to 2009 made an accurate measurement to the agglomeration of cultural industry in China and found that cultural industry have shown strong agglomeration phenomenon with obvious regional and industrial characteristics. He then further pointed out the significant positive influence of the cultural infrastructure, human cost, trading convenience onto the agglomeration of cultural industry.

The central governmental "policy dividend" is catalyst for the development of cultural industry, so the local government has to pay full consideration on to how to be in a better position in the development of cultural industry when in the scramble for effective policy resources, which inspired scholars's regional cultural industry research from the angle of competitiveness. Gu and Xia (2007) constructed a culture industry competitiveness comprehensive index evaluation system composed of three modules, 12 competition surface, 14 competitiveness evaluation point based on clarifying the concept of the cultural industry competitiveness and then compared the culture industry competitiveness of nine cities by factor analysis model. Li (2009) constructed a regional comparative culture industry competitiveness index system based on modified VRIO model. Ye (2009) evaluated and analyzed the culture industry competitiveness of 31 provinces and cities by using the method of factor analysis and cluster analysis based on

constructing an evaluation index system of cultural industry competitiveness. They conclude that there is a big regional difference in the development of current culture industry and the competitiveness of most regional cultural industry is not strong and the competitiveness level of cultural industry shows obvious positive correlation features with the level of regional economic development. Ma and Zheng (2010) pointed out the advantages and disadvantages of the eastern, central and western economic developing area and the development of cultural industry must pay full attention to their own advantage and promote the transformation of disadvantage through the regional communication.

Based on the obvious regional developing difference of cultural industry competitiveness, scholars begin to pay close attention to another feature of the development of cultural industry: regional differences of developing efficiency. Ma and Zheng (2010) conducted empirical research on regional efficiency of cultural industry development by using DEA model. Their empirical research results shows that the current culture industry development has obvious regional efficiency variance but the gap of efficiency of culture industry between the western and the eastern is gradually narrowing. Dong (2012) firstly theoretically analyzed the factors of impacting the cultural industry efficiency, including industrial policy, market and cultural needs, human capital and so on, then by using the stochastic frontier technology to test the data coming from 31 provinces from year of 2004 to 2009 and analyze the dynamic evolution characteristics of the efficiency using nuclear density profile analysis. The results shows that there is significant no-technical efficiency in the cultural industry production function, industrial policy, market and cultural needs, human capital, urbanization level and the level of economic development play a significant role in enhancing the efficiency of cultural output, but as a result the backwardness of industrial infrastructure constraints the efficiency. From different areas to look, the difference of comprehensive technical efficiency in the eastern is significant, the efficiency of the central firstly deteriorated then improved and the efficiency in the western in recent years has obviously improved.

Based on the special characteristics research on the culture industry development, scholars come to realize China's culture industry development must pay attention to regional factors. Han (2009) pointed out that the current western culture industry development has obviously showed regional characteristics based on resources and endowment, regional unbalanced development model of cultural industry development is a kind of important model. She considered that endowment condition is the

key element to decide the regional model of cultural industry development, the development of cultural industry in different areas must follow the basic requirements for culture industry and regional development to achieve coordination between the cultural industry and regional development. Huang (2009) put forward that in the development of regional cultural industry, the local governmental strategy formulation and policy direction play an outstanding role in the regional cultural industry development, the local government must pay attention to the basic cultural, economic, social and institutional and other condition and carefully plan the regional cultural industry to avoid the developing pattern of similar industrial structure and weak advantages in industry.

From the above literature, we can conclude that scholars have made great achievements in the research on the spatial characteristics of cultural industry in development. However we should understand that the above research was carried out surrounding the developing mode of cultural industry and spatial characteristics in the process of development, based on the assumption of the cultural industry has been developed. While the reality at present in China is that a lot of areas are just beginning its development of cultural industry. Therefore such a realistic condition, the local governments will have to think carefully of their regional cultural industry. This paper will conduct an empirical research on regional selection for the cultural industry development based on the correspondence analysis method.

#### **CONSTRUCTION OF INDICATOR SYSTEM OF REGIONAL SELECTION OF CULTURE INDUSTRY DEVELOPMENT**

**Analysis on the regional selection factor of the development of cultural industry:** Regional selection of cultural industry development means evaluation and selection of what elements can support the development of the cultural industry in some areas. From the dynamic mechanism of developing of cultural industry to see, the current main dynamic mechanism of developing of cultural industry includes rich cultural resources, sufficient capital resources, a good system security and effective commercialization, strong technical innovation conditions, improved industrial infrastructure. The above factors in fact can be divided into four aspects of technology innovation, market demand thrust, resource endowment conditions and external policy support.

In addition to considering the related elements to cultural industry development, some more widely external

**Table 1: Evaluation index system of culture industry regional selection**

Criterion layer	Field layer	Index layer	Note
Technological innovation ability	Current technological innovation ability	Total factor productivity X1	Regional cultural industry total factor productivity/national cultural industry total factor productivity
		Comparative patent X2	Regional cultural industry patent number/national cultural industry patent number
	Future technological innovation ability	Research personnel equivalent X3	Regional cultural industry research and development personnel full-time equivalent/national culture industry research and development personnel full-time equivalent
		Comparative research and developing spending X4	Regional cultural industry research and development spending/national culture industry research and development spending
Industry developing level	Basic of industry developing	Cultural enterprise quantity than X5	Regional cultural enterprise quantity/national culture enterprise number
		Proportion of Value X6	Regional cultural industry output value/national cultural industry output value
		Proportion Influence coefficient X7	Regional cultural industry influence coefficient/national cultural industry influence coefficient
	Potency of industry developing	New fixed assets than X8	Regional cultural industry new fixed assets/national cultural industry new fixed assets
		Comparative sales revenue growth rate X9	Regional cultural industry sales revenue growth rate/national cultural industry sales revenue growth
		Per cultural consumption X10	Regional per cultural consumption /national per cultural consumption
Industry developing environment	Financial support	Risk investment X11	Regional risk capital investment culture industry total/national culture industry investment capital investment total cultural industry
		Financial institution loans X12	Regional financial institutions loan balance/national financial institutions
	Policy support	Fiscal spending X13	Regional cultural industry financial investment amount/national culture industry investment amount
		Cultural enterprise ownership structure X14	Regional cultural enterprise private rate/national culture enterprise private rate
	Human capital	Culture enterprise staff education structure X15	Regional cultural enterprise staff above college degree in personnel than/national culture enterprise staff above college degree in personnel

environment factors are should be considered in the selection of development of cultural industry. As mentioned above, a number of studies have suggested that the cultural industry development and regional economic development level is inseparable and apparently cultural industry development is more easier to succeed in the higher level of economic development. At the same time, the existing research has demonstrated the human capital plays a very important role in the cultural industry development, so human resource allocation situation must also be considered.

**Construction of the indicator system:** Combined with the above analysis, according to principle of evaluation index system of reasonableness, scientificity, comprehensiveness and effectiveness, based on the regional selection of development of cultural industry, this paper put forward three evaluation criterion layer, respectively is technological innovation ability, industrial development environment and the industrial development level. In the criterion layer of technical innovation ability, this paper put forward two field layer index of the current technology innovation ability and technology innovation ability in the future marked with a number of indicators. In the criterion layer of industrial development level, this paper puts forward two fields layer index of the industrial

development foundation and the industrial development potential marked with a number of indicators. In the criterion layer of industrial development environment, this paper puts forward four areas layer index of the development of industry market demand, financial support environment, policy system environment and human resources conditions marked with a number of indicators. The final index system follows as Table 1.

All the indexes in Table 1 was selected the average of year of 2007 to 2011, the data come from the issue of "the risk investment yearbook ", "culture industry statistical yearbook", "regional financial development report" and "China statistical yearbook ", the influence coefficient is calculated according to the input-output table of 2007 in China .

**Correspondence analysis based on the empirical analysis:** The whole process of correspondence analysis consists of two parts: data form and corresponding analysis. The correspondence analysis table is a two-dimensional form comprised of rows and columns. Each row represents an attribute of things, the column represents different things themselves, each sample is concentrated into a point set in the corresponding analysis chart and the variables of sample attribute on the chart is also displayed in the form of point set. The analysis procedure is:

**Prepare cross contingency table and calculate probability matrix P:** First, prepare two quality variable cross contingency tables and involve two variables, respectively called line variable and column variable:

$$X = \begin{pmatrix} x_{11} & x_{12} & \dots & x_{1c} \\ x_{21} & x_{22} & \dots & x_{2c} \\ \dots & \dots & \dots & \dots \\ x_{r1} & x_{r2} & \dots & x_{rc} \end{pmatrix} \quad (1)$$

The  $r$  for samples,  $c$  for target,  $X_{ij}$  for the observational index of NO. $j$  of sample NO. $i$ .

Second, matrix  $X$  into probability matrix  $P$ , namely:

$$P = \begin{pmatrix} p_{11} & p_{12} & \dots & p_{1c} \\ p_{21} & p_{22} & \dots & p_{2c} \\ \dots & \dots & \dots & \dots \\ p_{r1} & p_{r2} & \dots & p_{rc} \end{pmatrix} \quad (2)$$

Among them

$$p_{ij} = \frac{x_{ij}}{\sum_{i=1}^r \sum_{j=1}^c x_{ij}}$$

is total percentage frequency of each unit.

**Data point coordinates according to the probability matrix P:** Will  $P$  matrix  $r$  line as  $r$  samples and the  $r$  samples as  $r$  data point in  $c$  dimensional space and the coordination of each data points defined as:  $Z_{1j}, Z_{2j}, Z_{3j}, \dots, Z_{rj}$  ( $i = 1, 2, 3, \dots, c$ ):

$$z_{ij} = \frac{p_{ij}}{\sqrt{\sum_{k=1}^r p_{ki} \sum_{l=1}^c p_{lk}}} \quad (3)$$

$(i = 1, 2, 3, \dots, r; j = 1, 2, 3, \dots, c)$

If two data points are nearer, this then shows that frequency distribution differences in two categories of the line variables corresponding to all categories of column variables are not obvious. Similarly, take the  $c$  column in matrix  $P$  as  $c$  samples and the  $c$  sample as  $c$  data points in the  $r$  dimensional space and coordination of each data point defined as:

$$Z_{1j}, Z_{2j}, Z_{3j}, \dots, Z_{rj} \quad (i = 1, 2, 3, \dots, c)$$

$$z_{ij} = \frac{p_{ij}}{\sqrt{\sum_{k=1}^c p_{ik} \sum_{l=1}^r p_{lk}}} \quad (4)$$

$(i = 1, 2, 3, \dots, r; j = 1, 2, 3, \dots, c)$

If two data points are nearer, this then shows that frequency distribution differences in two

categories of the column variables corresponding to all categories of line variables are not obvious.

**Classification and dimension reduction treatment of line variables and column variables:** First, do dimension reduction to the column variables. Taking  $c$  column in matrix  $P$  as  $c$  variables, then calculate covariance matrix  $A$  of  $c$  variables and calculate the characteristic root of covariance matrix  $A$  starting from the covariance matrix  $A$ :

$$\lambda_1 > \lambda_2 > \dots > \lambda_k, 0 < k \leq \min\{r, c\} - 1$$

and feature vector  $u_1, u_2, \dots, u_k$  which covariance matrix  $A$  characteristic root corresponding. The number of final extracted characteristic root was determined by the cumulative variance contribution rate, usually take  $k$  as 2 and calculates the corresponding factor loading matrix  $F$ , namely:

$$F = \begin{pmatrix} u_{11}\sqrt{\lambda_1} & u_{12}\sqrt{\lambda_2} \\ u_{21}\sqrt{\lambda_1} & u_{22}\sqrt{\lambda_2} \\ \dots & \dots \\ u_{c1}\sqrt{\lambda_1} & u_{c2}\sqrt{\lambda_2} \end{pmatrix} \quad (5)$$

Among them, the factor loading is the load of a classification of column variable in a factor, which reflects the relationship between them. And similarly with factor analysis, the degree of variance explanation and loss of information can be measured through the common degree of variables (a classification of column variable), and the importance of factors can be measured through the variance contribution of factors.

Second, do dimension reduction to the column variable. Taking  $r$  line in matrix  $P$  as  $r$  variables, calculate covariance matrix  $B$  of  $r$  variables, then calculate the characteristic root and feature vector of covariance matrix  $B$  starting from the covariance matrix  $B$ . The number of final extracted characteristic root was determined according to the cumulative variance contribution rate, usually take  $K$  as 2 and calculates out the corresponding factor loading matrix  $G$ , namely:

$$G = \begin{pmatrix} v_{11}\sqrt{\lambda_1} & v_{12}\sqrt{\lambda_2} \\ v_{21}\sqrt{\lambda_1} & v_{22}\sqrt{\lambda_2} \\ \dots & \dots \\ v_{r1}\sqrt{\lambda_1} & v_{r2}\sqrt{\lambda_2} \end{pmatrix} \quad (6)$$

Among them, the factor loading is the load of a classification of line variable in a factor, which reflects the relationship between them. Similarly with factor analysis, the degree of variance explanation and loss of information can be measured through the common degree of variables

**Table 2: Improved indicators and advantageous indicators of the regional selection of cultural industry development based on the correspondence analysis**

Provinces	Level of Industrial technological innovation		Level of industry development		Level of industrial environment	
	Advantage index	Disadvantage index	Advantage index	Disadvantage index	Advantage index	Disadvantage index
Beijing	X5	X3	X1	X4	X1	X7 X9
Tianjin	X6 X3			X4 X5		
Hebei	X2					
Liaoning					X2	
Jilin	X1	X5	X14	X18		X9 X2
Shanghai				X14		
Jiangsu		X4	X9	X8		
Zhejiang		X1 X5	X6	X15	X9	X7
Anhui	X5	X1 X3		X10		
Fujian	X1	X7		X14	X7	
Jiangxi					X7	
Shandong	X2			X9		X2
Henan					X20	
Hubei	X6				X12	
Hunan			X6			X9
Guangdong		X6			X8	
Sichuan						

(a classification of line variable) and the importance of factors can be measured through the variance contribution of factors.

**Draw corresponding profile of classification of line and column variables:** The scope of element in the factor load F and G is same and the meaning of the number and size of element are also similar. F and G can respectively be taken as c two-dimensional point and r two-dimensional points map in a common coordinate plane and form a corresponding profile, then each point coordinate is the corresponding factor loading.

The above steps realized the dimension reduction of line variables and column variables and the multiple classification point of line variables and column variables intuitively showed in the corresponding profile coordinated with the factors load, so as to realize the quantization of difference between all kinds of quality variable. The relationship between all kinds of variables will be judged through the observation of each corresponding profile of data point distance. In the correspondence analysis chart, from two-dimensional axis (0, 0) point, if a province point is nearer to some indicators point in the same orientation, it is showed that the two kinds is of strong relevance; If the distance is far or not in the same direction, the relationship that both will be weak or no relevant. On behalf of a certain indicators point to another point index, on behalf of a certain province point ii close to another province point means the both is for the same type indicator or region and vice versa.

This study conducted evaluation and analysis by using the above methods from three criterion layer of technical innovation ability, industry characteristics and the supporting industry and made the evaluation results

contact and contrast with the ranking of criterion layer for providing scientific basis for policy making and measures improvement.

**Empirical analysis:** Based on the correspondence analysis ideas, this study got the original index values of corresponding analysis by using SPSS20.0 and got the advantages and disadvantages must improved showed in Table 2 through the corresponding analysis from the development of the cultural industry of the provinces in China.

**CONCLUSIONS AND SUGGESTIONS**

From the spacial process perspective of regional culture economic development to see, the development of cultural industry always firstly focused on a few region of relative good conditions with points distribution. The industry point is regional growth pole. From the time of strategic interests of the regional cultural industry development to see, the realization of the strategic intent of the layout strategy of regional cultural industry as the main strategy can not finished only once in space but completed in the process of constant strategic adjustment process, which determines the layout of regional cultural industry development strategy has periodic law, which reflected in the construction of growth pole is that it is necessary to form a regional scientific complete and reasonable regional cultural industry layout for a region to form a rational layout, scientific planning modern cultural industry system and integral comprehensive competitive power of cultural industry.

Based on the correspondence analysis, this paper pointed out the advantage and disadvantage of

developing cultural industry in 31 provinces of China and provided valuable theoretical and empirical analysis explore through index hint of the advantages and worth improved, for our country the development of cultural area selection. According to the empirical results, this paper argues that choice for regional cultural industry strategic should not mechanically apply the general form of the industrial distribution theory but should be ready for the positive results from the theory of industrial layout and absorb wisdom from the theory of industrial layout to select and form suitable regional cultural industry layout strategy in accordance with the local culture industry development situation and sums up the culture industry layout theory belong to the characteristics of cultural industry spacial layout movement as our strategic choice.

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