Research on the Evaluation and Promotion Plan of Competitiveness of Chinese Cultural and Creative Industries - Taking Provinces and Cities Along the "Belt and Road" As an Example

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Abstract: With the rapid growth of high-tech, the development of cultural and creative industries has gradually become the focus of national industrial development. With the proposal of China's "Belt and Road" strategy, the role of cultural and creative industries in the provinces and cities along the "Belt and Road" in the entire international trade is becoming increasingly critical. It is necessary to explore solutions to improve the competitiveness of China's cultural and creative industries, factoring the surrounding cities of the "Belt and Road" as an example. Thus, this paper proposes the six-element diamond model based on innovation capability and government support to render a comprehensive evaluation of the competitiveness of the cultural and creative industries in the 31 provinces and cities across the country. The results show that the overall competitiveness of the 18 provinces and cities along the "Belt and Road" cultural and creative industries is weak. Focusing on the 18 provinces and cities along the "Belt and Road", using the linear regression measurement model quantitative analysis, the four types of influencing factors affecting the development of the competitiveness of cultural and creative industries along the "Belt and Road" were obtained. Finally, according to the four types of influence, the competitiveness improvement plan is proposed from the four aspects: government role, consumption preference, industrial innovation ability, and the introduction of high-quality talent.

1. Introduction

With the continuous advancement of science and technology and the arrival of the era of "Internet +" and "Industry 4.0", people's more attention to the cultural industry falls on the technological innovation and creativity of the industry. Therefore, the cultural and creative industry was born and began to develop, and gradually became a hot spot of people's attention. In 2017, the added value of China's cultural and creative industries accounted for 4.2% of GDP, which shows that cultural and creative industries, as a new force, are providing new impetus for China's industrial structure optimization and economic transformation and development. Under the background of globalization, the competition at the industrial level has become increasingly fierce. The cultural and creative industry, as a new pillar industry, how to enhance its industrial competitiveness has become the focus of attention of all countries.

In recent years, domestic and foreign scholars have done a lot of research on the competitiveness of the cultural industry, mainly by constructing models or evaluation index systems, and then with the help of actual case analysis, finally come to a plan to enhance the competitiveness of the cultural industry. In constructing the evaluation model of the competitiveness of the cultural industry, there are already some mature models, e.g.

Using Porter's theory for reference to put forward the cultural industry competitiveness model [1]. Based on Porter's theory and Barclays's 3P analysis framework proposed a cultural industry competitiveness level model [2]. In constructing the evaluation index system of cultural industry competitiveness, scholars have also achieved certain results, e.g. Constructed an evaluation index system containing subcategories of cultural industries such as commerce, art and public culture [3]. Evaluation Index System Based on IMD and WEF Theory [4]. Evaluation index system based on Porter diamond model theory [5, 6]. With the advancement of science and technology, more and more scholars pay more attention to technological innovation in the cultural industry, so the research direction has shifted to the cultural creative industry. Because the cultural and creative industry is an emerging industry, the definition of the industry and related research are not yet mature, but scholars have also achieved some results in the research process. e.g. When studying the competitiveness of cultural and creative industries, on the one hand, the case analysis of the competitiveness of cultural and creative industries in individual provinces of China (e.g. Jiangxi Province, Shandong Province) was conducted [7, 8]. On the other hand, it has constructed some evaluation index systems for the competitiveness of cultural and creative industries. Reference [9] proposed an evaluation index system for the competitiveness of Chinese cultural and creative industries based on analytic hierarchy process (AHP). Reference [8] comprehensively uses the analytic hierarchy process and fuzzy comprehensive evaluation method to construct a regional cultural creative industry competitiveness evaluation index system.

In 2013, China proposed the "the Belt and Road" strategy, and international trade became more and more frequent, which brought an opportunity for cultural exchanges and cooperation and economic development along the provinces and cities along the route "the Belt and Road". More and more scholars have begun to take an interest in the evaluation and promotion of the cultural and creative industries under "the Belt and Road" strategy. Reference [10] put forward the problems existing in the current international competitiveness of Chinese cultural industry through the collection and collation of literature and data, and gave a plan to enhance competitiveness. Reference [11] used comparative advantage (TC) and dominant comparative advantage (RCA) to analyze the advantages and disadvantages of Chinese cultural products' competitiveness in the international market, and gave a plan to enhance competitiveness. Reference [12] through the collection and collation of literature and data, proposed that under the strategic background of "the Belt and Road", China should strengthen its technological innovation capability to enhance the competitiveness of cultural and creative industries. Reference [13] used the literature review method to analyze the development status and existing problems of the cultural and creative industries in Zhejiang Province, and proposed a plan to enhance the competitiveness of Zhejiang's cultural and creative industries from four aspects.

After combing the literature, it is found that scholars have more research on the competitiveness of cultural industries, and less research on the competitiveness of cultural and creative industries. However, there are more qualitative theoretical studies than quantitative empirical studies in the study of the competitiveness of cultural and creative industries. Under the background of the "Belt and Road", the object of studying the competitiveness of China's cultural and creative industries is often a single province, and a lack of overall research on the cities along the line. Therefore, this paper takes 18 provinces and cities along the "Belt and Road" as the research object, and uses Porter's diamond model as the theoretical basis to construct a cultural and creative industry competitiveness evaluation model, and using statistical software SPSS and R-Studio to quantitatively evaluate the competitiveness of China's cultural and creative industry from the whole situation. Finally, it proposes the plan to improve competitiveness based on the evaluation results, which is more objective, and have a certain degree of innovation.

2. The Concept Definition and Development Status of Chinese Cultural and Creative Industry

2.1 Conceptual definition of Cultural and Creative Industries

Nowadays, there is no unified conclusion about the standard concept of cultural and creative industries at home and abroad. Each country interprets and understands this concept from a different perspective in different political, economic and cultural contexts. Therefore, it presents various titles such as "Cultural Industry", "Creative Industry", "Copyright Industry" and "Cultural Creative Industry".

"Cultural Industry" was first proposed by German scholars Horkheimer and Adorno in 1947. They believe that "Cultural Industry" is an industrial system that replicates, disseminates and consumes cultural products on a large scale by means of modern technology [14]. Subsequently, economists from various countries have developed a strong interest in the connotation of cultural and creative industries, and have conducted research.

The UK is a pioneer and leader in the study of cultural and creative industries and the first country to propose "Creative Industries". The definition of the creative industry is defined as the origin of the creative industry: from the individual creativity, skills and talents, through the development and application of intellectual property, the industry that creates wealth and employment potential [15]. The United States is currently the world's cultural and creative industry powerhouse, and in the United States the cultural and creative industry is called "Copyright Industries", including the core copyright industry, cross-copy industry, some copyright industries and marginal support industries. The core copyright industry includes most of the industries of the American cultural and creative industries such as film, television, radio, commercial and entertainment software, books, newspapers, music and advertising [16]. In Japan cultural and creative industry is called the entertainment industry. Japanese scholars believe that the purpose of the cultural and creative industry is to create a cultural symbol and then sell the cultural symbol [17]. According to the definition of The UNESCO, the cultural and creative industries are a process of producing, reproducing and composing cultural products and services according to industrial standards [18].

At present, there are certain differences in the definition and understanding of cultural and creative industries in China. Before the reform and opening up, the cultural sector was basically a public institution, and the "culture" was mainly a public welfare undertaking. With the rise of the cultural industry, the government gradually realized that in addition to the ideological attributes, culture has commodity attributes and industrial functions [19]. The Sixth Plenary Session of the Sixteenth Central Committee clearly distinguished the concepts of "cultural undertakings" and "cultural industries" and proposed to promote cultural undertakings as the pillar industries of the national economy. In April 2004, the National Bureau of Statistics of China announced the "Chinese Culture and Related Industries Classification", which divided the "cultural industries" into two categories: "cultural services" and "culture-related industries." At that time, the government's understanding of the cultural industry was limited to the traditional cultural industry. Although the market orientation of the cultural industry has been clarified in the development policy, the concept of "cultural creativity" has not received enough attention. Later, with the widespread spread of the concept of "creative industries" at home and abroad, China began to accept this concept gradually. In 2006, the Outline of the Cultural Development Plan for the 11th Five-Year Plan of China used the concept of "creative industry" for the first time. With the continuous development of the practice of domestic cultural and creative industries, domestic scholars have carried out many reflections and explorations on the connotation and extension of the concepts of cultural industry, creative industry and cultural creative industry [20]. Although the opinions vary, there are three main categories:

The first type of view holds that the cultural industry, creative industries and cultural and creative industries are roughly the same in terms of concept and extension. Scholars who hold this view believe that the cultural and creative industries are basically equivalent to the creative industries; while the cultural and creative industries and cultural industries have different perspectives, but the extension is similar [21].

The second type of view holds that the cultural and creative industries are no longer simply confined to traditional cultural industries. They are innovative concepts that emerge from adaptation to new industrial forms. The creative industry is different from the sweat industry and labor-intensive industries such as manufacturing. The development of the creative industry depends on the creative class, relying on the high culture, high technology and high management of the creative group, especially the most creative high-end creative talents in the creative class [22].

The third type of view is that cultural industries and cultural and creative industries are two different industries. Beijing adopted the "A+B" type of cultural and creative industry classification in the industry classification. The so-called "A" refers to the classification of the National Bureau of Statistics; the so-called "B" includes two types of industries, namely, design planning and new media technologies such as software, networks, and computer services. Shanghai divides the cultural and creative industries into two categories: the "cultural industry" managed by radio, film, television and press publishing department, and the "creative industry" managed by the economic information department. Obviously, there are many differences between the two industries. Therefore, some scholars have pointed out that the "cultural industry" is an industry that converts cultural products and cultural services into goods and services through the market mechanism and operation, and realizes monetization. The cultural content elements play a central or leading role; "Creative industry" refers to the industry in which the creative elements play a central or leading role [23].

This paper presents that the cultural and creative industries are a cluster of multi-industry integration, based on the cultural industry, with creative planning as the core, and more emphasis on high technology.

2.2 The development status of Chinese cultural and creative industries

Since the 16th National Congress of the Communist Party of China put forward the "Development of Cultural Industry and Creative Industry", the Chinese cultural and creative industry has entered a rapid development track.

2.2.1 Overall Development

From 2007 to 2017, the added value of Chinese cultural and creative industries continued to increase, from 645.5 billion yuan to 347.2 billion yuan, an increase of more than 5 times, indicating that the development of Chinese cultural and creative industries is relatively fast. In addition, in the past 10 years, except for 2012, the trend of the growth rate of China's cultural and creative industries in other years is roughly the same as the trend of GDP growth. However, as a whole, it can be seen that the growth rate of the value added of cultural and creative industries has been higher than the growth rate of GDP, and the annual growth rate has exceeded 10% in the past ten years. This shows that the cultural industry as a new force is providing new impetus to economic transformation and development (As shown in Figure 1(a)). It can be seen from Figure 1(b) that the added value of China's cultural and creative industries has increased year by year, and the proportion of GDP has also increased year by year. As of 2017, the added value of cultural and creative industries has accounted for 4.2% of GDP. However, the proportion of the United States has reached 11.25% in 2013, and South Korea has reached 9.89% in 2012[24]. By comparison, there is still a lot of room for development in the development of Chinese cultural and creative industries (As shown in Figure 1(b)).
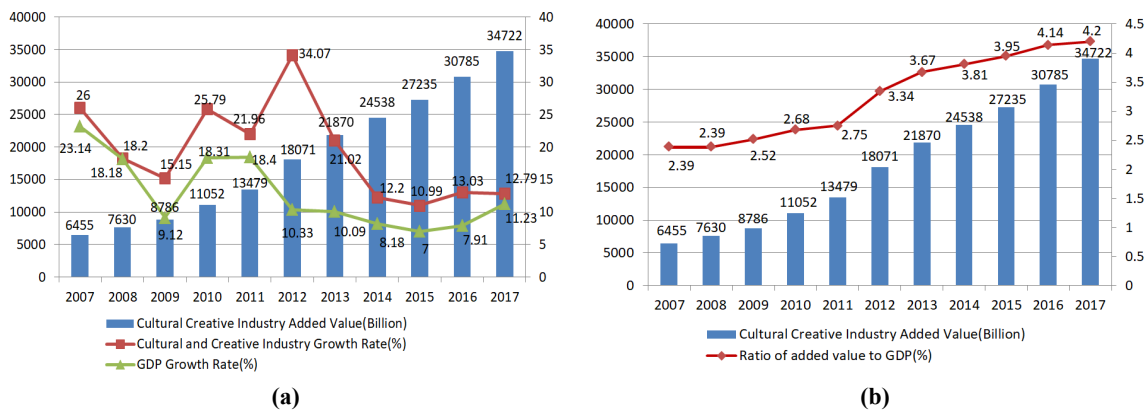
Figure 1. The figure shows the relationship between China's cultural and creative industries and GDP from 2007 to 2017. **(a)** Comparison of the added value and growth rate of China's cultural and creative industries and GDP growth rate; **(b)** The graph of the added Value of China's cultural and creative industries and the ratio of added value to GDP.

2.2.2 Degree of Concern of Cultural and Creative Industries in Government

The development of an industry is closely related to the support and importance of the government. The proportion of industrial value-added to GDP reflects the contribution rate to the local economy to a certain extent. Therefore, this paper divides the proportion of added value of the cultural and creative industries of local GDP in 31 provinces and cities in China, and divides them into six categories according to the proportion (As shown in Table 1). Through the comparison of the four-year data, it can be seen that the contribution rate of the cultural and creative industries in different provinces to the local economy is very different. At the same time, this proportion responses the degree of concern of cultural and creative industries in government.

It can be seen from Table 1 that the development of cultural and creative industries in 2004 and 2008 is relatively slow. Most provinces do not pay enough attention to the development of cultural and creative industries, accounting for the vast majority of provinces with less than 2%. However, this situation improved in the following years. In 2014 and 2017, more provinces began to support the development of cultural and creative industries, accounting for more than 3% of the provinces. According to international standards, 5% of the industrial added value exceeds the proportion of GDP is recognized as a pillar industry [25]. Then we can clearly see from Table 1 that in 2004 and 2008, only Beijing reached the standard. By 2014, apart from Beijing,

the cultural and creative industries of Hunan, Guangdong, Shanghai and Chongqing have become the pillar enterprises of the province, in 2017 in addition to Beijing, the development of cultural and creative industries in Shanghai, Zhejiang and Guangdong has quickly reached the standards of the pillar industry.

Figure 2. "The Belt and Road" strategic path map

The reason for the above situation is that, since 2009, a series of policies on accelerating the development of cultural and creative industries have been introduced. For example, the "Cultural Industry Revitalization Plan" promulgated by the State Council in 2009, and the "Outline of the National Cultural Reform and Development Plan for the Twelfth Five-Year Plan" issued in 2012.On the other hand, in September 2003, China proposed "the Belt and Road" strategic concept(As shown in Figure 2.). This strategy has great practical significance for promoting the development of China's central and western regions and expanding the space for opening up to the outside world. Among them, "the belt" refers to the "Silk Road Economic Belt", also known as the Onshore Silk Road (as shown in the solid line in Figure 2.), and "the Road" refers to "21 actually on the Silk Road", also known as the Maritime Silk Road (as shown by the dotted line in Figure 2.). "the Belt and Road" routes 18 provinces and cities in China including Heilongjiang, Jilin, Liaoning, Shanghai, Zhejiang, Fujian, Guangdong, Hainan, Chongqing, Guangxi, Yunnan, Tibet, Xinjiang, Shaanxi, Gansu, Inner Mongolia, Ningxia and Qinghai. These 18 provinces and cities, 10 of which belong to the western region, mean that the transformation of China's opening up strategy, that is the opening pattern has shifted from the eastern region to the western region. After "the Belt, and Road" strategy was put forward, the government proposed many supportive policies for the development of the central and western regions.

Table 1. The added value of cultural and creative industries in 31 provinces of China accounts for the proportion of regional GDP

the ratio of added value to GDP	Province(Sort by ratio)			
	2004	**2008**	**2014**	**2017**
More than 5%	Beijing	Beijing	Beijing,Hunan,**Guangdong, Shanghai**,Chongqing	Beijing,**Shanghai,Zhejiang,Guangdong**
4%-5%		**Guangdong**	Jiangxi,Jiangsu,**Xizang**	Jiangsu,Anhui,**Fujian**,Shandong, Sichuan,**Yunnan,Shaanxi**
3%-4%	**Guangdong,Shanghai**		**Fujian**,Zhejiang,Shandong, Anhui,Hubei	Tianjin,Hebei,Jiangxi,Henan,Hubei,Hunan,**Hainan**,Chongqing
2%-3%	**Fujian,Zhejiang,Xizang**, Tianjin	**Fujian,Shanghai,Zhejiang**,Hunan,Jiangxi,Xizang, Shandong,Jiangsu	Henan,Tianjing,**Shaanxi**	Shanxi,**Neimenggu,Liaoning,Heilongjiang,Guangxi,Guizhou,Xizang,Gansu,Ningxia**
1%-2%	Hunan,Shandong,**Ningxia**,Suzhou,**Hainan,Yunnan,Guangxi,Shaanxi**,Guizhou,**Chongqing,Liaoning**,Sichuan,Jilin,Hubei,Jiangxi,Henan,Anhui,**Qinghai,Xinjiang,Neimenggu,Gansu**,Shanxi,**Heilongjiang**	Chongqing,**Jilin,Shaanxi,Hainan**,Sichuang,**Guangxi**,Hubei,Henan,Tianjin,**Yunnan**,Anhui,**Neimenggu,Liaoning,Heilongjiang,Ningxia,Qinghai**	**Qinghai**,Sichuan,**Guangxi**,Shanxi,**Hainan,Yunnan**,Shanxi,**Liaoning,Gansu**,Guizhou,**Jilin**	**Jilin,Qinghai,Xinjiang**
less than 1%	Hebei	Shanxi,**Gansu**,Hebei,**Guizhou,Xinjiang**	**Neimenggu,Heilongjiang,Xinjiang,Ningxia**	

In 2015, China released the "Vision and Action for Promoting the Construction of the Silk Road Economic Belt and the 21st Century Maritime Silk Road". The document pointed out that it is necessary to play a unique geographical advantage in Xinjiang and open an important window to the west, forming an important

transportation hub, trade logistics and cultural science and education center on the Silk Road Economic Belt, and building the core area of the Silk Road Economic Belt. Bring into play the comprehensive economic culture of Shaanxi and Gansu, and the humanities advantages of Ningxia and Qinghai, create a new highland for reform and opening up in Xi'an, accelerate the development and opening up of Lanzhou and Xining, and promote the construction of the Ningxia Inland Open Economy Experimental Zone. It has formed a channel for Central Asian, South Asian and West Asian countries, a trade and logistics hub, an important industry and a humanities exchange base, and has defined the positioning of key provinces in the west in "the Belt and Road" strategy. The implementation of "the Belt and Road" strategy provides an unprecedented opportunity to narrow the development gap between the western region and the eastern coastal region [26]. In Table 1, the provinces and cities with the standard font size are the provinces and cities of the Maritime Silk Road route, and the provinces and cities with the bold font size are the provinces and cities on the way of the Silk Road on the land. It can be clearly seen from the results that in the two years of 2004 and 2008, the proportion of provinces and cities in "the Belt and Road" approach was mainly concentrated below 2%. In 2014, the proportion of Tibet and Shaanxi increased significantly, and the rest did not change much. However, by 2017, the proportion of provinces and cities in "the Belt and Road" approach has increased significantly, and less than 1% has disappeared. Except for Jilin, Qinghai and Xinjiang, the proportion is between 1% and 2%, and the rest are over 2%. Among them, Shaanxi Province, which is located at the gateway to the Silk Road on the land, has more than 4%. This shows that after "the Belt and Road" strategy was put forward in 2013, especially after the introduction of the "Vision and Action for Promoting the Joint Construction of the Silk Road Economic Belt and the 21st Century Maritime Silk Road", the governments at all levels are interested in the cultural and creative industries. The development of the company is paying more and more attention. Especially in the areas that require key development in the "Belt and Road" strategy, the government's emphasis on cultural and creative industries has been significantly enhanced.

Although the current development of China's cultural and creative industries is in good shape, it has gradually become a pillar industry of the Chinese economy. Especially under "the Belt and Road" strategy, the provinces and cities that the state requires to focus on development have begun to pay attention to cultural and creative industries to varying degrees, and have formulated measures for the development of cultural and creative industries. But most provinces and cities only point out the direction of vigorously developing cultural and creative industries. They do not specifically point out which areas to improve and develop. Therefore, the development status of the industries in various provinces and cities is still very different.

3. Theoretical Background of the Competitiveness Evaluation

3.1 The Theoretical Basis

3.1.1 Comparative Advantage Theory

Adam Smith's theory of absolute superiority stressed that if a country produces a product that is cheaper than the cost of producing such a product abroad, the country will be competitive in producing the product [27]. David Ricardo succeeded in developing Adam Smith's "absolute advantage" theory and proposed the "comparative advantage" theory. He believes that the trade between the two countries, or the international division of labor, does not depend on the absolute difference in the production of the product, but mainly on the relative difference between the production of this product and the productivity of other products. In his theory, assuming that a country or an economy has an advantage in product labor productivity, it may also trade with other countries. The key is not the advantage of the absolute productivity of the product, but the country's focus on producing products with relative productivity advantages in the country. The resulting international division of labor is that countries with comparative advantages or economies produce products with the highest relative productivity. David Ricardo proposed that the theory of comparative advantage provides a theoretical basis for comparing the competitiveness of a country or a region.

Later, Professor Lin Yifu proposed the "new structural economics", which is based on the continuous deepening of Ricardo's "comparative advantage" doctrine, and constitutes one of the important theoretical basis for discussing competitiveness. In Lin Yifu's theory, the government should play a certain role in the economy. He believes that the government should provide measures such as infrastructure, financial environment, legal system construction, and industrial parks to reduce corporate transaction costs. However, the role of the government should be based on the fundamental role of the market. More is to play a comparative advantage over the competitive enterprises or potential competitive enterprises, rather than supporting enterprises that do not have

the ability to grow [28]. The "new structural economics" pioneered by Lin Yifu provides a good research perspective for us to study the development of cultural and creative industries.

3.1.2 Porter's Diamond Model Theory

Michael E. Porter proposed the diamond model theory in "National Competitive Advantage". The definition of industry is understood as a set of competitive enterprises, pointing out four key elements that determine the competitive advantage of an industry (or enterprise) in a particular country (or region), namely, factors of production, conditions of demand, and performance of related and supporting industries, Corporate strategy, structure and competitive performance. The most important factor in the diamond model that affects the competitive advantage of the industry is the factors of production, including key elements such as human resources, capital, resources and infrastructure. He pointed out that the quality of personnel and the ability to innovate and the degree of informatization have a more obvious effect on enhancing competitiveness. The second influencing factor is market demand. A sound and mature consumer market is an important driving force for the significant increase in industrial competitive advantage. Demand is both a result and a prerequisite. The improvement of competitiveness is conducive to the expansion of demand. When there is greater demand, the competitiveness will be further improved. The third influencing factor is the support of relevant industries, which helps to form a benign development pattern of mutual promotion and orderly competition. The fourth influencing factor is the strategic outcome of the enterprise and competition in the same industry. These key factors together constitute the diamond model theory, which has a decisive influence on the industry (or enterprise) link of the country (or region) (as shown in the solid line in Figure 3(a)).

(a)   **(b)**
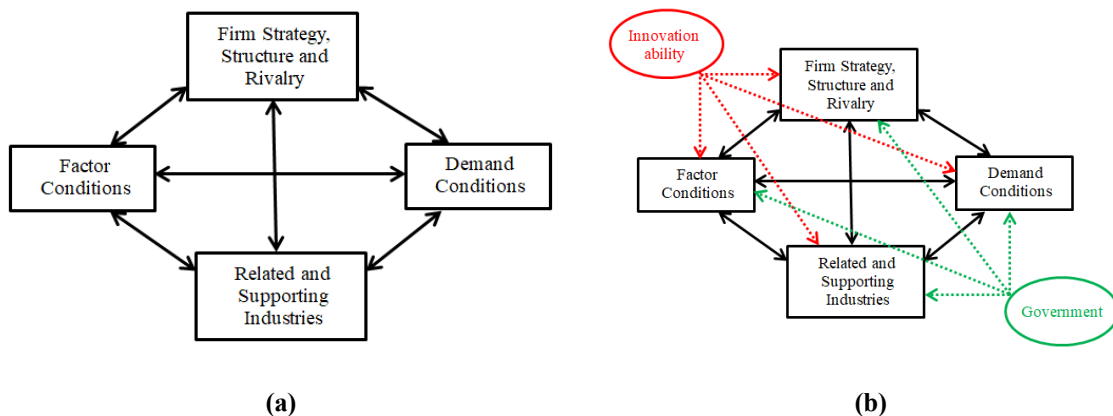
Figure 3. Porter's Diamond Model. **(a)** Prototype of Porter Diamond Model; **(b)** Diamond Model based on Innovation and Governmental Support

3.1.3 Technological Innovation Theory

In 1912, Schumpeter first proposed the concept of "innovation" in "The Theory of Economic Development". He believed that the continuous introduction of innovation into the economic system could change the original mode of production and promote sustainable economic development [29]. Schumpeter's innovation theory is different from the competitive advantage theory. The competitive advantage is from external factors, while Schumpeter's innovation theory is to use innovation ability as an endogenous factor. Schumpeter pointed out that the real innovation is to apply new technology in actual production, which will bring revolutionary changes to the entire production system. As a result, Schumpeter pioneered the theoretical research of technological innovation. Technological innovation has evolved to include innovation in science, technology, knowledge and management [30]. With the further research on science and technology innovation theory, scholars have found that science and technology innovation is often reflected in human activities, so the theory of science and technology innovation capacity has emerged. There are differences between technological innovation capabilities and technological innovation. Technological innovation is a dynamically changing process and can be seen as a practical activity. But technological innovation ability is a hands-on ability, emphasizing the collection of human related knowledge, skills, cleverness and wisdom, which can be equated to creativity.

3.2 The Statistical Basis

3.2.1 Principal Components Analysis

Principal component analysis is a multivariate statistical method that uses the idea of dimensionality reduction to convert multiple indicators into several comprehensive indicators under the premise of losing little information. Usually, the comprehensive index generated by the transformation is called the principal component, and each principal component is a linear combination of the original variables, and each principal component is not related to each other, which makes the principal component have some superior performance than the original variable. When studying complex problems, we can consider only a few principal components without losing too much information, so that it is easier to grasp the main contradictions, reveal the regularity between the internal variables of the things, and at the same time simplify the problems and improve the efficiency of analysis. Principal component analysis is widely used in various fields because it can condense information, simplify the structure of variables, and make the process of observing facts and analyzing problems more simple, intuitive and effective [31].

3.2.2 Factor Analysis

The factor analysis method is based on the study of the dependence of the original variable correlation matrix, and some variables with intricate relationships are reduced to a multivariate statistical analysis method [32]. Factor analysis can be divided into three steps: determining factor load, factor rotation, and calculating factor score. First, the variables are normalized, and the correlation coefficient matrix and its eigenvalues and eigenvectors are calculated; Secondly, the principal component analysis method is used to calculate the factor load and the cumulative variance, and the number of factors is determined according to the variance contribution rate of the common factor; Then, using the factor rotation method, the common factors with more clear meaning and more practical meanings between the factors are calculated, and the explanatory meaning of each factor is determined. Finally, through the variable score, each factor is weighted and aggregated by the variance contribution rate of each factor to obtain a comprehensive score [33]. Among them, the factor analysis uses varimax, which can make each variable produce a higher load on one of the factors, so that the remaining factors produce a smaller load, that is, the factor load on the same column is separated as close as possible to 1 and close to 0. This can make the difference between factors more obvious. To highlight the relationship between each common factor and its large load variable, then these larger load variables can reasonably explain the meaning of the common factor, and thus get a more easily explained factor. The factor score is the final embodiment of the evaluation model factor analysis. By calculating the specific value of each factor in each region, the factor score is obtained. This achieves the effect of reducing the dimension by replacing the original variables with factor scores. First, a regression algorithm is used to obtain a matrix of factor score coefficients, which is substituted into the formula (1) to find the score of each principal factor in each region F_iScore :

$$F_iScore = \sum_{k=1}^{n} \lambda_k X_k \ , \tag{1}$$

Where λ_k is the factor score coefficient, X_k is the k-th original variable, n is the total number of original variables, and F_i is the i-th principal factor. Secondly, the contribution rate of the factor variance obtained after the rotation is weighted, and the comprehensive factor score and ranking of the evaluated object are calculated.

3.2.3 Cluster analysis

Cluster analysis is a scientific and effective method to study "objects to gather together". When doing cluster analysis, different statistic and clustering methods can be selected for different purposes and requirements. Because there are different degrees of similarity between samples or variables in the actual problem being studied, we also call it a close relationship. Therefore, we can find some statistics that can measure the similarity between samples or variables based on multiple observed variables of the sample. These statistics are used as the basis for the classification type, and some samples (or variables) with higher similarity are taken. Aggregate into one class, and then aggregate other samples (or variables) that are similar to each other to another class until all the samples (or variables) are aggregated. This is the basic idea of cluster analysis [34].

3.2.4 Least Squares

The least squares method is a method for estimating the coefficients of a regression equation. The basis of its establishment is the conditional mean, which is used to describe the degree of influence of the independent variable on the dependent variable at the conditional mean [35]. The least squares method is based on the idea of "minimizing the prediction error", and finding the best fitting straight line by minimizing the sum of the squared errors between the predicted value and the true value [36]. The specific process is as follows:

Suppose a multiple linear regression equation is given as:

$$y_t = \beta_0 + \beta_1 x_t + \mu_t \ , \ t = 1,2, \ldots, T \tag{2}$$

Where X is an independent variable, Y is a dependent variable, T is the sample size, x_t and y_t are sample values of X and Y, β_0 and β_1 are equation parameters, and μ_t is an error term.

The estimated values β_0 and β_1 of the parameters b_0 and b_1 are calculated by the least squares method, and the true observation value of the t-th sample point is recorded as y_t, and the predicted value is recorded as $\hat{y}_t$, and the relationship between the two is as follows:

$$\hat{y}_t = b_0 + b_1 x_t \ , \tag{3}$$

Then the error between the predicted value of the t-th sample point and the true observation value is $\hat{\mu}$:

$$\hat{\mu} = y_t - b_0 - b_1 x_t \tag{4}$$

To minimize the sum of the squared errors between the predicted and true observations, there are:

$$\min \quad \sum_{t=1}^{T} \mu_t^2 = \sum_{t=1}^{T}(y_t - \hat{y}_t)^2 = \sum_{t=1}^{T}[y_t - (b_0 + b_1 x_t)]^2 \tag{5}$$

To calculate the formula (5), get the formula (6):

$$\begin{cases} \frac{\partial}{\partial b_0} \sum_{t=1}^{T}[y_t - (b_0 + b_1 x_t)]^2 = 0 \\ \frac{\partial}{\partial b_1} \sum_{t=1}^{T}[y_t - (b_0 + b_1 x_t)]^2 = 0 \end{cases} \tag{6}$$

Solving the equations (6), we get (7):

$$\begin{cases} b_1 = \frac{\sum_{t=1}^{T}(x_t - \bar{x})(y_t - \bar{y})}{\sum_{t=1}^{T}(x_t - \bar{x})^2} \\ b_0 = \bar{y} - b_1 \bar{x} \end{cases} \tag{7}$$

Where $\bar{x}$ and $\bar{y}$ are the sample mean values.

4. Construction of Evaluation Model of Competitiveness of Chinese Cultural and Creative Industries

The efficient development of China's cultural and creative industries is inseparable from the coordination of national macro policy guidelines and the actions of local governments. At the same time, for the cultural and creative industry, it can be clearly seen from its concept that the industry is based on creative planning and pays more attention to high-tech means, so when evaluating the competitiveness of the industry, the technological innovation capability is an indispensable evaluation index. Therefore, it is not comprehensive enough to use only the four elements of the diamond model to determine the evaluation index of the competitiveness of China's cultural and creative industries. Through the introduction in Chapter 3, the government support factors in the new structural economics based on Comparative Advantage Theory proposed by Professor Lin Yifu [28] and the innovation capability factors emphasized in Technological Innovation Theory are added to the diamond model. Finally, this paper proposes a six-element diamond model based on innovation ability and government support (As shown in Figure 3(b)). Using this model to evaluate the competitiveness of China's cultural and creative industries is more comprehensive and objective.

Table 2. China's cultural and creative industry competitiveness evaluation index system

First level indicator	Second level indicator	Third level indicator	Unit	Variable
Production factor	Human Resources	Number of employees in culture and related industries at the end of the year	person	X_1
	Capital resources	Fixed assets investment in culture and related industries	Ten thousand yuan	X_2
	Cultural resources	Number of venues such as museums, cultural and art museums, and public libraries	Number	X_3
Demand condition	Consumer demand	Per capita cultural consumption expenditure	yuan	X_4
Related and supporting industries	manufacturing	Gross value of cultural manufacturing	Ten thousand yuan	X_5
	Tourism	International tourism foreign exchange income	One million U.S. dollars	X_6
	Information industry	Information society index		X_7
		The proportion of actual users of cable radio and television to the total number of households	%	X_8
	Communication industry	Value added value of the telecom industry	Ten thousand yuan	X_9
Industrial operation and competition	Industrial strength	The proportion of added value of cultural and creative industries accounts to GDP	%	X_{10}
		Number of enterprises in culture and related industries	Number	X_{11}
		Cultural and related industry corporate assets	Ten thousand yuan	X_{12}
	Industrial efficiency	Cultural and related industry business income	Ten thousand yuan	X_{13}
		Total profits of cultural and related industries	Ten thousand yuan	X_{14}
Government coordination	Government Action	National general public budget culture, sports and media expenditure	Billion	X_{15}
		Local general public budget culture sports and media expenditure	Billion	X_{16}
Innovation capacity	High-level talent	Companies with R&D activities	Number	X_{17}
		R&D personnel equivalent to full-time equivalent	Year of the human	X_{18}
		Number of R&D projects	Number	X_{19}
	Innovation ability effect	New product development project	Number	X_{20}
		Cultural and creative industry patents	item	X_{21}
		Copyright contract registration	Share	X_{22}
	Potential development	Voluntary registration of works	Piece	X_{23}

This paper uses the six-element diamond model based on innovation ability and government support to evaluate the competitiveness of Chinese cultural creative industry. Firstly, the production factors, demand conditions, related and supporting industries, industrial operation and competition, government support, and innovation capabilities contained in the model are identified as first-level indicators. Then, the six first-level indicators are decomposed into 14 secondary indicators according to the contents and effects. According to the two principles of objectivity and measurability of model construction, cover as much information as possible with as few indicators as possible, and eliminate non-quantitative indicators. Finally, 14 secondary indicators were decomposed into 23 third-level indicators, and finally a three-level index system for the competitiveness evaluation of Chinese cultural and creative industries was obtained. The specific structure is shown in Table 2.

5. Empirical Research

5.1 Analysis on the Evaluation Results of the Competitiveness of Chinese Cultural and Creative Industries

5.1.1 Data Source and Data Preprocessing

By referring to the China National Statistical Yearbook (2018) and the Chinese Culture and Related Industry Statistical Yearbook (2018) published by the National Bureau of Statistics of China, based on the six-element diamond model based on innovation ability and government support, this paper selects 31 provinces and cities in China (including provinces and cities along "the Belt and Road") as a sample.

Firstly, preprocess the data. In order to unify the dimension of data, the statistical software SPSS.25 is used to standardize the cultural creative industry competitiveness evaluation datasets of 31 provinces and cities

in China (including provinces and cities along "the Belt and Road"), and transform the data into intervals [0, 1] between the data.

Secondly, the factor analysis of the data is applied, that is, the correlation between the variables is tested. Common and well-effected methods for determining the correlation between variables are KMO statistic and Bartlett spherical test. In this paper, the standardized data set is tested by SPSS.25 for applicability, and the KMO statistic value is 0.746, which indicates that it is suitable for factor analysis. Bartlett's spherical test's companion probability Sig.=0.000, less than the significant level of 5%, rejects the null hypothesis, which also indicates that it is suitable for factor analysis, that is, the data set selected in this paper passes the applicability test of factor analysis(As shown in Table 3)

Table 3. KMO and Bartlett test results

KMO Sampling suitability		0.746
Bartlett sphericity test	The Approximate chi-square	1544.099
	Df	253
	Sig.	0.000

Table 4. Total Variance Explained before and after rotation

Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings**		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.984	65.147	65.147	14.984	65.147	65.147	12.146	52.809	52.809
2	4.117	17.898	83.046	4.117	17.898	83.046	6.263	27.230	80.039
3	1.511	6.570	89.615	1.511	6.570	89.615	2.203	9.577	89.615
4	0.601	2.615	92.230						
5	0.513	2.231	94.461						
6	0.349	1.516	95.976						
7	0.288	1.254	97.231						
8	0.162	0.703	97.933						
9	0.142	0.616	98.550						
10	0.090	0.392	98.941						
11	0.082	0.355	99.296						
12	0.050	0.219	99.515						
13	0.039	0.171	99.686						
14	0.023	0.098	99.784						
15	0.017	0.074	99.858						
16	0.014	0.061	99.919						
17	0.008	0.035	99.954						
18	0.005	0.020	99.975						
19	0.003	0.011	99.986						
20	0.002	0.007	99.993						
21	0.001	0.005	99.997						
22	0.000	0.002	99.999						
23	0.000	0.001	100.00						

5.1.2 Principal Component Analysis Result

Using SPSS.25 to perform principal component analysis on the standardized data, we first get the common degree. The results show that the commonality of the 23 indicator variables exceeds 0.77. The residualness of the remaining indicator variables except X_2 and X_8 exceeds 0.8, indicating that the information of each original variable loses little during the extraction process. Second, the total variance is explained. It indicates that each principal component interprets the total variance of the original variables, and retains the components whose eigenvalues are greater than 1 in the results, that is, the first three components are the main components. And their cumulative contribution rate has reached 89.615%, indicating that the three principal components are concentrated on the original 23 variables and the information is close to 90% (As shown in Table 4). The three principal components obtained by principal component analysis are respectively recorded as: F_1, F_2, and F_3, ready for factor analysis.

5.1.3 Factor Analysis Result

Through principal component analysis, it is found that the three principal components F_1, F_2, and F_3, and contain most of the information in the original variables. Therefore, selecting these three principal components as the main factors of factor analysis can make a comprehensive evaluation of the competitiveness of cultural and creative industries in China. After using SPSS.25 factor analysis, the absolute value of the correlation coefficient between the factor load matrix and the 23 index variables is more than 0.5, and a reasonable explanation for the three factors cannot be given. Therefore, a new total variance interpretation and factor loading matrix is obtained by the method of maximum orthogonal rotation of variance (As shown in Table 4 and Table 5). Although the cumulative contribution rate of the three principal components after rotation is still 89.615%, the amount of information carried by each factor has changed, and the result of the factor load matrix after rotation (As shown in Table 5). Through the correlation coefficient between the original index variable and each main factor, a comprehensive analysis shows: The main factor F_1 has a higher load value on the relevant indicators of the industry itself, related industries and high-level talents; The main factor F_2 has a higher load value on the relevant indicators of potential development of consumption and creativity; The main factor F_3 has a higher load on the government's investment in industrial investment and infrastructure construction. Therefore, a reasonable explanation of the three common factors is obtained. F_1 is the industry's own development and related industry correlation factors, F_2 is the consumption capacity and potential creative development factor, and F_3 is the government input factor. Substituting the factor score coefficient obtained in Table 5 into the formula (1), the main factor score is obtained. Finally, the contribution rate of the variance of each factor is used as the weight, and the factor scores of the competitiveness of the cultural and creative industries in 31 provinces and cities in China are calculated by formula (8), and then the comprehensive ranking of each province and city is obtained(As shown in Table 6).

$$\text{Factor Score} = F_1\text{Score} \cdot 52.809 + F_2\text{Score} \cdot 27.290 + F_3\text{Score} \cdot 9.577 \tag{8}$$

Table 5. Rotated Component Matrix

variable	Component			variable	Component		
	1	2	3		1	2	3
X_1	0.918	0.277	0.204	X_{13}	0.840	0.492	0.143
X_2	0.390	-0.027	0.787	X_{14}	0.834	0.475	0.080
X_3	0.154	-0.171	0.869	X_{15}	0.249	0.572	0.702
X_4	0.223	0.854	-0.205	X_{16}	0.333	0.549	0.662
X_5	0.909	0.057	0.303	X_{17}	0.959	0.076	0.152
X_6	0.835	0.272	-0.186	X_{18}	0.926	0.081	0.265
X_7	0.406	0.814	-0.257	X_{19}	0.976	0.073	0.113
X_8	0.368	0.768	-0.230	X_{20}	0.984	0.060	0.036
X_9	0.901	0.284	0.238	X_{21}	0.952	0.181	0.019
X_{10}	0.340	0.873	0.093	X_{22}	0.039	0.924	0.089
X_{11}	0.841	0.366	0.333	X_{23}	-0.096	0.905	0.020
X_{12}	0.819	0.546	0.078				

In Table 6, the fonts of provinces and cities along "the Belt and Road" will be bolded in the comprehensive ranking results of China's cultural and creative industries, and it is clear that: In China, the cultural and creative industries in the cities along "the Belt and Road" are not balanced, and the competitiveness varies greatly. The rankings of the cultural and creative industries in the provinces and cities along the Maritime Silk Road (except Hainan) are ranked in the top 10. In addition to Shaanxi Province, the provinces and cities along the Silk Road on the land, the rankings of the remaining provinces and cities are after 17. The competitiveness of the cultural and creative industries in the provinces and cities along the Maritime Silk Road is significantly better than the provinces and cities along the Silk Road on the land.

Table 6. Comprehensive ranking of competitiveness of cultural and creative industries in 31 provinces and cities in China

Province	Score	Rank	Province	Score	Rank
Guangdong	212.14	1	**Liaoning**	-25.19	17
Jiangsu	129.82	2	**Chongqing**	-25.74	18
Zhejiang	89.74	3	**Yunnan**	-29.15	19
Beijing	78.52	4	**Guangxi**	-29.68	20
Shandong	64.08	5	**Neimenggu**	-32.99	21
Shanghai	54.38	6	Guizhou	-37.6	22
Fujian	15.65	7	**Jilin**	-38.44	23
Hunan	6.31	8	**Heilongjiang**	-38.82	24
Sichuan	3.62	9	Shanxi	-38.91	25
Henan	2.99	10	**Xinjiang**	-42.57	26
Anhui	-2.45	11	**Hainan**	-45.17	27
Hubei	-7.06	12	**Gansu**	-45.3	28
Tianjin	-12.74	13	**Ningxia**	-51.48	29
Shaanxi	-15.2	14	**Qinghai**	-52.44	30
Hebei	-15.75	15	**Xizang**	-53.93	31
Jiangxi	-16.63	16			

5.1.4 Cluster Analysis Result

According to the competitiveness factor scores, using the SPSS.25 software, 31 provinces and cities in China are divided into strong competitive category, stronger competitive category, general competitiveness category and weak competitiveness category by adopting two-stage clustering method(As shown in Table 7).From the classification results in Table 7, most of the provinces and cities along "the Belt and Road" fall in general competitiveness category and weak competitiveness category, especially the provinces and cities along the Silk Road on the land are basically weak competitiveness category.

Table 7. Classification of the competitiveness of cultural and creative industries in 31 provinces and cities in China

Classes	Number	Province
Strong competitiveness	4	Guangdong, Jiangsu, Zhejiang, Shandong
Stronger competitiveness	2	Beijing, Shanghai
General competitiveness	13	Fujian, Hunan, Sichuan, Henan, Anhui, Hubei, Tianjin, Shaanxi, Hebei, Jiangxi, Chongqing, Yunnan, Guangxi
Weak competitiveness	12	Liaoning, Neimenggu, Guizhou, Jilin, Heilongjiang, Shanxi, Xinjiang, Hainan, Gansu, Ningxia, Qinghai, Xizang

Considering the results of factor analysis and cluster analysis, it can be clearly seen that the level of competitiveness of cultural and creative industries among provinces and cities along "the Belt and Road" varies greatly. The competitiveness of provinces and cities along the Onshore Silk Road is significantly weaker than that of provinces and cities along Maritime Silk Road. Generally speaking, the competitiveness of the cultural and creative industries in the provinces and cities along "the Belt and Road" is generally weak, and there is much room for improvement.

5.2 The Influencing Factors Analysis of the Competitiveness of Cultural and Creative Industries in the Provinces and Cities along the "One Belt and One Road"

From the data analysis results of 5.1, it is found that the overall competitiveness of the cultural and creative industries along the "Belt and Road" is relatively weak, especially on the land Silk Road. But which of the 32 indicators in the evaluation model selected in this article are the main factors that affect its competitiveness? Only by identifying these main influencing factors, can we propose a more efficient enterprise competitiveness improvement plan. The following will discuss this issue using the six-element diamond model based on innovation ability and government support and the linear regression econometric model.

5.2.1 Variable Selection

In order to better find the factors affecting the competitiveness of the cultural and creative industries along "the Belt and Road", continue to adopt the Chinese cultural and creative industry competitiveness evaluation model, using SPSS.25 software, using the factor analysis method to determine the independent variables and dependent variables of the measurement model.

Firstly, extract the 23 indicators corresponding to the 18 provinces and cities along the "Belt and Road" for standardization, and then do the factor analysis applicability test. The result is a KMO value of 0.657. The Bartlett spherical test yields a companion probability (Sig.=.000), which is less than a significant level of 5%. The null hypothesis is rejected, indicating that it is suitable for factor analysis.

Table 8. Total Variance Explained before and after rotation

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.576	72.069	72.069	16.576	72.069	72.069	12.169	52.910	52.910
2	3.408	14.818	86.887	3.408	14.818	86.887	6.566	28.549	81.458
3	1.170	5.089	91.975	1.170	5.089	91.975	2.419	10.517	91.975
4	0.640	2.785	94.760						
5	0.471	2.047	96.807						
6	0.234	1.020	97.826						
7	0.187	0.814	98.640						
8	0.124	0.539	99.179						
9	0.095	0.415	99.594						
10	0.048	0.210	99.804						
11	0.025	0.108	99.911						
12	0.012	0.052	99.964						
13	0.004	0.016	99.979						
14	0.002	0.009	99.989						
15	0.002	0.007	99.996						
16	0.001	0.003	99.999						
17	0.000	0.001	100.00						
18	7.819E-16	3.399E-15	100.00						
19	2.476E-16	1.077E-15	100.00						
20	-8.840E-17	-3.844E-16	100.00						
21	-2.557E-16	-1.112E-15	100.00						
22	-4.770E-16	-2.074E-15	100.00						
23	-6.519E-16	-2.834E-15	100.00						

Secondly, factor analysis is carried out. The load matrix of each factor and the cumulative variance contribution rate are calculated by the maximum variance orthogonal rotation method. The number of factors is determined according to the variance contribution rate of the factors. It can be seen from the results that the eigenvalues of the first three factors are More than 1 and the cumulative variance contribution rate is 91.975%, so the first 3 factors are extracted as a common factor (As shown in Table 8). Further analysis of the rotated factor load matrix results, observe the correlation coefficient between the three common factors and each of the original variables (As shown in Table 9). Screen out the influencing factors closely related to the first common factor according to the criterion that the correlation coefficient is greater than 0.9(Strong Correlation), that is X_1, X_5, X_{12}, X_{18}, X_{20}, X_{21}. Screen out the influencing factors closely related to the first common factor according to the criterion that the correlation coefficient is greater than 0.9(Strong Correlation), that is X_4, X_{22}, X_{23}. Screen out the influencing factors closely related to the first common factor according to the criterion that the correlation coefficient is greater than 0.7(Correlation), that is X_2, X_3, X_{15}. The influencing factors of the competitiveness of the cultural and creative industries along the provinces and cities along "the Belt and Road" are taken as the independent variables of the measurement model. Finally, according to the three common factor score coefficient matrices, the evaluation scores of competitiveness of the cultural and creative industries in 18 provinces and cities along "the Belt and Road" are calculated (As shown in Table 10), and the score is taken as the dependent variable of the measurement model, which is recorded as Y.

Table 9. Rotated Component Matrix

variable	Component			variable	Component		
	1	**2**	**3**		**1**	**2**	**3**
X_1	0.936	0.286	0.150	X_{13}	0.844	0.522	0.102
X_2	0.344	0.086	0.731	X_{14}	0.795	0.486	0.229
X_3	0.261	-0.115	0.886	X_{15}	0.282	0.544	0.715
X_4	0.139	0.952	-0.104	X_{16}	0.576	0.545	0.502
X_5	0.957	0.177	0.157	X_{17}	0.827	0.182	0.284
X_6	0.865	0.334	0.143	X_{18}	0.955	0.176	0.223
X_7	0.417	0.853	0.130	X_{19}	0.837	0.181	0.252
X_8	0.377	0.805	0.204	X_{20}	0.963	0.154	0.200
X_9	0.872	0.336	0.310	X_{21}	0.946	0.192	0.240
X_{10}	0.419	0.781	0.220	X_{22}	0.193	0.913	0.043
X_{11}	0.862	0.384	0.296	X_{23}	0.097	0.911	-0.180
X_{12}	0.903	0.495	0.101				

Table 10. Comprehensive scores of cultural and creative industries in 18 provinces and cities along the "The Belt and Road"

Province	Factor score	Province	Factor score	Province	Factor score
Guangdong	201.93	Liaoning	-16.61	Heilongjiang	-30.54
Zhejiang	81.87	Guangxi	-21.44	Xinjiang	-32.84
Shanghai	68.4	Yunnan	-21.47	Ningxia	-33.16
Fujian	21.13	Neimenggu	-25.4	Qinghai	-34.66
Shaanxi	-14.04	Hainan	-27.11	Gansu	-34.71
Chongqing	-15.98	Jilin	-28.06	Xizang	-37.31

Descriptive statistical analysis of independent and dependent variables is presented below. The results are shown in Table 11. It can be seen from the results that the difference of the key influencing factors of cultural industry competitiveness are obvious, and the largest data is 9.097 times of the minimum data. The minimum, maximum and standard deviation characteristics of each data are basically consistent with the corresponding characteristics of each region.

5.2.2 Measurement Model Selection

The regression coefficient of the linear regression measurement model can reflect the linear influence of each independent variable on the dependent variable when other independent variables are fixed. Therefore, this paper uses the linear regression measurement model. Taking each influencing factor obtained by factor analysis as an independent variable and the comprehensive score as the explanatory variable, the measurement model is:

$$Y = \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 4 + \alpha_5 X_5 + \alpha_{12} X_{12} + \alpha_{15} X_{15} + \alpha_{18} X_{18} + \alpha_{20} X_{20} + \alpha_{21} X_{21} + \alpha_{22} X_{22} + \alpha_{23} X_{23} + \varepsilon \quad (9)$$

Where $\alpha_1, \alpha_2, \dots, \alpha_5, \alpha_{12}, \alpha_{15}, \alpha_{18}, \alpha_{20}, \dots, \alpha_{23}$ is the influence coefficient corresponding to 12 influencing factors $X_1, X_2, \dots, X_5, X_{12}, X_{15}, X_{18}, X_{20}, \dots, X_{23}$, and ε is the residual. The parameters of the linear regression measurement model are estimated by the least squares method.

Table 11. Comprehensive scores of cultural and creative industries in 18 provinces and cities along the "The Belt and Road"

Variable	Sample size	Minimum	Maximum	Mean	Standard deviation
Y	18	-0.61191	3.30889	0.1561	0.25505
X_1	18	-0.50727	3.69273	0.1208	0.23810
X_2	18	-1.14033	1.65290	0.4082	0.35801

X_3	18	-1.68187	1.30825	0.5625	0.33443
X_4	18	-1.09069	3.61007	0.2320	0.21273
X_5	18	-0.43870	3.73685	0.1051	0.23949
X_{12}	18	-0.52844	3.33938	0.1366	0.25854
X_{15}	18	-1.03884	2.96804	0.2593	0.24957
X_{18}	18	-0.41153	3.55130	0.1038	0.25234
X_{20}	18	-0.39097	3.55669	0.0990	0.25331
X_{21}	18	-0.45239	3.66212	0.1099	0.24304
X_{22}	18	-0.77467	3.27935	0.1911	0.24667
X_{23}	18	-0.45536	3.61714	0.1118	0.24555

Table 12. Model coefficients

Variable	Regression Coefficients	Standard Deviation	t value	P-Value
Intercept	-4.048e+01	1.195e+00	-33.874	4.22e-07 ***
X_1	-3.163e-05	2.834e-05	-1.116	0.315052
X_2	-1.502e-07	1.003e-07	-1.497	0.194652
X_3	-3.520e-03	1.027e-03	-3.427	0.018692 *
X_4	7.743e-03	4.981e-07	3.436	0.018508 *
X_5	6.595e-08	2.253e-03	0.132	0.899827
X_{12}	2.089e-07	1.250e-07	1.250e-07	0.155521
X_{15}	1.120e-01	2.307e-02	4.852	0.004665 **
X_{18}	1.579e-02	2.310e-03	6.834	0.001023 **
X_{20}	-2.578e-02	5.582e-03	-4.618	0.005746 **
X_{21}	2.104e-03	5.031e-04	4.182	0.008637 **
X_{22}	3.224e-02	3.286e-03	9.809	0.000187 ***
X_{23}	-4.026e-05	4.501e-05	-0.895	0.411984
R^2	0.9999	Residual		1.097
Adjusted R^2	0.9997	P-Value		3.102e-09

***p< .001, **p< .01, *p< .1

5.2.3 Least Squares Regression Result

Using R-Studio software for least squares regression analysis to determine model parameters ε and $\alpha_1, \alpha_2, \ldots, \alpha_5, \alpha_{12}, \alpha_{15}, \alpha_{18}, \alpha_{20}, \ldots, \alpha_{23}$ (As shown in Table 12). It can be seen from the results that the fitness is 0.9999, and the adjusted fitness is 0.9997, which means that the comprehensive score of the competitiveness evaluation of cultural and creative industries in 18 provinces and cities along the "Belt and Road" that can be explained by 12 dependent variables accounts for 99.97%. The P-Value is 0.000000003102 less than 0.001, indicating that the fit is credible within the 99% confidence interval. The second column in the result is the regression coefficient, which is substituted into the formula (9) to obtain a linear regression measurement model, which is of the formula (10).

$$Y = -0.00003163X_1 - 0.0000001502X_2 - 0.00352X_3 + 0.0077434X_4 + 0.000000066X_5$$
$$+0.0000002089X_{12}+0.112X_{15} + 0.01579X_{18} -0.02578X_{20}+0.002104X_{21}+0.03224X_{22}$$
$$-0.00004026X_{23} -40.48 \qquad (10)$$

From the results, we can see that the independent variable X_{15}(national general public budget culture sports and media expenditure), X_{22}(copyright contract registration), X_{18}(R&D personnel equivalent full-time equivalent), X_4(per capita cultural consumption expenditure), X_{21} (patent number) has a strong positive influence on the dependent variable(the comprehensive score of the competitiveness of cultural and creative industries in 18 provinces and cities along "the Belt and Road"). The independent variables X_3(the cultural resources of museums, cultural and art museums, public libraries, etc.) and X_{20}(new product development

projects) have a strong negative impact on the dependent variables, and the other variables have very little influence on the dependent variables. In summary, the main influencing factors for improving the competitiveness of the cultural and creative industries of provinces and cities along "the Belt and Road" can be summarized into four categories, namely, government behavior (X_{15}, X_3), creative ability and efficiency (X_{22}, X_{21}, X_{20}), high-level human resources(X_{18}) and cultural and creative industry consumption level (X_4).

6. Competitive Improvement Plan

The following conclusions can be drawn from the quantitative analysis results of empirical research. Firstly, from a national perspective, the comprehensive evaluation of the competition of cultural and creative industries in 31 provinces and cities in China shows that the competitiveness of cultural and creative industries in the provinces and cities along the "Belt and Road" is generally weak. At the same time, the competitiveness of the provinces and cities along the Maritime Silk Road is significantly better than the Land Silk Road. The competitiveness of cultural and creative industries in the provinces and cities along the "Belt and Road" (especially those along the Land Silk Road) still has a lot of room for improvement. Secondly, from the perspective of the "Belt and Road", there are four main factors that affect the competitiveness of the 18 provinces' cultural and creative industries. Four main types of influencing factors are obtained: government behavior (X_{15}, X_3), cultural and creative industry consumption level (X_4), creative ability and effect (X_{22}, X_{21}, X_{20}) and cultural and creative industry high-level professionals (X_{18}). Based on these four main influencing factors, this paper proposes a plan to improve the competitiveness of cultural and creative industries in 18 provinces and cities along the "Belt and Road".

6.1 Giving full play to the guiding role of the government and cultivating new vitality for land-based Silk Road provinces and cities

The development of the industry is inseparable from the government's support in terms of policies and funds and corresponding macroeconomic regulation and control. From the results of least squares regression analysis, it can be seen that the independent variable X_{15} has the greatest positive impact on the comprehensive score of the cultural and creative industries in the provinces and cities along "the Belt and Road", and the dependent variable X_3 has a certain reverse effect. The government should increase investment in cultural and creative industries, but it must focus on it and not blindly add infrastructure investment in cultural and creative industries. Therefore, in the development process of the cultural and creative industries in provinces and cities along "the Belt and Road", we must give full play to the guiding role of the government and comprehensively enhance its industrial competitiveness. The government's guidance and macro-control measures mainly include: Firstly, establish a corresponding creative talent training base, and provide creative talents, network technology talents, management talents, etc. for the cultural and creative industries. Secondly, improve relevant laws and regulations, establish a sound knowledge protection system, and provide tax incentives to provide a good environment for the development of cultural and creative industries, especially to increase the policy support to the cultural and creative industries along the Land Silk Road. We must give preferential policies with local characteristics and fully mobilize the enthusiasm of the industry. Thirdly, the government must constantly improve the establishment of infrastructure, and at the same time avoid duplication of waste, increase protection and repair of existing infrastructure, increase infrastructure investment in backward areas, and make government resources effective. Utilize and continuously promote the balanced development of cultural and creative industries along the provinces and cities along "the Belt and Road"; Fourth, according to the geographical location and ecological resources of the provinces along the route, the government can create distinctive creative economic growth points, such as the establishment of characteristic tourist scenic spots and characteristic traditional cultural festivals; The government can still improve the operating mechanism of the industry and implement more effective and broader industrial system development, such as establishing an industrial development model of "cultural and creative industries + N", cultivating new growth points, and the cultural and creative industries have high permeability. It is more practical to integrate with other industries. In particular, the provinces and cities along the Silk Road on the land are mostly ethnic provinces and cities, such as: Hui in Xinjiang, Gansu, Tibetan in Qinghai and Tibet, Yi, Bai, Hani and Yi in Yunnan, Mongolia in Inner Mongolia, Guangxi Zhuang, Miao and so on. The government should increase the protection of minority cultures, encourage and support the development of cultural and creative industries that integrate with minority

cultures, and promote the development of cultural and creative industries along the Land Silk Road, and continuously enhance its industrial competitiveness.

6.2 Accelerate the deep integration of cultural and creative industries and modern technology and continuously improve the ability of industrial innovation

From the regression results, X_{20}, X_{21}, and X_{22} have a greater impact on the comprehensive scores of the cultural and creative industries along the "Belt and Road", and all three indicators point to innovation capabilities. The cultural and creative industry is an industry that pays more attention to high-tech means. Nowadays, informationization has become one of the main themes of economic development, and the coordinated development of cultural and creative industries has become an inevitable trend of development. However, provinces and cities along "the Belt and Road", especially the provinces and cities along the Land Silk Road, are mostly central and western cities in China, with a low degree of informatization. Therefore, in order to rapidly improve the competitiveness of the "One Belt, One Road" cultural and creative industry, we should continuously improve the level of regional informationization and vigorously promote the integration of informationization and cultural and creative industries. This requires the use of new display technologies, communication technologies and manufacturing technologies brought by the information industry in the cultural and creative industries, accelerating the deep integration of cultural and creative industries and modern technology, and comprehensively enhancing the innovation capability of the cultural and creative industries. At the same time, further transform technology into productivity, increase economic efficiency, and liberate the productivity of cultural and creative industries. In order to meet the needs of development between the world countries, the competition for the commanding heights of science and technology is often taken as the strategic focus, and technological innovation is the most important strategic investment. This means that the information culture and creative industries will become the leading force in promoting the development of the national, regional and global economy. Therefore, paying attention to the development of emerging cultural and creative industries is the common choice for the international community to cope with the financial crisis and achieve sustainable development. It is also the strategic direction for the development of cultural and creative industries in provinces and cities along "the Belt and Road" to further enhance the competitiveness of cultural and creative industries. At present, the era of "Internet +" and "Industry 4.0" has come to an end, and the impact of economic and social benefits brought about by modern technology is enormous. The cultural and creative industries in provinces and cities along the "Belt and Road" should seize opportunities in time, integrate scientific and technological resources, break down departmental barriers and fragmentation, promote interdisciplinary, cross-disciplinary, cross-sectoral and inter-regional scientific and technological collaboration, and continuously improve the cultural and creative industries. The scientific and technological content will further enhance the industry's ability to innovate.

6.3 Increase the introduction of high-quality talents and continuously improve the mechanism for training industrial talents

From the regression results, X_{18} (R&D personnel equivalent to full-time equivalent) has a greater impact on the comprehensive scores of the cultural and creative industries in the provinces and cities along the "Belt and Road". It shows that high-quality talents have a certain impact on industrial competitiveness. Talents are an important engine for the competitiveness of the cultural industry, especially for the industrial upgrading of the regions with the weakest competitiveness of the cultural and creative industries. Most of the provinces and cities along the "Belt and Road" are in the backward areas of the west, and the loss of highly educated and technical professionals is serious, and the talents of cultural and creative industries are relatively scarce. Therefore, it is necessary to proceed from this specific situation and supplement the gap between the composite high-quality talents in the cultural and creative industries. In terms of the introduction of industrial talents, the cultural and creative industries should actively introduce strategic emerging industries and high-level technical talents of traditional advantageous industries to enhance cultural content creativity and product added value, increasing the value of each industry chain, thereby improving the economic benefits of cultural and creative industries. Cultural and creative industries need to introduce big data and new media marketing talents, extend the value chain of cultural and creative industries, and expand high-end business and new services. The cultural and creative industry needs to introduce cultural and technological integration of comprehensive talents. It is not only technical, creative, but also good at industrial management. It integrates cultural, industrial, research

and technical characteristics to enhance cultural creativity of the comprehensive productivity and economic benefits of the industry. Second, in terms of talent development, by accelerating the innovation of personnel training, we will further improve the construction of talent carriers, enhance the blood production function of the enterprise itself through targeted training, talent exchange, and cooperation between industry, university and research institutes, and ensure that human resources play an active role in the transformation and upgrading of cultural and creative industries. At the same time, from the cultural and creative industries of the provinces and cities along the "Belt and Road", the development competitiveness of cultural and creative industries in various provinces and cities is uneven, and the provinces and cities with relatively poor competitiveness can form partnerships with highly competitive provinces and cities to realize the advantages of inter-regional industry mutual learning and exchange, resource sharing, and finally achieve the benign development of common industry optimization.

6.4 Innovative industry product transformation and upgrading to meet consumer cultural and creative consumer preferences

From the regression results, it can be seen that X_4 (consumer spending per capita cultural and creative industry) has a certain impact on the comprehensive scores of the cultural and creative industries in the provinces and cities along the "Belt and Road". The per capita cultural industry consumption expenditure also reflects the degree of recognition of the output of the cultural and creative industries in provinces and cities along "the Belt and Road". The cultural and creative industry consumption expenditure is equivalent to cultural consumption, which refers to the behavior of people to consume spiritual products and services in different ways in order to meet spiritual needs. Unlike material consumption, cultural consumption targets spiritual products and services, such as magazines, art, literature, television, and online games. In recent years, people's consumption patterns have gradually shifted from imitative and wave-type consumption to individualized and diversified consumption, and on the basis of quantity satisfaction, they have paid more attention to qualitative improvement. Different from the rigid demand of material consumption, cultural consumption is flexible and has the characteristics of "stickiness", that is, once a certain cultural consumption is produced, it will form habits and continue to climb. Different people have different cultural consumption. Different consumers have different needs and preferences for cultural products due to differences in occupation, income, social status, education level and personality hobbies, showing obvious individual differences and diversity. Based on this, the government and cultural and creative industries in provinces and cities along "the Belt and Road" should actively develop cultural and creative products that cater to different levels of consumers based on local humanities, national culture and ecological resources. Through the promotion of cultural and creative concepts, consumers can continue to improve their cultural literacy, thereby enhancing consumers' cultural consumption preferences, cultivating consumer cultural consumption habits, and increasing the per capita consumption expenditure of cultural and creative industries, thereby stimulating income of the cultural and creative industries.

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