

Spatial Analysis of Regional Distribution of Tourism Industry and Tourism-Related Disciplines: A Case Study of Guangdong Province

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Abstract

With the rapid development of China's tourism industry, the problem of slow development of the educational system for cultivating tourism talents gradually surfaces. And also needs to be urgently tackled is the problem of the asynchronous development of tourism industry and tourism-related disciplines formation in institutes of higher education in different regions. Deploying Principal Component Analysis Method (PCA) and Sudoku Model and by constructing assessment and indicator systems for evaluating the development of both tourism industry and tourism-related disciplines formation, the article tries to evaluate the spatial consistency of the development of tourism industry and tourism-related disciplines formation in institutes of higher education in different regions within Guangdong Province. Conclusions are reached after intent investigation that Pearl River Delta Region sees well-coordinated development of tourism industry and tourism-related disciplines formation in its local institutes of higher education, Northern and Eastern Guangdong Regions find relatively slow development of the industry and disciplines formation, and Western Guangdong Region lags behind in the whole Guangdong Province in the development of both tourism industry and tourism-related disciplines formation in its local institutes of higher education. Optimization strategies are thus proposed that "improvements shall be made in inter-city interaction in Pearl River Delta Region in the development of tourism industry and tourism-related disciplines formation, the standard of tourism-related disciplines formation shall be well raised in Northern and Eastern Guangdong Regions and also a series of tourism-related disciplines to be established in institutes of higher learning in Western Guangdong Region".

Keywords: Tourism Industry; Tourism-Related Disciplines; Spatial Distribution; Principal Component Analysis; Sudoku Model

1. Introduction

As an integral part of China's national economy, tourism industry has seen its importance on constant rise in recent years and after the promulgation of "Opinions of the State Council on Accelerating the Development of Tourism Industry", the development of tourism industry has been attached the importance of national strategic level. Consequently, the demand for tourism talents grows tremendously. Although most of colleges and universities in China have set up tourism-related majors, excess establishment of tourism-related disciplines in various universities has made the surplus graduates majoring in tourism-related majors out of work while the shortage of truly versatile tourism talents remains large. Meanwhile, tourism education is, in intrinsic sense, a complex self-organizing system, reflecting the characteristic mostly in its high correlation with policies environment. Thus, the investigation into the problems concerning the spatial layout of tourism-related disciplines in regional institutes of higher education from the perspective of spatial distribution and the corresponding tackling measures of innovative and practical value can hopefully aid in the subsequent decision making processes.

Taking Guangdong Province as the study subject, the author deploys Principal Component Analysis Method(PCA), and designs and constructs assessment and indicator systems for evaluating the development of both tourism industry and tourism-related disciplines formation in institutes of higher education in different regions of Guangdong Province, and analyzes the spatial consistency of the development of tourism industry and tourism-related disciplines formation in different regions within Guangdong Province utilizing Sudoku Model as well. Bearing in mind the framework of regional cooperation, the author proposes specific optimization strategies to improve the spatial consistency of the development of regional tourism industry and tourism-related disciplines formation in local institutes of higher education. The ultimate goal of this study is to put forward an

educational system for cultivating innovative tourism talents, which will reflect the characteristics of both various tourism activities and tourism industry so as to realize the ideal coordination with the development of tourism industry in different regions within Guangdong Province.

2. Literature Review

The research on the relationship between tourism higher education and the development of regional tourism industry traces back to 1974 in "Annals of Tourism Research" initiated by Jafari. The Journal was issued on a yearly basis since 1979, summarizing the relationship between tourism industry and tourism education, and tourism theories and methods as well in each issue.^[1] In general, tourism higher education in Europe attaches more importance to skill training and application; and in the United States, the focus is on training higher level managerial staff, while the education in Australia pays more attention to providing pioneering solutions to problems emerged in sustainable development and eco tourism, etc. In all, scholars abroad conducting researches on educational pattern of tourism higher studies explore diverse range of fields and possess unique and penetrating viewpoint in their analysis, thus making their conclusions reflect regional characteristics and applicable in particular locality. Goodenough^[2] analyzed the relationship between tourism education and tourism industry and proposed a geography-based tourism educational system; and based on the European integration, Greg Richards^[3] proposed a reticular educational system, which can well prompt unified development of European tourism industry in different countries; while Jennifer Churchward and Michael Riley^[4] also explored into the relationship between tourism industry and tourism education, and they put forward the idea of combining traditional economics disciplines with geographic perspective in tourism education.

At home, researches on tourism education also received due attention from scholars. Taking tourism talents cultivation model featuring combining learning, research and production in Guilin as example, Zhou Jianglin^[5] pointed out that tourism higher education should be employment-oriented, and realize the virtuous circle of "base the development of tourism industry on the development of tourism education, accelerate the development of tourism education with the support of the tourism industry and prompt the development of tourism industry with the spur of tourism-related researches; in all, combine learning, research and production". By analyzing current situation of human resources in tourism industry and talent-cultivation in tourism colleges, Ji Peiling and Lu Jun^[6] pointed out the human resource contradiction between overall balance and individual imbalance in tourism industry. They suggested readjusting human resource cultivation structure and also put forward the view that the design of individual cultivation pattern should be conducted in different levels in accordance with the requirements of industry development for human resources so as to improve the benefit from human resource cultivation. By analyzing the situation of tourism higher education in Guangxi Province, Ren Guanwen^[7] proposed suggestions as to establish independent tourism college and instructing committee of Guangxi tourism education. Recommendations were also made in the aspects of team construction of teaching staff, arrangement of major courses and establishment of the model of higher education which combines producing, study and research. Wu Yaoyu^[8], Yang Zhijun^[9], Dong Xiaomei^[10], Feng Xufang^[11] also analyzed current situation of tourism education in Jiangsu, Hunan, Inner Mongolia, and Shanxi Provinces respectively, and they identified the general problems in tourism education as overall small scale, unclear objectives, irrational curriculum structures and the lack of teaching staff in the above mentioned provinces, although in these provinces, a great number of colleges and universities which have or are going to establish tourism-related disciplines sprout. They also proposed corresponding measures for tackling these problems.

3. General Introduction to the Development of Tourism Industry and Tourism-Related Disciplines Formation in Guangdong Province

3.1 Development of Tourism Industry in Guangdong Province

The total revenue generated by tourism industry in Guangdong Province reached 380.944 billion yuan in 2010, and 483.527 billion yuan in 2011, making a 26.93% increase year-on-year; and Guangdong's tourism industry development boosted in 2012, and the total revenue reached 579.474 billion yuan that year, accounting for 10.15 percent of the GDP. Meanwhile, tourism value added, foreign exchange earnings from tourism and the number of overseas tourists who stay over in Guangdong also registered high growth rate, making Guangdong the forerunner in whole China in ranking lists of these travel-booming indicators.

However, influenced by the factors such as tourism resources, tourists market, regional social and economic development and regional economic structures, development of tourism industry varies greatly within

Guangdong Province. Pearl River Delta Region remains to be the most advanced area in the development of tourism industry, and the number of tourists visiting the area have already reached 15.29773 million in 2010, accounting for 69.37 percent of the total number of tourists visiting Guangdong that year and the tourism revenue reached 30.1421 billion yuan, accounting for 77.62% of the total revenue generated by tourism that year. On the other, while Northern Guangdong Region laments a weak economic foundation, the region boasts itself as a tourism paradise with most beautiful eco-environment and abundant tourism resources. Meanwhile, the development of tourism industry in Northern Guangdong Region has ushered into a golden phase benefiting from a series of favorable conditions, such as the Danxia landform scenic spots there being listed in the World Heritage, the opening of Wuhan-Guangzhou high speed rail line, the foundation of the Pan-Pearl River Delta Economic Zone and introduction of various policies by governments supporting tourism development, and now the tourism industry has become a new economic growth point in the region; in the mean time, Eastern Guangdong Region is promoting the integration of speciality tourism resources with Hakka culture in Chaozhou and Shantou as the gluing power, and Western Guangdong Region is on its way of creating its own knockout brands featuring "Golden Coastal Line, Eco Islands and Perfect Recreation Spots" with coastal tourism as its focus, striving to establish itself as a nation-renowned coastal tourism recreational destination. However, due to the late start of the development of tourism industry in Eastern and Western Guangdong Regions, scenic spots in the two regions claim less fame and as a result, tourists visiting the areas and their tourism revenues are both extremely limited.

3.2 Development of Tourism-Related Disciplines Formation in Different Regions within Guangdong Province

At present, there are altogether 20 colleges and universities in Guangdong where there are postgraduate study programs for tourism management major students. However, as the number of colleges and universities which have or are going to establish tourism management major continues to grow, the imbalance of the spatial distribution of colleges and universities with tourism-related disciplines becomes more severe and the scale and quality of tourism-related disciplines formation varies considerably in institutes of higher learning in different regions. In 2001, there were 5 colleges and universities in Guangdong that had established tourism-related disciplines, 4 of which were based in Guangzhou and students enrolled there accounted for 79.53% of the total number of students in whole province majoring in tourism-related majors; and so far as to 2010, the number of colleges and universities that had established tourism-related disciplines reached 22, 11 of which were based in Guangzhou, making the city as the forefront in tourism education. In the respect of discipline construction, Pearl River Delta Region, with Guangzhou, Shenzhen, Zhuhai as its pillar cities, sees a good number of colleges and universities have built quality tourism-related disciplines, benefiting from advanced development of tourism industry, strong economic foundation and clustered key universities in the region. For example, key universities such as Sun Yat-Sen University, Jinan University and Guangdong University of Foreign Studies have taken the lead in establishing tourism-related majors and shaped their own characteristics in their tourism talents cultivation. While in contrast, colleges and universities in other regions of Guangdong lag behind in tourism-related disciplines building and most of them only started to form the disciplines or started to enroll students majoring in tourism-related majors after 2006. The courses were mainly offered for undergraduate students and teaching staff stuck to the traditional teaching model which features "lecturers narrating theories and students taking notes". There were few practical courses offered and traditional theory-memorizing dominated the learning process. Tourism education was gravely divorced from the practical training.

Table 3-1 General Introduction to the Colleges and Universities within Guangdong Province where Tourism-Related Disciplines were Established

Region \ Year	Number of Colleges and Universities where Tourism-Related Disciplines were Established		Number of Students Enrolled into Tourism-Related Majors in Colleges and Universities where Tourism-Related Disciplines were Established		Number of Students in Colleges and Universities where Tourism-Related Disciplines were Established	
	2001	2010	2001	2010	2005	2010
Guangdong Province	5	22	342	2295	1416	17371
Guangzhou	4	11	272	1368	635	10319
Shenzhen	1	2	70	220	247	1581
Zhuhai	0	3	0	358	420	4168
Shantou	0	0	0	0	0	0
Foshan	0	1	0	52	114	200
Shaoguan	0	1	0	61	0	318
Heyuan	0	0	0	0	0	0
Meizhou	0	1	0	46	0	128
Huizhou	0	1	0	53	0	106
Shanwei	0	0	0	0	0	0
Dongguan	0	0	0	0	0	0
Zhongshan	0	0	0	0	0	0
Jiangmen	0	0	0	0	0	0
Yangjiang	0	0	0	0	0	0
Zhanjiang	0	0	0	0	0	0
Maoming	0	0	0	0	0	0
Zhaoqing	0	1	0	78	0	315
Qingyuan	0	0	0	0	0	0
Chaozhou	0	1	0	59	0	236
Jieyang	0	0	0	0	0	0
Yunfu	0	0	0	0	0	0

Source: Guidebook of University Admission for Guangdong Students and relevant interviews

4. Construction of Assessment and Indicator Systems and Their Application in Guangdong Province

4.1 Construction of Assessment and Indicator Systems for Evaluating the Development of Tourism Industry

To evaluate the development of tourism industry in specific region, one shall establish comprehensive indicator systems and take every factor of production into consideration, so as to analyze their combined effects on the development of tourism industry. Based on the previous research findings, the author chooses 7 assessment indicators of X1, X2, X3, X4, X5, X6, X7, as each representing the increase of tourism earnings, the increase of the number of tourists, the percentage of tourism earnings in GDP, the contribution ratio of Tourism Value Added to GDP Value Added, the increase of per capita income in tourism industry, labor productivity in tourism industry and the growth rate of aggregate tourism economy.^{[12] [13]}

Principal Component Analysis (CPA) is a statistical method for data simplification featuring dimensionality reduction, as various indicators are synthesized into several comprehensive indicators^{[14] [15]}. When there are not a few indicators being deployed to evaluate the different facets of the sampling subject, the method is often used for the sake of dimensionality reduction. To conduct the analysis, data from Guangdong Statistical Yearbook are collected for Principal Component Analysis and 3 principal components are synthesized for the comprehensive evaluation of the development of tourism industry in specific region. The three principal components are synthesized on the basis of cumulative contribution to variance exceeding 85% and their respective eigenvalue and accumulated variance contribution rate are given in Table 4-1.

Table 4-1 Eigenvalue, Variance Contribution Rate and Accumulated Variance Contribution Rate of Principal Components for Evaluating the Development of Tourism Industry

Principal Component	Eigenvalue	Variance Contribution Rate %	Accumulated Variance Contribution Rate %
1	3.675	52.501	52.501
2	1.744	24.919	77.419
3	.963	13.764	91.184

Meanwhile, a radar graph is sketched to show the statistical significance of each original indicator in influencing the 3 principal components.

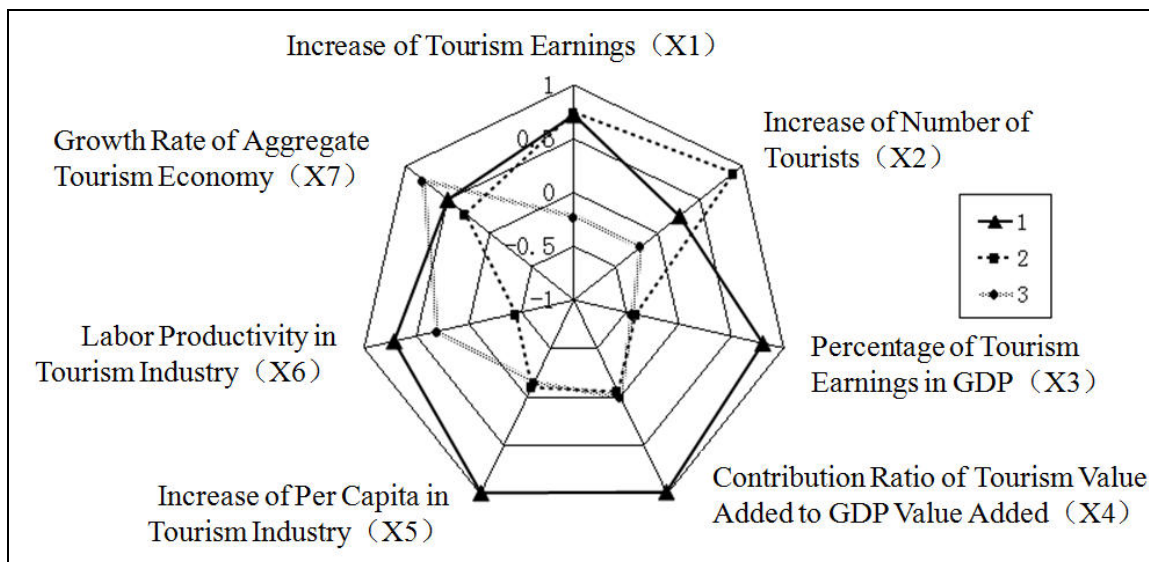


Figure 4-1: Radar Graph of the Relationship between the Original Indicators and the Principal Components

As shown in the radar graph, the statistical significance of X3,X4,X5,X6 influencing the first principal component all exceeds 0.5, and the 4 indicators can be compressed into one umbrella assessment indicator or the

first principal component, termed as the economic returns of the tourism industry; and X1 and X2 can be compressed into another assessment system or the second principal component, termed as the scale of tourism industry and X7 can be deployed as the third principal component, termed as the development speed of tourism industry. Thus 3 second-tier indicators and 7 third-tier indicators are formed to evaluate the development of tourism industry in one specific region (See Table 4-2).

Table 4-2 Comprehensive Assessment and Indicators for Evaluating the Development of Tourism Industry

First-Tier Indicator	Second-Tier Indicator	Third-Tier Indicator	Unit	Variable	
Comprehensive Assessment of the Development of Tourism Industry	Scale of the Tourism Industry	Increase of Tourism Earnings	0.1 Billion Yuan	X1	
		Increase of Number of Tourists	10 Thousand Yuan	X2	
	Economic Returns of the Tourism Industry	Percentage of Tourism Earnings in GDP	%	X3	
		Contribution Ratio of Tourism Value Added to GDP Value Added	%	X4	
		Increase of Per Capita in Tourism Industry	Yuan Per Person	X5	
	Development Speed	Growth Rate of Aggregate Tourism Economy	Labor Productivity in Tourism Industry	Yuan Per Person	X6
				%	X7

In summary,

$$F = 0.525 f_1 + 0.249 f_2 + 0.138 f_3$$

f1, f2, f3 stand for the score of the 3 principal components respectively; and F stands for the comprehensive score.

4.2 Application of the Assessment and Indicator Systems in Guangdong Province

Based on the assessment and indicator systems constructed in previous part, indicator-related data are collected from different prefecture-level cities within Guangdong Province for calculation of the score of the 3 principal components (f1,f2,f3) as well as the comprehensive score (F) . The ranking of the cities is presented in Table 4-3.

Table 4-3 Ranking of the Prefecture-Level Cities within Guangdong Province in Tourism Development

City	Score	Ranking	City	Score	Ranking
Guangzhou	9.22	1	Heyuan	-1.3	12
Shenzhen	7.23	2	Zhanjiang	-1.38	13
Foshan	2.56	3	Shaoguang	-1.44	14
Dongguan	1.44	4	Jieyang	-1.62	15
Zhuhai	0.35	5	Maoming	-1.69	16
Zhongshan	0.05	6	Yangjiang	-1.79	17
Huizhou	-0.07	7	Shanwei	-1.9	18
Jiangmen	-0.65	8	Chaozhou	-1.9	19
Qingyuan	-0.97	9	Yunfu	-1.93	20
Zhaoqing	-1.08	10	Meizhou	-1.99	21
Shantou	-1.15	11			

Source: Guangdong Statistical Yearbook from 2009 to 2011

It is clearly shown that the Pearl River Delta Region enjoys most advanced development of tourism industry and has formed quite a scale of the industry; while Northern, Eastern and Western Guangdong Regions contrast with the Pearl River Delta Region with less developed tourism industry, with relatively small number of tourists visiting the areas and less contribution ratio of tourism revenue to the total revenue generated by tourism in the whole Guangdong Province.

4.3 Construction of Assessment and Indicator Systems for Evaluating the Development of Tourism-Related Disciplines Formation

Similar to the construction of the assessment and indicator systems for evaluating the development of tourism industry, the assessment and indicator systems for evaluating the development of tourism-related disciplines formation are constructed deploying similar method. In this respect, 3 second-tier indicators are synthesized, and they are the scale of disciplines construction, quality of education, and the development speed of the disciplines formation respectively. And 5 third-tier indicators are the original data in the Principal Component Analysis (See Table 4-4).

Table 4-4 Comprehensive Assessment and Indicator Systems for Evaluating the Development of Tourism-Related Disciplines Formation

First-Tier Indicator	Second-Tier Indicator	Third-Tier Indicator	Variable
Comprehensive Assessment of the Development of Tourism-Related Disciplines Formation	Scale of Disciplines Construction	Number of Students in Colleges and Universities	X1
		Number of Undergraduate Colleges and Universities	X2
	Quality of Education	Number of Students Per 10 Thousand People	X3
	Development Speed of Disciplines Formation	Increase of Number of Colleges and Universities that have Established Tourism-Related Disciplines	X4
		Increase of Number of Students Enrolled into Colleges and Universities that have Established Tourism-Related Disciplines	X5

The eigenvalue, variance contribution rate and accumulated variance contribution rate of the principal component are given in the below Table (See Table 4-5)

Table 4-5 Eigenvalue, Variance Contribution Rate and Accumulated Variance Contribution Rate of Principal Component for Evaluating the Development of Tourism-Related Disciplines Formation

Principal Component	Eigenvalue	Variance Contribution Rate (%)	Accumulated Variance Contribution Rate (%)
1	4.351	87.028	87.028

Therefore, the principal component is chosen as the comprehensive assessment indicator for evaluating the development of tourism-related disciplines formation and the final score is calculated for each city in Guangdong Province.

Table 4-6 Ranking of the Prefecture-Level Cities within Guangdong Province in Development of Tourism-Related Disciplines

City	Score	Ranking	City	Score	Ranking
Guangzhou	3.843	1	Zhongshan	-0.429	10
Zhuhai	1.701	2	Shanwei	-0.429	10
Shenzhen	0.234	3	Heyuan	-0.429	10
Zhaoqing	-0.072	4	Qingyuan	-0.429	10
Shaoguan	-0.081	5	Jiangmen	-0.429	10
Chaozhou	-0.094	6	Shantou	-0.429	10
Foshan	-0.119	7	Jieyang	-0.429	10
Huizhou	-0.129	8	Maoming	-0.429	10
Meizhou	-0.132	9	Dongguan	-0.429	10
Yangjiang	-0.429	10	Zhanjiang	-0.429	10
Yunfu	-0.429	10			

Source: Guidebook of University Admission for Guangdong Students and relevant interviews

5. Spatial Consistency Analysis of the Development of Tourism Industry and Tourism-Related Disciplines Formation within Guangdong Province

A large number of researches have been done by scholars on the relationship between the distribution of institutes of higher education and regional economic development using various methods. Deploying the Soduko Model created by Pro. Sheng Shaohan and combining the previous research findings of rankings of the cities within Guangdong Province in the respects of the development of tourism industry and tourism-related disciplines formation (See Table 4-3 and Table 4-6), the development of the two subjects being investigated (i.e., tourism industry and tourism-related discipline formation) are classified into 3 levels respectively and the whole Guangdong Province can be divided into 9 areas according to the different groupings of the development of the two subjects (See Figure 5-1).

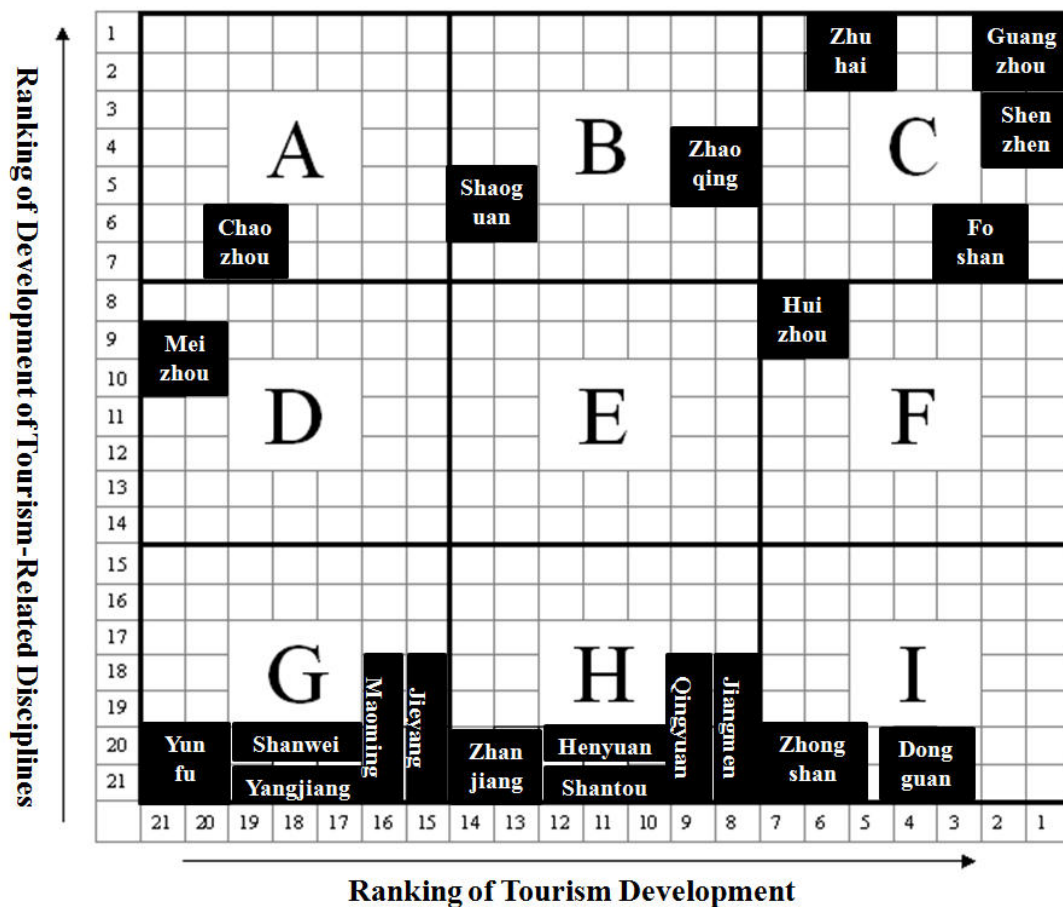


Figure 5-1: Relationship between Development of Tourism Industry and Tourism-Related Disciplines Formation in Different Regions within Guangdong Province

The 9 areas are further classified into 6 types according to the degree of coordination between the development of tourism industry and tourism-related disciplines formation.

Region C: Highly-Coordinated Development of Tourism Industry and Tourism-Related Disciplines Formation

Advanced development of tourism industry prompts to upgrade tourism-related disciplines formation and high level tourism higher education injects vitality into and raises competitiveness of the tourism industry in the region. Thus, a healthy interactive dynamism is formed between the development of tourism industry and tourism-related disciplines formation.

Region E: Moderately-Coordinated Development of Tourism Industry and Tourism-Related Disciplines Formation

Both the development of tourism industry and tourism-related disciplines formation are of middle level within Guangdong Province while the two has formed some degree of interaction.

Region G: Lowly-Coordinated Development of Tourism Industry and Tourism-Related Disciplines Formation

Slow development of tourism industry and sluggish formation of tourism-related disciplines and the two have little interaction with each other.

Region B/F: Discordant Development of Tourism Industry and Tourism-Related Disciplines Formation with Either One Enjoys High Level Development

Region B stands for places which has advanced development of tourism-related disciplines formation while the development of tourism industry is of middle level; and Region F stands for those whose development of

tourism-related disciplines formation is of middle level while enjoy advanced development of tourism industry.

Region D/H: Discordant Development of Tourism Industry and Tourism-Related Disciplines Formation with Either One Laments Low Level Development

Region D stands for places which see backward development of tourism industry but whose formation of tourism-related disciplines of middle level has much potential to develop; and Region H stands for those enjoy middle level or relatively advanced development of tourism industry while whose development of tourism-related disciplines formation is backward.

Region A/I: "Blind Area" of the Relationship between the Development of Tourism Industry and Tourism-Related Disciplines Formation

Region A stands for places who boast themselves with sophisticated tourism-related disciplines structure in local institutes of higher learning while their tourism industry remains almost undeveloped; and Region I stands for those enjoy high level development of tourism industry while their tourism-related disciplines formation lags extremely behind.

From above analysis, conclusion can be made that cities located in the Pearl River Delta Region enjoy both high level development of tourism industry and tourism-related disciplines formation in local institutes of higher learning. The upbeat situation is the result of a good interaction model between the two subjects being studied here and it also leads to diversified ways of meeting the demand of booming tourism industry for high quality tourism talents.

However, the rest regions in Guangdong are all troubled by asynchronous development of tourism industry and tourism-related disciplines formation. From the perspective of social and economic factors influencing the educational development, one can attribute the lack of financial support for the development of tourism-related disciplines to the backward development of tourism industry. And the demand from booming tourism industry for the construction of tourism-related disciplines in institutes of higher learning will be undermined due to little application of tourism knowledge in tourism businesses; on the other hand, high quality tourism talents feel reluctant to work tourism-related corporations. Thus, little attention from institutes of higher learning is paid to tourism industry and tourism-related disciplines formation. This explains the puzzling phenomenon that although Chaozhou and Meizhou boast themselves with high standard education, their tourism industry lags behind education development.

Another important factor influencing the demand from booming tourism industry for the construction of tourism-related disciplines in institutes of higher learning is the introduction of "foreign" talents. The situation exists mostly in cities or regions that have large tourism earnings and possess location advantages, for example Dongguan. In those places, the development of tourism education necessitated by booming tourism industry is thwarted to some degree as the introduction of "foreign" tourism talents have eased the huge demand for quality tourism talents. Thus, the dependence of the development of tourism industry on the tourism education would be reduced, leading to the discordant development of tourism-related disciplines formation otherwise shall be level with the development of tourism industry.

For regions with slow economic development, governments there shall implement policies aimed at coordinating the development of tourism industry and tourism-related disciplines formation in local institutes of higher learning. A number of new colleges and universities specializing in tourism shall be founded or tourism-related disciplines shall be set up in colleges and universities already there. It is absolutely no wrong thinking that well-established tourism-related disciplines in colleges and universities will contribute profoundly to the stable development of tourism industry. Special attention shall be paid to Qingyuan and Shaoguan, etc. Though these cities enjoy rapid and sound development of tourism industry, colleges and universities which have established tourism-related disciplines are rare to be found there.

6. Optimization Strategies for Improving the Spatial Consistency of the Development of Tourism Industry and Tourism-Related Disciplines Formation within Guangdong Province

To establish a sound tourism-related discipline system so as to improve the spatial consistency with the development of tourism industry, different regions within Guangdong Province shall carry out different optimization strategies to coordinate the development of the two subjects studied in the paper.

(1) Improve Inter-City Interaction in the Development of Tourism Industry and Tourism-Related Disciplines

Formation in Pearl River Delta Region

Although Pearl River Delta Region enjoys a sound development of tourism industry, colleges and universities in different cities located there vary considerably in their development of tourism-related disciplines formation. Colleges and universities in Guangzhou boast themselves as the forerunner in tourism-related disciplines formation with their early start in the field and large scale as well as their high quality; but while institutes of higher learning in Shenzhen, Zhuhai, Foshan and Huizhou have formed their tourism-related disciplines of prototype kind, colleges and universities of Dongguan, Zhongshan and Jiangmen have even not made any effort to form tourism-related disciplines there. It is understandable that a model featuring inter-city interaction is ideal for improving the standard of the tourism-related disciplines formation in colleges and universities in the region. Governments in Pearl River Delta Region shall promote inter-city interaction and cooperation so as to share quality teaching resources. For example, governments in different cities shall construct platform for cooperation. Teachers of experience in colleges and universities which have established sophisticated tourism-related disciplines shall be sent for or introduced into cities whose colleges and universities lag behind in tourism-related disciplines formation. Thus, the goal of balancing the distribution of educational resources will be achieved. By this, a good interaction between the development of tourism industry and tourism-related disciplines formation will be established and resources sharing will be achieved on the basis of complementary advantages in different cities.

(2) Strive to Raise the Standard of Tourism-Related Disciplines Formation in Institutes of Higher Learning in Northern and Eastern Guangdong Regions

The development of tourism industry and tourism-related disciplines formation in colleges and universities is not well coordinated in Northern and Eastern Guangdong Regions, as tourism-related disciplines formation lagging behind the development of tourism industry there. Therefore, more importance shall be attached to the development of tourism-related disciplines formation in institutes of higher education there and due attention shall be paid to developing tourism industry. Northern and Eastern Guangdong Regions shall well exploit their advantageous resources such as pristine eco environment, Hakka folk culture and Zen Buddhism culture and spare no efforts in promoting the development of tourism industry, taking advantage of the favorable conditions such as the Danxia landform scenic spots being listed in the World Heritage, the opening of Wuhan-Guangzhou high speed rail line, the foundation of the Pan-Pearl River Economic Zone. In the respect of tourism-related disciplines formation in colleges and universities there, Northern and Eastern Guangdong Regions shall accelerate the development of tourism-related disciplines formation on the basis of previous discipline structure by using educational resources of Shaoguang University, Hanshan Normal University, Jiaying University and Huizhou University. And institutes of higher learning shall set up new tourism-related majors, drawing lesson from universities with large scale tourism-related disciplines structure and rich experience in disciplines formation, such as Sun Yat-Sen University, Jinan University and South China Normal University. Thus, versatile tourism talents can be cultivated and channeled into tourism market.

(3) A Series of Tourism-Related Disciplines to be Established in Institutes of Higher Learning in Western Guangdong Region

Most of the prefecture-level cities located in Western Guangdong Region are classified into the Region G (See above Figure), indicating that the development of both of their tourism industry and tourism-related disciplines formation in institutes of higher learning there is backward compared with other regions within Guangdong Province. Due attention shall be paid to the development of both tourism industry and tourism-related disciplines formation. Western Guangdong Region shall create its own knockout brands featuring "Golden Coastal Line, Eco Islands and Perfect Recreation Spots" with coastal tourism as its focus, striving to establish itself as a nation-renowned coastal tourism recreational destination. In the respect of tourism education, colleges and universities specializing in tourism shall be urgently founded or tourism management major shall be set up immediately to cultivate tourism talents so as to meet the demand for tourism talents in the market there. Besides, special attention shall be paid to cultivating intermediate and elementary tourism talents and their practical ability shall be fostered. Also, the process of tourism-related disciplines formation in institutes of higher learning and tourism talents cultivation there shall be conducted in an orderly way so as to prevent the excess interest-driven establishment of tourism-related disciplines in colleges and universities where there totally lack the foundation for developing the disciplines or teaching staff. It is assumed that 5 to 10 years are needed for Western Guangdong Region to catch up with the Pearl River Delta Region in the development of tourism

industry and tourism-related disciplines formation and the spatial balance of the development of tourism industry and tourism-related disciplines formation will be achieved.

7 Conclusions

The booming tourism economy in Guangdong Province creates great demand for tourism talents, but the current spatial distribution of colleges and universities that have established tourism-related disciplines is not consistent with the development of tourism industry. The discordance has resulted in the unemployment of large number of students who major in tourism-related majors. Against this backdrop and based on the previous research findings on the relationship between tourism higher educational and regional tourism development at home and abroad, the author chooses Guangdong Province as an example, deploys PCA method and constructs assessment and indicator systems for evaluating the development of tourism industry and tourism-related disciplines formation. Conclusions are reached that "most of cities in Pearl River Delta Region enjoy advanced development of tourism industry and tourism-related disciplines formation and the two have formed a healthy interaction relationship; and Northern and Eastern Guangdong Regions see moderate development of the two subjects studied but Western Guangdong Region lags behind in the whole Province in the development of the two subjects". Soduko Model is used in the investigation into the spatial consistency of the development of tourism industry and tourism-related disciplines formation. The current situation that "most of cities, except Guangzhou, Shenzhen, Zhuhai and Foshan, are troubled by asynchronous development of tourism industry and tourism-related disciplines" is pointed out.

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