

# The Development Model Study of Tourism Industry Driving Economic Development Based on Data of New Normal Economy of Sichuan

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**Abstract**—The development of tourism industry has been became one of the important driving force of Sichuan economic development. Meanwhile, the development of tourism industry will further promote the transition and optimization of Sichuan economic in the background of new normal economy. The research studies the relationship between tourism income and the development of Sichuan tertiary industry, tourism income and Sichuan economic development, and studies the grey correlation degree between large tourism industry and Sichuan economy through literature research, regression analysis and grey correlation degree analysis methods. Research shows that the development of Sichuan tourism industry has a significant driving effect on the tertiary industry value and GDP of Sichuan. The development of tourism industry has a positive impact on stimulating internal demand and investment growth, industrial restructuring, regional coordinated development, scientific and technological innovation, urbanization and beautiful Sichuan. The coupling coefficient between tourism industry, accommodation industry, catering industry and transportation industry and Sichuan economic system is 0.6632125. The development of large tourism industry has significantly promoted the economic development of Sichuan.

**Keywords**—*Tourism Industry; Economic Development; Driving Force of Sichuan Economic Development; Grey Correlation Degree*

## I. INTRODUCTION

Since the subprime crisis happened in the US in 2007, the major western economies have not come out of the haze of the financial crisis, financial leverage continues to be abnormally high, monetary and fiscal policies are ineffective, unemployment rate remains high, and economic recovery is weak. Economists have begun to study the new features of global economic development. In 2010, the PIMCO defined this new feature and pattern of economic development as a New Normal of economic in the report of "Managing the New normal in industrialized countries". In China, there has been sustained high speed growth for nearly 40 years, economic development is entering a shifting period, and a new track is being formed. Under the background of China's economy entering into the New Normal, as an important part of the whole economy, Sichuan's economy is bound to change the pace of growth, change the growth model and foster new

impetus for growth in the new normal. For a long time in the future, the problems for Sichuan's economy mainly focus on how to expand the effective demand and stabilize the economic growth, how to develop and strengthen the dominant industries, and how to promote the core competitiveness, how to enhanced the multi-point and multi-pole support, how to cultivate the new engine of regional economy. The new normal indicates the personalized, diversified consumption of the condensation of new business type and model will become the important supporting force to promote the economic development. As a traditional dominant industry in Sichuan, tourism can play a fundamental role in effectively expanding demand and stabilizing economic growth. The development of tourism will become an important driving force for the economic development of Sichuan. Under the background of national economic transition, tourism industry is also undergoing the transformation from traditional service industry to modern service industry. Sichuan tourism is undergoing profound and long-term changes, and it is also constantly deriving new factors of economic development. The purpose of this research is by exploring the interdependence between the tourism economy and the Sichuan economy, identifying to what extent does the Sichuan tourism industry contributed to the economic development.

According to the research of a large number of scholars, tourism has become an important driving force of economic growth[1], tourism development and macro-economy have a nonlinear time-varying causality[2]. Many factors in the development of tourism industry have a structural influence on economic development, such as cultural capital and other factors[3]. Some scholars even consider that tourism industry has become a strategic pillar industry of economic development[4]. The level of regional economic development [5][6][7] and the development of transportation facilities have multiple positive correlations with the development of tourism industry[5][8]. Due to the development and transformation of the global economy, tourism has become an important part of the economy. Inbound tourism is actually an export behavior, which urges many scholars to study the contribution of tourism to economic growth from the perspective of export-driven, promote tourism operators to enhance their competitiveness and increase labour productivity[9][10]. At the same time, a

large number of inbound tourists will encourage tourism destinations to invest more and achieve economies of scale effect[11]. Ghal (1976) conducted a study of the tourism industry in the Philippines and classified Philippine exports as tourism-inclusive and non-tourism-inclusive[12]. It shows that the tourism-inclusive segment is 17% higher than the non-tourism sector in terms of total personal income and 14% higher than the non-tourism sector in terms of average growth rate of income. It is proved that the tourism industry has a positive impact on the economy[12]. Nowak.,et al (2007) taking Spain as an example, constructs and validates a tourism-foreign capital goods import-economic growth model[13].

At the same time, the degree of tourism specialization reflects the level of tourism development of a country or region, which is usually measured by the proportion of tourists to local residents, the proportion of tourism income to GDP and the proportion of tourism income to exports[14]. That is to say, the countries that account for more tourists, more tourism income to GDP and more tourism income to exports are called tourism specialized countries. Due to the different natural conditions and resource endowment, different countries have different attitudes towards to the development of tourism industry. The countries with high degree of tourism specialization are usually the countries with small scale and unbalanced industrial development[15]. Bing (2011) suggested that tourism growth was negatively correlated with human capital and positively correlated with local prices[16]. The high price level is disadvantageous to the development of manufacturing industry. A negative effect of tourism development is that it may damage the competitiveness of the local manufacturing industry or hinder the development of the manufacturing industry, that is, the problem of "de-industrialization". Spain and Greece, after a long tourism boom, have experienced varying degrees of decline in competitiveness. In other words, the growth rate of tourism specialization countries is higher than that of non-tourism specialization countries[16]. Tourism is the first choice, in places where there is no opportunity to develop other industries. And other areas should make use of the flow of people and funds brought by tourism to promote the development of other industries, so as not to fall into the post-tourism predicament era.

Williams and Shaw conducted an empirical study on the development of tourism industry in European countries, and found that the development of tourism industry can promote the transfer of wealth. The imbalance of development between regions and the imbalance of wealth will be restructured because of the development of tourism industry, thus reducing the regional differences and promoting the balanced development of the region[17]. However, since the problems of market, aging, migration, innovation deficiency and lacking of entrepreneurship have not been solved, the economy of many regions has not grown as a result of the development of tourism industry[18].

From the scholars' research, it can be seen that the development of tourism industry can promote the development of local economy to a certain extent. Especially the development of tourist destination makes it easy for a region to attract foreign tourists. These foreign tourists' consumption is actually an export behavior, and its influence model on

economic growth is similar to that of export-oriented economy. At the same time, scholars have carried out a more detailed analysis and research on which areas are suitable for the vigorous development of tourism industry. The scholars come to the conclusion that manufacturing, structural reform and innovation are the core elements for the rapid development of the economy. In the undeveloped area and the area which cannot upgrade the industry, and the area with good natural endowment is suitable for the development of the first choice of tourism industry. The development of tourism industry in underdeveloped areas is not omnipotent. It should lead the development of other industries with the development of tourism industry.

Scholars have not studied the interdependence among tourism industry, tertiary industry and economic development. At the same time, the tourism industry is a systematic industry, involving many industries such as tourist destinations (tourist attractions), catering, accommodation, transportation, and so on. No scholars have started from the concept of large tourism industry to the numerous industries included in the tourism industry. The research and analysis of the correlation degree of economic impact will be the focus of this study.

## II. CORRELATION MODEL RESEARCH BETWEEN TOURISM INCOME AND SICHUAN ECONOMY

### A. Linear Regression Model

There is a certain degree of correlation between Sichuan income and the development of Sichuan economy, which can be explained by mathematical model. In the real world, there are a large number of cases in which two variables  $X$  and  $Y$  that some dependencies exist. The relationship between variables is called "correlation". Regression model is a powerful tool to study the interdependence. Usually the  $Y$  is called as dependent variable or response variable, and  $X$  is called independent variable or forecast variable. We can imagine that the value of  $X$  consists of two parts: one is the part that can be determined, and it is the function, which is recorded as  $f(X)$ . The other part is the influence of many other unconsidered factors (including random factors), which is regarded as random error, that is,  $e$ . So we get the following model:

$$Y = f(X) + e.$$

In here,  $e$  as a random error, we have reason to ask its mean value  $E(e) = 0$ , that  $E(\cdot)$  represents the mean of random variables.

In particular, when  $f(X)$  is a linear function  $f(X) = \beta_0 + \beta_1 X$ , we get the

$$Y = \beta_0 + \beta_1 X + e.$$

In this model, if ignored  $e$ . It is a normal linear equation, so we call it linear regression model or linear regression equation.

*B. The Construction and Analysis of the Linear Regression Model among the Total Income of Tourism, the Tertiary Industry Value and the GDP in Sichuan Province*

In “Statistical Bulletin on National Economic and Social Development in Sichuan Province”, the data from 2010 to 2017 of the Total Income of Tourism  $X$ , the Tertiary Industry Value  $Y_1$ , and the GDP  $Y$  are shown in the following table 1(units: RMB 100 million)

From the figure of growth trend among the Total Income of Tourism, the Tertiary Industry Value and the GDP in Sichuan from 2010 to 2017, the same trend growth can be seen in the figure (Fig. 1). And there is a trend of linear growth for  $X, Y_1, Y$ .

From the scatter figure (Fig. 2) of the GDP  $Y$ , and the Tertiary Industry Value  $Y_1$  for the Total Income of Tourism  $X$ , it can be seen that the total value of the tertiary industry and the GDP of Sichuan have the same positive correlation growth trend when the total tourism income of Sichuan is increased by the total value of Sichuan economy and the total value of the third industry respectively. It is shown that the Sichuan tourism industry has a driving effect on the tertiary industry and the Sichuan economy.

At the same time, according to Fig. 1, we can see that the change trend of the Total Output Value  $Y$ , the Tertiary Industry Value  $Y_1$  and the Total Income of Tourism  $X$  are very similar, so it is concluded that there is a certain correlation between  $Y, Y_1$  and  $X$ . At the same time, linear regression model is the most common mathematical model in factor correlation analysis. The main advantage is that the mathematical modeling process and applied analysis are relatively simple. Finally, according to the scatter diagram of output value on total tourism income (Fig. 2), the relationship between the Total Output Value  $Y$ , the Tertiary Industry Value  $Y_1$  and the Total Income of Tourism  $X$  is very similar, and it can be assumed to be a linear relationship. Therefore, according to the combination of qualitative analysis and quantitative research, the data from 2010 to 2017 (Table I) of the Total Output Value  $Y$ , the Tertiary Industry Value  $Y_1$  and the Total Income of Tourism  $X$  the gross product can be established two linear regression models as follows.

The results of the regression model of tertiary industry value and total tourism income are as follows (Table II):

According to Table II, we get that the regression equation is

$$Y_1 = 1.65X + 2676.2$$

Goodness of Fit is  $R^2 = 0.98$ ,  $F = 329.17$ ,  $P = 1.8E - 0.6$ .

Meanwhile, the Calculating results of linear regression model of GDP  $Y$  and total tourism income are as follows.

According to Table III, we get that the regression equation is

$$Y = 2.5X + 14812.4$$

Goodness of Fit is  $R^2 = 0.95$ ,  $F = 111.2$ ,  $P = 4.28E - 0.5$



Fig. 1. The Change of Total Tourism Income, the Tertiary Industry Value and GDP

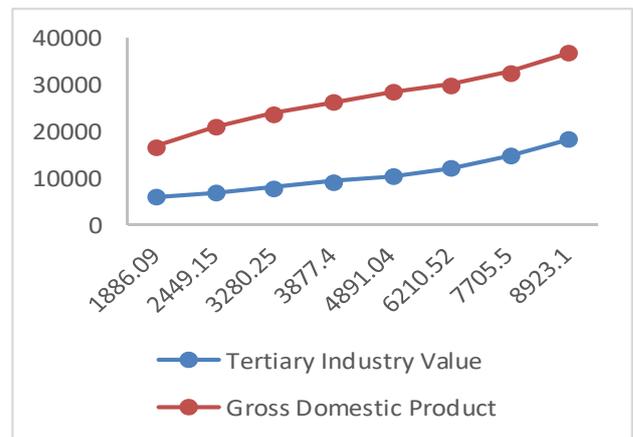


Fig. 2. Change trend of the GDP, the Tertiary Industry Value and the Total Income of Tourism

**TABLE I. 2010~2017 THE TOTAL INCOME OF TOURISM, THE TERTIARY INDUSTRY VALUE AND THE GDP IN SICHUAN**

<b>Years</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Total Income of Tourism	1886.09	2449.15	3280.25	3877.4	4891.04	6210.52	7705.5	8923.1
the Tertiary Industry Value	6030.41	7015.3	7964.8	9256.13	10486.2	12132.6	14831.7	18403.4
GDP in Sichuan	16898.6	21026.7	23849.8	26260.77	28536.7	30103.1	32680.5	36980.2

**TABLE II. REGRESSION ANALYSIS OF TERTIARY INDUSTRY VALUE AND TOTAL TOURISM INCOME**

<b>Regression statistics</b>						
Multiple R	0.991009					
R Square	0.982099					
Adjusted R Square	0.979115					
Standard error	606.8351					
Observed value	8					
Analysis of Variance						
	df	SS	MS	F	Significance F	
Regression Analysis	1	1.21E+08	1.21E+08	329.1691	1.8E-06	
Residual	6	2209493	368248.9			
Total	7	1.23E+08				
	Coefficients	Standard error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	2676.169	494.7779	5.408828	0.00165	1465.491	3886.846
X Variable 1	1.649826	0.090934	18.14302	1.8E-06	1.427317	1.872334

**TABLE III. REGRESSION ANALYSIS OF GDP AND TOTAL TOURISM INCOME**

<b>Regression statistics</b>					
Multiple R	0.974058				
R Squae	0.948789				
Adjusted R Square	0.940254				
Standard error	1578.789				
Observed value	8				
Analysis of Variance					
	df	SS	MS	F	Significance F
Regression Analysis	1	2.77E+08	2.77E+08	111.1631	4.28E-05
Residual	6	14955452	2492575		
Total	7	2.92E+08			

Regression statistics						
	Coefficients	Standard error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	14812.41	1287.252	11.507	2.59E-05	11662.62	17962.2
X Variable 1	2.494378	0.236582	10.54339	4.28E-05	1.915482	3.073273

It can be seen from the above two models that the results of the test *P-value* and the Significant *F* value of the test are both less than 0.05, and the values are very small. It can be seen that the test *F* is significant, and the *t* test of variables *X* is also significant. From the calculation results, we can get that the fitting degree of the above two models is very close to 1, and the goodness of fit is good. It shows that there is a significant positive correlation between the gross economic product of Sichuan Province and the tourism income of Sichuan Province, as well as the output value of the tertiary industry and the tourism income of Sichuan Province, which affects each other and promotes the development of each other. The effect of the total tourism income *X* on the gross product and the output value of the tertiary industry are extremely significant. The gradual increase of the ratio of total tourism income *X* to gross domestic product *Y* and the output value of tertiary industry  $Y_1$  also shows the importance and influence degree of total tourism income to GDP.

### III. CORRELATION ANALYSIS BETWEEN THE DEVELOPMENT OF TOURISM INDUSTRY AND SICHUAN ECONOMY

From the results of the model, it shows that the total tourism income in Sichuan has a significant driving effect on the value of the tertiary industry and the GDP of Sichuan Province. Vigorously developing tourism plays an important role in adjusting Sichuan's economic structure, expanding domestic demand, and increasing employment, stimulating economic growth, promoting social progress, and meeting the needs of the people's material and cultural life. The development of tourism has also greatly attracted purchasing power to Sichuan consumption from outside of province and overseas, promoted the prosperity of Sichuan market, and expanded domestic demand. In the process of opening up to the outside world, tourism has played an important role in creating foreign exchange and improving the investment environment, and has played an important role in increasing foreign exchange reserves and enhancing economic strength. The development of the tourism industry will have a positive impact on the economy from the following aspects:

#### A. Impact of Tourism Industry Development on Stimulating Intenal Demand and Investment Growth in Sichuan

In recent years, the tourism industry consumption in Sichuan Province has developed like a blowout. According to the news released by the Sichuan Provincial Tourism Industry Development Leading Group Office, the total number of tourists in Sichuan is 71.4579 million person-times during the Golden week of National Day in 2017, an increase of 5%. The data include: 24.6056 million person-times of overnight

tourists, , an increase of 1.9%; 46.8523 million person-times of one-day trips were received, , an increase of 6.7%; and total tourism revenue was 52.471 billion RMB, , an increase of 18.9%. Sichuan becomes the province that receives the most tourists in the country and the tourism income ranks the third in the whole country. It is further proved that Sichuan has the status of a major tourist province. However, although Sichuan is the province that receives the most tourists in the country, but its tourism income only ranks third, indicating that the per capita consumption of tourists in Sichuan is less than that in Zhejiang and Shandong Province. At the same time, the percentage of tourists from within and outside the province is 77.66% and 22.34% respectively. Sichuan's ability to attract outside tourists has yet to be improved. Under the new normal, personalized and diverse demands of consumers will become the mainstream of consumption. For Sichuan tourism industry, satisfying the consumers' individuation and diversified demands means excavating the real needs of tourists, meeting its various needs will bring about the growth of per capita consumption, and at the same time, excavating and satisfying tourists' individuation. The diversified demand will attract more tourists from other provinces and overseas tourists. Sichuan will become the major export province of tourism products. The increase in the number of tourists and the increase in per capita consumption of tourism will also stimulate the growth of the economy.

At the same time, the construction of Sichuan tourism destination is still in the initial stage. Now the tourism destination can be provided relatively limited. Sichuan Province has many valuable international tourism resources, and the exploitation of these tourism resources will attract a large amount of capital construction investment. The construction of international tourism destination will make Sichuan face a new round of investment peak. While building charming China and beautiful Sichuan province, it will invigorate Sichuan economy and achieve the purpose of economic growth.

#### B. Impact of Tourism Industry Development on the Adjustment and transformation of Sichuan's Indsustry Structure

As mentioned earlier, not every region is suitable for the development of manufacturing and tourism industry, and the layout and development of the industry have its own scientific rules to follow. Sichuan is a large province with a vast region. The industrial structure adjustment and transformation have a relatively broad space. First of all, different cities and urban clusters have their own superior industries and industrial clusters. These industries can be optimized and upgraded through innovation-driven, and other industries can be distributed to areas where the economic development level of

Sichuan is lower. And some areas are not suitable for industrial adjustment and transformation, its main development direction is tourism industry.

In recent years, the proportion of tertiary industry in GDP in Sichuan Province has increased year by year, from 38.2% in 2011 to 49.7% in 2017. However, as far as the whole country is concerned, the share of the tertiary industry in GDP is 51.6%. As a major agricultural and industrial province, the speed of industrial adjustment and transformation in Sichuan Province is obviously lower than the national average level. Services dominated by modern services usually account for between 65% and 75% of GDP in western developed countries, while the total labor force driven by the tertiary industry can reach between 60% and 70%, and China is going through a fairly long period of transformation and upgrading. In particular, this road of transformation in Sichuan needs to be taken seriously. Tourism industry belongs to the traditional service industry. At the same time, with the rise of intelligent tourism and the deepening of ecological construction, the tourism industry is transforming to the modern service industry. The transformation and upgrading of tourism industry will be accompanied by the increase of the proportion of the tertiary industry in Sichuan and become one of the support points of the modern service industry in Sichuan. Therefore, the economic development highlights the importance of the tourism industry, promotes the tourism industry to the modern service industry transformation and upgrading, and promotes the tourism consumption and the fundamental change of the tourism concept.

Sichuan Province is in the key stage of regional industrial layout adjustment and regional key industrial planning. Which regions need to carry on the construction and planning of emerging industries, which regions need to undertake the undertaking of transitional industries, and which regions need to develop tourism industry are the important tasks of Sichuan at this stage. As an important support for the modern service industry, the tourism industry will certainly become the focus of industrial planning in partial areas. For these areas with good natural endowments and poor conditions for the development of other industries, tourism industry planning and the development of tourism industry play a decisive role in its economic development. Only with the development of tourism industry can the wealth of Sichuan's economic development be shared by the whole province and people.

#### *C. Impact of Tourism Industry Development on Science and Technology Innovation in Sichuan Province*

The development of tourism industry will be transformed to meet the individuation of consumers and diversified demand, and the market competition of tourism market will gradually turn to the competition of quality and differentiation. The market will play a decisive role in the allocation of tourism market resources. Therefore, intelligentize and intelligence will play a more and more important role in the development of tourism industry. That is to say, personalized, diversified consumption demand and quality, differentiated market competition is promoting the modernization transformation of tourism industry. The modernization transformation of Sichuan

tourism industry drives practitioners to turn to intelligent tourism. Intelligent tourism is the use of cloud computing, the Internet of things and other new technologies, through the Internet and mobile terminals, active awareness of tourism resources, tourism economy, tourism activities, tourists and other aspects of information, and timely release. So that people can understand the tourism-related information in time, arrange and adjust the travel plan in advance, so as to achieve the intelligent perception of all kinds of tourism information and the effect of convenient utilization. The construction and development of intelligent tourism is, in essence, a comprehensive activity that integrates the latest achievements of scientific and technological innovation through the exploration of individual and diversified needs of consumers, the means of marketing, the aid of modern intelligent technology and the Internet, and the integration of the latest achievements of scientific and technological innovation. Among them, only the use of technology and Internet in modern times, the integration of scientific and technological innovation results will form a strong back-stepping effect on the scientific and technological innovation in Sichuan.

The development of technology is often driven by the market, and the consumer market promotes a large number of scientific researches and the application of scientific research results, all of which have greatly promoted the economic development. The use of modern intelligent technology in the field of tourism is only an initial stage of intelligent tourism. The advanced stage of intelligent logistics is to tap and satisfy the personalized and diversified tourism needs of consumers through the development of an intelligent technology, thus to create demand. The tourism industry in Sichuan has a huge market scale, even the pillar industry in many areas of Sichuan, and the innovation and movement of science and technology brought about by the development of tourism industry in Sichuan will make this part of science and technology seek for a broad market space. This will make Sichuan no longer follow the eastern scientific and technological innovation as an imitator, and the tourism industry-driven scientific and technological innovation will make Sichuan turn into a major province in this field, together with the institutional promotion of the transformation of relevant scientific research achievements. And then promote the development of the economy on a larger scale.

#### *D. Impact of Tourism Industry Development on Regional Coordinated Development in Sichuan*

The level of economic development in Sichuan is very different. As mentioned above, Chengdu and Chengdu plain city group, represented by Chengdu, have an absolute advantage in the economic development of Sichuan. There are great differences in economic mass, potential of economic development, industrial structure, natural endowment, historical development, and future development trend. Just like the gap between the east areas and the west areas of China, Sichuan has appeared the co-existence of the developed area and the less-developed area. If the economic development of less developed areas is not solved at the same time, the economic development of Sichuan will be abnormal. The Sichuan provincial government has carried out detailed

planning and various efforts in this work, and has determined the development direction and path for each region, especially for the scientific prediction and planning of the key development industries in each region. However, due to the restriction of natural conditions, the distribution of agriculture and manufacturing in former revolutionary base areas, areas inhabited by minority nationalities, remote and border areas and poverty-stricken areas of Sichuan is obviously unwise, and even the development of modern service industry is restricted by the natural conditions. And the areas with bad natural conditions happen to be the most beautiful areas in China, such as Tibetan Autonomous Prefecture of Garzê, Aba Tibetan Qiang Autonomous Prefecture, and Yi Autonomous Prefecture of Liangshan, which are in the western Sichuan plateau with beautiful natural scenery. The advantage of developing tourism industry is exactly the inferior condition of transportation, the shortage of people and the lack of inferior position of agricultural manufacturing industry. Through the development of tourism industry, former revolutionary base areas, areas inhabited by minority nationalities, remote and border areas and poverty-stricken areas of Sichuan can enjoy the dividends brought by economic development, or through the development of tourism industry, they can build their own pillar industries and gather a large number of people. Human flow aggregation effect (capital flow, business flow, logistics, and information flow aggregation effect) and promote the rapid development of local economy. At the same time, some areas that are particularly poor are because they simply do not have the basic conditions for industrial development, and industrial development will involve the destruction of part of the ecological environment, all of which lead to the inability of these areas to adjust and upgrade their industries. These regions can choose to use the tourism industry as their mainstay, emulate the tourism development experiences of Australia, New Zealand and parts of Europe, and then develop their economies.

The economic development of former revolutionary base areas, areas inhabited by minority nationalities, remote and border areas and poverty-stricken areas will lead to the redistribution of wealth in Sichuan, and the more reasonable industrial distribution of Sichuan's economic structure will meet the requirements of sustainable development, modern agriculture, and advanced manufacturing. The rational distribution of modern service industry will become an important driving force of regional coordinated development and finally promote the coordinated development of Sichuan economy.

#### *E. Impact of Tourism Industry Development on New-type Urbanization in Sichuan Province*

The new-type urbanization is the urbanization characterized by the overall planning of urban and rural areas, the integration of urban and rural areas, industrial interaction, saving economy and intensive economy, ecological livability and harmonious development. It is the coordinated development of large and medium-sized cities, small towns and new-type rural communities and promotes mutually advancing urbanization. At present, the urbanization rate of permanent residents in China is 53.7%, and the urbanization rate of household

registration population is about 36%, which is far below the national average of 80% and the average per capita income of 60% of the developing countries similar to China. The urbanization rate in the eastern region reaches 62.2%, while the urbanization rate in the central and western regions is only 48.5% and 44.8% respectively. And according to Sichuan Province housing urban and rural construction work conference released data, Sichuan new urbanization development in 2016 is obvious. The urbanization rate of permanent residents in the whole province reached 48.9%, an increase of 1.2% over the same period of last year. The urbanization rate of household registration population reached 32.8%, an increase of 2.2% over the same period of last year. The urbanization rate of Sichuan Province is also lower than the average level in China and far below the average level in the eastern part of China. According to the relevant requirements of the National New urbanization Plan (2014 - 2020), the urbanization rate of permanent residents in China should reach about 60%, and the urbanization rate of household registration population should reach about 45%. The gap between the urbanization rate of registered population and that of permanent residents has narrowed by about 2 percentage points, and efforts have been made to achieve 100 million or so agricultural transfer population and other permanent residents in cities and towns. There is still great space for development in Sichuan.

The development of tourism industry will promote the process of new urbanization in Sichuan. The tourism industry has played a great role in the industrial distribution and adjustment in partial areas of Sichuan, and even played an important role in the pillar industry in some areas. The development of tourism industry can promote the transfer of agricultural population to the employees of tourism industry, and then improve the urbanization rate. Especially in the western Sichuan Plateau and revolutionary old areas, the incomes of agriculture, industry and other industries are not enough to support economic development and increase the income of residents, a large number of agricultural populations can be transferred to the tourism industry. These regions which account for more tourists, tourism income to GDP and tourism income to exports are called tourism specialized areas. The tourism specialization area will promote the urbanization rate of the relevant areas in Sichuan Province rapidly, and meet the related requirements of the National New urbanization Plan (2014 - 2020) by 2020, so as to enhance the economic growth potential.

#### *F. Impact of Development of Tourism Industry on the Construction of Beautiful Sichuan*

In the face of the severe situation of tight resource constraints, serious environmental pollution and ecosystem degradation, the 19th CPC National Congress proposed that the construction of ecological civilization is a thousand-year plan for the sustainable development of the Chinese nation. We must establish and practice the concept that green water and green mountains are Gold and Silver Mountain, adhere to the basic national policy of conserving resources and protecting the environment, treat the ecological environment like life, and coordinate the overall management of landscape, forest, land, lake and grass systems. Implement the strictest ecological

environment protection system, form a green development style and lifestyle, firmly follow the road of civilized development with rich life and good ecology, build a beautiful China, and create a good working and living environment for the people, and contribute to global ecological security.

To protect ecological environment is to protect productivity. To improve ecological environment is to develop productive forces. During the 13th Five-year Plan, Sichuan Province made the decision and planned to "adhere to ecological priority and resolutely hold the green water and green mountains, and build up the ecological barrier in the upper reaches of the Changjiang River in an all-round way". In the new normal, the construction of beautiful China and the construction of beautiful Sichuan need to vigorously develop the tourism industry. The combination of tourism industry development with industrial layout and adjustment and ecological civilization construction can greatly improve the implementation efficiency of constructing beautiful China and beautiful Sichuan. We will adhere to the deep integration of tourism and environmental protection, coordinate the development of tourism with the three industries, promote the upgrading of a number of scenic spots, develop a number of fine tourism routes and tourism products, and create an economy of tourist destinations based on ecological and environmental protection. The implementation of urban-rural integration strategy and the construction of beautiful Sichuan under the concept of global tourism will ultimately promote the coordinated development of ecological civilization construction and economic construction in the relevant areas, so as to preserve the green mountains and waters and benefit future generations.

At present, the tourism industry in Sichuan Province is in a critical period of development, and it has preliminary advantages compared with other domestic tourism industries, but the tourism economy has not fully shown its advantages, and the contribution rate of total tourism income to GDP needs to be greatly increased. Compared with Guangzhou, Beijing, Shanghai and other first-tier cities, the number and income of overseas tourism in Sichuan province are quite different, the level of tourism development is still very uneven, and the level of intelligent tourism is not high. Sichuan's economic development strength and rich geographical tourism resources environment decide that the tourism development space in Sichuan is still very large. In future, tourism to the tertiary industry such as transportation industry, accommodation industry, catering industry will further highlight the driving effect on the tertiary industry.

#### IV. GREY CORRELATION MODEL BETWEEN THE BIG TOURISM INDUSTRY AND SICHUAN ECONOMY

##### A. Grey Correlation Model

1) *Coupling Measure Method and Big Tourism Industry:* In 1982, Professor Deng Julong of Huazhong University of Technology put forward the concept of grey system firstly, and then established and perfected the theory of grey system.

Grey system is a partially definite and partly uncertain information system. Because of the grey nature of people's understanding of objective things, the analyzed objects are also gray-colored. Therefore, the grey system theory can be used to study the related problems of tourism industry. It is found that there is a strong correlation between tourism industry and economic growth[19]. The correlation analysis method is a factor analysis method in the grey system theory. By comparing the geometric relations of the statistical series of the system, the degree of correlation among the multi-factors in the system is analyzed, and the closer the geometric shape of the curve between the factors and the time variables is, the closer the relationship between the factors and the time variables is. The closer the development and change of the factors are, the greater the degree of correlation is. Grey correlation degree is widely used in factor analysis, scheme decision-making and comprehensive evaluation. The correlation analysis is a quantitative analysis of the dynamic development process of the system. It measures the degree of proximity between the factors according to the similarity or difference of the development situation among the factors, and provides a quantitative measure for the change situation of the system development and for dynamic change analysis. Grey correlation degree is a method to measure the degree of correlation among factors according to the similarity or difference degree of development trend among factors. The quantitative measurement is provided for the development and change situation of the system, which is suitable for dynamic change analysis.

Tourism industry is a complex concept, the essence of its industry includes tourists in the process of "eat, live, walk, travel, purchase, entertainment" in the process of consumer industry. In this study, the tourism industry, catering industry, accommodation industry and transportation industry, which are generally recognized by the academic circles, are brought into the scope of the study, and the concept of tourism industry in a broad sense, namely, the big tourism industry, is formed. The coupling relationship between Sichuan big tourism industry and economic system has typical grey system characteristics. The research of this part is to construct the relevant model. This model is based on the idea of complex adaptive system analysis. The coupling model of large tourism industry and Sichuan economic system based on Deng's grey correlation degree is established, and the coupling correlation and coordination degree between Sichuan big tourism industry and Sichuan economic system are analyzed.

2) *Data Sources:* The data of this paper comes from the Sichuan Statistical Yearbook from 2011 to 2017 or according to the data of the Statistical Yearbook of Sichuan Province from 2011 to 2017. Detailed information can be shown in Tables III and Table IV.

TABLE IV. RELEVANT INDICATORS OF TOURISM INDUSTRY IN SICHUAN PROVINCE

Years	Total Tourism Income (RMB 100millions)	Total Catering Income (RMB 100millions)	Total Profit of Corporate Enterprises of Accommodation and Catering above the Limit (RMB 10thousands)	Passenger turnover (Billion person kilometers)
2011	2449.15	1178.6	121364	1555.9
2012	3280.25	1363.6	145192	1697.5
2013	3877.4	1537.8	22200	1923.6
2014	4891.04	1734.4	52072	1584.0
2015	6210.52	1956.0	90397	1623.8
2016	7705.5	2214.0	250202	1686.7
2017	8923.1	2487.8	321076	1698.3

TABLE V. RELEVANT INDICATORS OF ECONOMIC GROWTH IN SICHUAN PROVINCE

Years	GDP (RMB 100millions)	Growth Rate of Primary Industry	Growth Rate of Secondary Industry	Growth rate of tertiary industry
2011	21026.7	4.5%	20.7%	10.9%
2012	23849.8	4.5%	15.4%	11.2%
2013	26260.7	3.6%	11.5%	9.9%
2014	28536.7	3.7%	9.9%	10.3%
2015	30103.1	3.7%	7.8%	9.4%
2016	32680.5	3.8%	7.5%	9.1%
2017	36980.2	3.8%	7.5%	9.8%

B. Grey Correlation Analysis between the Big Tourism Industry and Sichuan Economy

1) *Determine analysis sequence:* Analysis sequence of the Big Tourism Industry-Sichuan Economic system includes the total tourism income of the large tourism industry subsystem series  $T_1$ . The income of the catering industry  $T_2$ , the accommodation industry (the total profit of the food and beverage legal person enterprise above the limit)  $T_3$ , the revenue of the transportation industry (passenger turnover)  $T_4$ , the total GDP of the economic subsystem sequence group  $E_1$ , the growth rate of the GDP in the first industry  $E_2$ , the growth rate of the GDP in the secondary industry  $E_3$ , Tertiary industry GDP growth rate  $E_4$ . Among them, the tourism subsystem sequence as the reference column, the economic subsystem sequence as the comparison column.

2) *Data dimensions:* In practical problems, different indicators have different dimensions and orders of magnitude. In order to eliminate the influence caused by different dimensions of variables, the method of standardizing index variables is often adopted. In this model, the initial value method is used to deal with the data dimensionless. The dimensionless nature of big tourism system data is as follows:

$$T'_i = \frac{T_i(t)}{T_i(2011)} (i = 1, 2, 3, 4; t = 2011, \dots, 2017)$$

In which,  $T_i(2011)$  represents the value of the number sequence  $T_i$  in 2011,  $T_i(k)$  represents the number  $T_i$  of the value of the  $t$  year. Similarly, the dimensionless data of Sichuan economic subsystem can be obtained as  $E'_j (j = 1, 2, 3, 4)$ .

3) *Calculating the correlation coefficient:* The Correlation Coefficient of the large tourism industry-Sichuan economic system is the relative difference of these two system index series at the  $t$  time (or region), choosing Deng's correlation degree, and obtaining the formula of the correlation coefficient:

$$\xi_{ij}(t) = \frac{\min_i \min_j |E'_i(t) - T'_j(t)| + \rho \max_i \max_j |E'_i(t) - T'_j(t)|}{|E'_i(t) - T'_j(t)| + \rho \max_i \max_j |E'_i(t) - T'_j(t)|}$$

$\xi_{ij}(t)$  is correlation coefficient between big tourism industry system  $i$  order parameter and Sichuan economic system  $j$  order parameter at  $t$  moment.;  $T'_i(t), E'_j(t)$  are standardized values on big tourism industry system  $i$  order parameter and Sichuan economic system  $j$  order parameter at  $t$  moment.  $\rho$  is distinguishing coefficient, it is introduced to reduce the influence of extreme value on calculation. In practical application, the distinguishing coefficient should be selected according to the degree of correlation between sequences, always value=0.5. Its function is to increase the significance of the difference between correlation coefficients.

4) *Calculating correlation matrix*: An association matrix can be obtained by calculating the average value of the correlation coefficient according to the number of samples, which can reflect the complicated coupling relationship between subsystems. The expression of the correlation degree is:

$$\gamma_{ij} = \frac{1}{7} \sum_{t=1}^7 \xi_{ij}(t)$$

$\gamma_{ij}$  is the Correlation degree between index  $i$  in the big tourism industry system and index  $j$  in Sichuan economic system, and  $p$  is sample size. The correlation degree between the indexes of large tourism industry system and those of Sichuan economic system can form an association matrix, it is

$$\gamma = \begin{pmatrix} \gamma_{11} & \gamma_{12} & \gamma_{13} & \gamma_{14} \\ \gamma_{21} & \gamma_{22} & \gamma_{23} & \gamma_{24} \\ \gamma_{31} & \gamma_{32} & \gamma_{33} & \gamma_{34} \\ \gamma_{41} & \gamma_{42} & \gamma_{43} & \gamma_{44} \end{pmatrix}_{4 \times 4}$$

5) *Calculating Subsystem correlation coupling degree  $C(t)$* : According to the calculation formula of inter-subsystem correlation degree, in order to further analyze the coupling between subsystems as a whole, the system correlation coupling degree model is adopted in this study, and the calculation formula is as follows:

$$r_i = \frac{1}{4} \sum_{j=1}^4 r_{ij} \quad (i = 1, 2, 3, 4)$$

$$c_j = \frac{1}{4} \sum_{i=1}^4 r_{ij} \quad (j = 1, 2, 3, 4)$$

$$C = \frac{1}{16} \sum_{i=1}^4 \sum_{j=1}^4 \gamma_{ij}$$

$r_i$  show the average correlation degree between index  $i$  in the big tourism industry system and Sichuan economic system;  $c_j$  show the average correlation degree between index  $j$  in Sichuan economic system and big tourism industry system;  $C(t)$  show the system coupling degree.

6) *Establishment of evaluation criteria*: Relevance matrix clearly shows the relationship and coupling between the indicators of big tourism industry system and Sichuan economic system.  $\gamma_{ij} \in [0, 1]$ , when  $\gamma_{ij} = 0$ , There is no correlation between big tourism industry system  $i$  order parameter and Sichuan economic system  $j$  order parameter; When  $\gamma_{ij} = 1$ , the law of change of the two is exactly the same. The closer  $\gamma_{ij}$  to 1, the greater the correlation between the two

systems, the stronger the correlation between system sub-indicators. According to the coupling degree, we have the following criteria for system correlation.

7) *Calculation results and analysis*: According to using the data in 3.1.3 and calculating with software, we can get the correlation matrix between Sichuan tourism and Sichuan economy as follows:

$$\gamma = \begin{pmatrix} 0.7157 & 0.6233 & 0.572 & 0.6346 \\ 0.8621 & 0.6333 & 0.5415 & 0.6544 \\ 0.6995 & 0.7221 & 0.7029 & 0.7081 \\ 0.6647 & 0.6754 & 0.4695 & 0.7325 \end{pmatrix}$$

Among them  $\gamma_{ij}$  is the correlation between the index  $i$  of the big tourism industry system and the index  $j$  of the Sichuan economic system.

Through the value of the first row of the correlation matrix, we can obtain that the total tourism income of Sichuan province has a good promoting effect on the three industries, especially the contribution of tourism itself as the third industry to the growth of the tertiary industry is the most obvious.

Furthermore, it can be concluded that the correlation  $r_1, r_2, r_3, r_4$  between the index  $i$  of big tourism industry and Sichuan economic system is as follows:

$$(r_1, r_2, r_3, r_4) = (0.6364, 0.672825, 0.7081, 0.635525) T$$

his shows that the development of accommodation industry as a big tourism industry plays a prominent role in the current economic development of Sichuan.

The correlation  $c_1, c_2, c_3, c_4$  between Sichuan economic system  $j$  and the big tourism industry system is as follows:

$$(c_1, c_2, c_3, c_4) = (0.7355, 0.663525, 0.571475, 0.68235)$$

The results show that the tertiary industry is the most important one in Sichuan economy, followed by the primary industry and the secondary industry. At the same time, the data further shows that Sichuan's primary industry and tourism are more and more close to the tertiary industry.

On the other hand, the coupling degree between the large tourism industry system and Sichuan economic system is as follows:

$$C = 0.6632125$$

According to Table V, the current big tourism industry system and Sichuan economic system are in a stable stage, with high correlation and strong coupling degree, and the large tourism industry promotes the development of Sichuan economy.

TABLE VI. EVALUATION CRITERIA AND BASIC TYPES OF COUPLED DEVELOPMENT OF SICHUAN ECONOMY AND TOURISM

Coupling degree	Horizontal classification	Evaluation statement
(0, 0.3]	Germination, low correlation and weak coupling	Big tourism industry is not closely related to Sichuan economy
(0.3, 0.6]	Initial stage, moderate correlation, moderate coupling	Big tourism industry gradually affects Sichuan economy
(0.6, 0.8]	Stable stage, high correlation and strong coupling	The Great Tourism Industry Promotes Sichuan economy
(0.8, 1]	Mature stage, highly correlated, highly coupled	Big tourism industry and Sichuan economy interact and promote each other

Similarly, we can calculate correlation coefficient between the total income of the tourism industry  $T_1$  and the total income of the catering industry  $T_2$  in the major tourism industry, the accommodation industry (the total profit of the legal enterprise of accommodation and catering above the limit)  $T_3$ , and the correlation coefficients of traffic revenue (passenger turnover)  $T_4$  were 0.7076, 0.6203 and 0.6237 respectively. The results show that the total income of tourism in Sichuan has the greatest correlation with the income of catering industry at present, which further shows that in the process of tourism development in Sichuan, it is the only way which must be passed to develop the tourism industry in Sichuan through the road of coordination between tourism and tourism.

### V. CONCLUSIONS

The development of tourism industry plays a more and more important role in promoting economic development in the new normal. There is a significant positive correlation between the total tourism income and the gross output value of Sichuan economy and the output value of the tertiary industry. The total tourism income has an extremely significant effect on the gross production value and the output value of the tertiary industry. The development of tourism industry has a positive effect on stimulating internal demand and investment growth, industrial structure adjustment, regional coordinated development, scientific and technological innovation, urbanization, beautiful Sichuan construction and so on. Therefore, the structural transformation and optimization of economic development in Sichuan should focus on the development of tourism industry.

At the same time, since the development of tourism (scenic spots), catering, accommodation, transportation and economic development are highly related to the development of the major tourism industry, the development of the tourism industry is the development of the related industries. The development of related industries also promotes the transformation and development of tourism industry, forming a high degree of interaction. Therefore, the development of tourism industry in Sichuan should not only be limited to the development of scenic spots, but also should broaden its vision to related industries, deepen the concept of "global tourism" into the

development of large tourism industry, and further construct tourism and catering industries, the integration and development of tourism and accommodation, tourism and transportation. Make the tourism industry become the strong engine of Sichuan's economic development. Realize the transformation and optimization of the economic structure.

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