

Study on evaluation model of traffic superiority degree in Yunnan Province

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ABSTRACT

Transportation is the leading force in the development of tourism industry, and the steady growth of tourism economy plays a certain role in supporting and guaranteeing the development of transportation industry, and the two support and progress each other. However, Yunnan Province is facing a situation where the overall development of tourism economy and transportation facilities is good, but the development of transportation and tourism economy differs greatly among different prefecture-level cities and autonomous prefectures. Therefore, the evolution process, spatial distribution characteristics and the level and type of coupling and coordinated development of transportation and tourism economy in different prefecture-level cities and autonomous prefectures in Yunnan Province are analyzed. It is of great significance to grasp the inner law of the development of transportation and tourism economy between different regions and promote the coordinated development between regions. This paper evaluates and analyzes the spatio-temporal changes of traffic facility network density, trunk impact degree and location advantage degree in Yunnan Province, and evaluates the spatio-temporal changes of traffic advantage degree in Yunnan province with the comprehensive index weighted by the three.

KEYWORDS

Traffic superiority degree; Network density of transportation facilities; Impact degree of trunk line; Location advantage degree.

1. INTRODUCTION

1.1. Research background

As the main way of travel today, transportation has gradually become the basis for the development of tourism and affects the development of the industry (Su Jianjun, 2012). Recognizing the close connection and important interaction between transportation and tourism development, Yunnan Province has accelerated the construction of a comprehensive transportation system. According to relevant data, by the end of 2020, the total mileage of the comprehensive transportation entity network in Yunnan Province has reached 302,000 kilometers, the railway operating mileage has reached 4,233 kilometers, and the high-speed railway has achieved a breakthrough of "zero" and the operating mileage has reached 1,105 kilometers. The total length of highways reached 292,000 kilometers, including 9,000 kilometers of expressways, ranking second in the country. The number of transport airports has reached 15, and seven general airports have been built. Tourism as a sunrise industry in the tertiary industry, relying on the gradually improved high-speed transportation network, will flourish and play an important role in the economic development of the whole province (Sun Wei, 2010).

1.2. The purpose and significance of the study

1.2.1. Research purpose

Traffic advantage is comprehensively evaluated from the three aspects of "quantity", "quality" and "potential". "Quantity" can reflect the coverage degree of traffic facilities network. The wider the coverage degree, the stronger the accessibility to tourist attractions. "Quality" can reflect the comprehensive evaluation of the development level of traffic facilities. The higher the level, the higher the convenient transfer degree for tourists. The "potential" can be reflected in the shortest time consumed by the same spatial distance, and the shorter the time, the more willing to travel to different regions. The purpose of further clarifying the types, stages and spatial characteristics of the development of traffic dominance in Yunnan Province is to provide guiding opinions for the relevant departments to formulate traffic development policies.

1.2.2. Research significance

This paper will carry out empirical research on the traffic superiority degree, explore the driving mechanism of Yunnan's traffic development, and achieve high-quality economic growth of Yunnan province. It has certain academic value and practical significance. This study expands the vision of traffic research, enriches the theoretical system of regional economics, and establishes the theoretical framework of traffic superiority degree by combining the study of the actual situation of Yunnan Province. In theory, it helps to determine the driving effect of transportation resources on industrial development, and provides theoretical basis and ideas for determining the development strategy of transportation industry.

1.3. Domestic and foreign research review

1.3.1. Research on traffic superiority degree

1). Research on the concept of traffic superiority degree

Traffic accessibility and traffic superiority are both key evaluation indexes reflecting the advantages and disadvantages of regional traffic location, and they can complement each other. Traffic superiority is an evaluation of the overall development of the comprehensive traffic network from a three-dimensional perspective through the necessary evaluation indexes of traffic facilities such as the scale of traffic facilities, the capacity of traffic facilities and the degree of superiority that traffic facilities can present. Through reviewing the existing literature, it is found that the evaluation of traffic advantage degree mainly adopts distance or travel time cost index to evaluate traffic convenience from the perspective of accessibility. In addition, due to the strong comprehensiveness of traffic accessibility, scientific research methods and the complete theoretical system that has been formed, it is widely used in the evaluation of traffic superiority in recent years. Therefore, accessibility is the main direction of traffic superiority evaluation in this paper. Jin Fengjun (2008) proposed the concept of traffic dominance for the first time, and believed that traffic dominance should be comprehensively evaluated from three aspects: quantity, quality and potential. The quantity is represented by the traffic line density of the area; Quality is represented by the impact degree of traffic trunk or traffic station; Potential refers to the location advantage degree, which refers to the shortest time distance for a node to reach the key node of the central city in the whole region. Therefore, traffic advantage degree is an integrated index. It is embodied in the integration of three levels: the connection inside and outside the communication area, the gathering ability and the location advantage degree. Since then, the traffic superiority degree has become an important index in the evaluation index system of main function zoning in our country, and the academic circles have carried out academic exploration and related research.

2). Research on the index construction of traffic superiority degree

Traffic superiority index system is one of the important models to analyze the development level of urban traffic. It can evaluate a city's traffic connectivity, traffic efficiency, traffic mobility and other aspects of the characteristics, so as to provide a scientific basis for urban planning and traffic system design. As for the quantitative analysis methods of traffic dominance, different scholars have different perspectives and methods on the construction of traffic dominance index, which can be divided into the following three aspects. (1) Basic index system. Dallas Smythe, an American social psychologist, put forward the so-called "Traffic capability index", which includes the speed of the busiest road, commuting time, number of bus stops and other factors in the calculation to comprehensively reflect the traffic advantage of the area (Charles, H. D, 1985). (2) Traffic travel time index system. The "Commuting time Index" proposed by Charles H. Dowling, an American traffic engineer, aims to reflect the difficulty and pressure of commuting time pursuit, taking into account factors such as turnaround time, traffic jam distance, and congestion time (Taylor, M, 2008). (3) Accessibility index system. Accessibility index system is a complex index system for evaluating urban traffic dominance, reflecting the traffic capacity and accessibility among nodes in a city (Xu, 2009). For example, Timothy J. Caple, a British transport researcher, proposed a method for assessing the quality of urban travel based on the accessibility of services such as rail transit, which he called "Traffic Impact of Urban Infrastructure Expansion Assessment" (Caple, T.J., 1993).

3). Research progress of traffic superiority degree

For the study of regional traffic dominance, Wu Wei et al. (2011) analyzed the spatial distribution pattern of traffic dominance in the Yangtze River Delta. Wang Yang et al. (2019) took Chongqing integrated transportation network as an example to analyze the spatio-temporal evolution characteristics of its traffic dominance. Wu Qitao et al. (2012) took Guangdong Province as an example to analyze and study its traffic superiority degree and spatial differences. More and more studies have been conducted on the relationship between regional traffic dominance and regional economic development. Huang Xiaoyan (2011)

Zhou Bo et al. (2018) took Hainan Province and Guangdong Province as examples to study the relationship between regional transportation superiority and economic conditions. Meng Deyou et al. (2014) discussed the coordination evaluation between spatial pattern of county transportation network and county economy in Henan Province based on county transportation superiority degree. Chen Yonglin (2014) and Peng Xiangming (2017) et al. took Jiangxi Province and Liaoning Province as examples to explore and study the spatial relationship between county transportation superiority and county economy. Based on the background of the Belt and Road Initiative, Yang Yanan et al. (2017) analyzed the potential relationship between urban transportation advantage and economic development in Xinjiang. Chen Xiaohong et al. (2018) studied the coupling coordination between China-Asean transportation dominance and regional economy; In terms of transportation and tourism, Guo Xiangyang et al. (2019) conducted a coupling and coordination analysis on the traffic superiority degree of tourist destination and the intensity of tourist flow, and Ji Xiaofeng et al. (2019) conducted a coupling and coordination analysis and measurement analysis on the traffic superiority degree and logistics industry efficiency, both of which have made certain academic progress.

2. RESEARCH METHODS AND THEORIES

2.1. Comparative analysis method

Comparative analysis method is a method to determine the similarities and differences of two or more similar things according to the same principle or the same method, and speculate the related characteristics of unknown things according to the characteristics of known things.

2.2. Relevant theoretical basis

2.2.1. Traffic location theory

In view of the important driving role of traffic construction in national economic development, the theory of traffic economic belt (TEB) has gradually been studied and paid attention to by scholars. Tourism industry is known as "sunrise industry", its quality and efficiency development is closely related to transportation construction. Areas with obvious advantages in tourism resources endowment and better transportation development conditions are often easy to form transportation tourism belts, such as the Yangtze River Golden Tourism Economic Belt in China. Therefore, the transportation tourism belt is composed of three elements: transportation infrastructure, tourism node and tourism industry. The three components of the transport tourism belt are closely related to a whole organic system. The formation, development and maturity of any strong transport tourism belt need the coordination and balanced development of the interaction between the three elements. The theory of transportation economic belt is conducive to the coordinated development of regional transportation system construction and tourism economy, and provides theoretical guidance for proposing reasonable transportation construction planning and tourism development planning policies, so as to better realize the high-quality coordinated and integrated development of transportation construction and tourism

3. CONSTRUCTION AND EMPIRICAL ANALYSIS OF TRAFFIC DOMINANCE MODEL

This paper evaluates and analyzes the traffic dominance models of different prefecture-level cities and autonomous prefectures in Yunnan Province, and observes the changes in time and space, so as to provide a basis for the subsequent identification of the impact of traffic dominance changes on tourism economic growth.

3.1. Connotation of traffic superiority degree

Traffic superiority is an integrated index to evaluate the degree of traffic integrity and the level of traffic superiority in a certain area. According to the research in this field by Chinese famous scholars such as Jin Fengjun, Wu Wei and Meng Deyou, the traffic superiority degree should be evaluated comprehensively from three aspects: quantity, quality and potential. Quality is represented by the impact degree of traffic trunk or traffic station; Potential refers to the location advantage degree and the shortest time distance between the traffic node and the key node in the central city. That is, only by comprehensive evaluation of the density of traffic facilities network, impact degree of traffic trunk and location advantage degree can we reflect the actual traffic environment of the region.

The grades of highway operation and the total mileage of highways in Yunnan Province in 2013, 2016 and 2019 were investigated and summarized, and the grades of railway stations and aviation stations were investigated and summarized. Finally, starting from all traffic nodes near different prefecture-level cities and autonomous prefectures, the spatial distance between these traffic nodes and the central urban areas of various prefecture-level cities and autonomous prefectures was calculated. The traffic nodes that take the shortest time to reach the central city are selected. Through calculation, the paper evaluates and analyzes the actual development of traffic in Yunnan Province from the aspects of time, space and traffic coverage.

Due to the full outbreak of the new coronavirus from the end of 2019 to the beginning of 2020, transportation lines across the country were sometimes open and sometimes stagnant during 2020 and 2021, and many tourist attractions were closed for a long time. For Yunnan Province, tourism industry is also the leading industry in most regions, and tourism economy shows a cliff decline; For many transportation facilities, especially high-speed rail stations and air stations, operation schedules are

constantly canceled, and when the epidemic repeatedly breaks out, the inspection facilities at transportation stations increase the time for people to travel. For the evaluation system of traffic advantage, it will involve the time spent on convenient transfer and the time spent on the distance between traffic nodes and urban centers, but the epidemic situation involves different degrees of traffic control and road closure. Therefore, the data of the evaluation index of tourism economy and traffic superiority during the epidemic will cause systematic disorder and fail to generate high-quality evaluation results. Therefore, this paper selects the data before the epidemic, that is, the data of 2013, 2016 and 2019, for comparative analysis. This paper analyzes the coupling and coordination between traffic superiority degree and tourism economy in Yunnan Province without being affected by external force majeure factors.

3.2. Change characteristics of traffic dominance index

3.2.1. Analysis of traffic facility network density and spatial and temporal characteristics

(1) Network density of transportation facilities

Traffic facility network density is a reflection of the coverage of different traffic facilities in a certain area of the road area, it is also a reflection of the development level of traffic lines in a certain area and its guarantee degree of national economic and social development. Since road traffic is the most widely covered traffic network, previous researches on traffic facility network density are divided into two categories. One is to classify roads by grade, then assign weights to roads of different grades, and calculate the network facility density under different levels respectively, and finally obtain the network density of traffic facilities by weighted average. The other is to calculate all the road miles marked at the county level and above to sum up, and then calculate the overall traffic facility network density. Due to the construction of a large number of fast lanes in modern highway traffic, the time and formal distance spent by drivers in road switching have been greatly reduced. Therefore, more scholars directly choose to calculate the total mileage of different levels of highways when studying the density of traffic facilities network.

Yunnan Province is a big tourism province in China, and the tourism industry is all over the province. As the pioneer of the tourism industry, the integrity of the transportation facilities network plays a decisive role in the development of the tourism industry. By the end of 2020, the total mileage of Yunnan's comprehensive transportation physical line network has reached 302,000 kilometers, the railway operating mileage has reached 4,233 kilometers, and the high-speed railway has achieved a breakthrough of "zero", and the operating mileage has reached 1,105 kilometers. The total length of highways reached 292,000 kilometers, including 9,000 kilometers of expressways, ranking second in the country. According to the data of the Statistical Yearbook of Yunnan Province in 2020, the railway mileage stations in Yunnan Province only account for 1.4% of the physical line network in the province, so this paper only chooses highway to calculate the network density of traffic facilities. Starting from all prefecture-level cities and autonomous prefectures in Yunnan Province, assuming that the network density of traffic facilities in Region i is D_i , L_i is the total mileage of roads at or above the county level calculated by region i , and A_i is the land area of region i , the formula is as follows:

$$D_i = \frac{L_i}{A_i} \quad (3.1)$$

3.2.2. Analysis of trunk impact degree and temporal and spatial characteristics

(1) Traffic trunk impact degree. The impact degree of traffic trunk is an important way to measure the convenience of interconnections between different geographical areas. The evaluation of traffic trunk impact level is mainly based on the classification of traffic types. The higher the level of different traffic types, the more quantity of traffic facilities will be configured, and the more vehicles

can be accommodated by traffic facilities such as highways, and the higher the traffic trunk level will be. It is proved that the larger the number of tourists in a certain time and space, the more the number of vehicles that can be deployed for operation. Therefore, when tourists choose their travel mode, they will have more choices within the same time and space range, and the more convenient the choice of travel mode from region to region will be, and the less travel time they will consume. On the contrary, the lower the level of traffic type, the less choice tourists have in the same time and space, and the travel time consumed is relatively more.

Yunnan Province includes 8 prefecture-level cities and 8 autonomous prefectures, and the transportation types are very rich, and the development degree of transportation network is relatively complete in most regions. By the end of 2020, Yunnan Province has built and operated vehicles and facilities of different grades in the fields of aviation, railway and highway, and the transportation network covers the whole province. The continuous improvement of the level of traffic trunk lines also continuously affects the change of the level of tourism economy between regions. Starting from various states and cities in Yunnan Province, we set the impact degree of traffic trunk in region i as C_i and P_{ij} as the corresponding weight assigned to the JTH transportation means in Region i , then the formula is as follows:

$$C_i = \sum_{j=1}^{n,m} P_{ij} \quad (3.2)$$

3.2.3. Analysis of location advantage degree and temporal and spatial characteristics

(1) Location advantage degree model

In previous studies on traffic dominance, some scholars calculated the actual mileage traveled by different means of transportation from each prefecture-level city to the provincial capital city, and then chose the shortest transportation mode to measure its spatial distance to judge the advantages and disadvantages of location dominance. The main factor of adopting this discrimination method is that most of the provincial capitals have relatively sound transportation networks, while most of the prefecture-level cities around the capital cities of the province have relatively simple transportation modes, which can not meet the needs of convenient transfer. Some other scholars judge the advantages and disadvantages of regional location based on the spatial distance between the area where the traffic node is located and the central city. The key of this identification method is the diversification and accessibility of transportation modes, which can meet the needs of most tourists for convenient transfer.

With the continuous diversification of transportation modes and the improvement of transportation network, the spatial distance is immutable, so it has certain limitations to judge the location advantage degree from the spatial distance. This paper improves the location advantage degree, and judges the advantages and disadvantages of regional location advantage degree by calculating the shortest time from the region where the traffic nodes of different transportation means of prefecture-level cities and autonomous prefectures are located to the central city of prefecture-level cities and autonomous prefectures, including the shortest time spent by high-speed traffic toll stations, railway stations and aviation stations to the central city, and selects the minimum value. The main factors that use time as a measure of location advantage are the completion of ring expressways, first-class expressways, high-speed railways, and the enrichment of metro route networks in provincial capitals, which constantly shorten people's travel time and improve people's convenient transfer degree. Then the shorter the travel time, the more it can show the advantages of the location advantage of the region.

Based on this, we set S_i as the location advantage degree of a region, and $\text{Min}(H_i)$ as the weight of the shortest time taken by different traffic nodes to the spatial distance from the central city of region i . The specific expression is as follows:

$$S_i = \text{Min}(H_i) \quad (3.3)$$

3.3. Analysis of traffic dominance and temporal and spatial characteristics

3.3.1. Data processing

(1) Extremely poor standardized processing of raw data

Positive indicators:

$$X_{ij} = \frac{x_{ij} - (x_{ij})_{\min}}{(x_{ij})_{\max} - (x_{ij})_{\min}} \quad (3.4)$$

Negative indicator:

$$X_{ij} = \frac{(x_{ij})_{\max} - x_{ij}}{(x_{ij})_{\max} - (x_{ij})_{\min}} \quad (3.5)$$

In equations (3.4) and (3.5) : $(X_{ij} \in [0,1])$, X_{ij} is the original value of the JTH index value of the i th region, and X_{ij} is the dimensionless value after standardization. $[(x_{ij})]_{\max}$ and $[(x_{ij})]_{\min}$ are the maximum and minimum values of the same index belonging to a prefecture-level city or autonomous prefecture in Yunnan Province.

(2) Calculate the proportion P_{ij} of the j term in region i

$$P_{ij} = \frac{X_{ij}}{\sum_{i=1}^n X_{ij}} \quad (3.6)$$

In equation (3.6) : $(i=1,2,\dots, n, j = 1, 2,\dots, m)$, n is the number of states and cities, m is the number of indicators.

(3) Calculate the entropy value of the J -th index. The entropy value of the entropy method mainly reflects the degree of disorder of the system. Using the entropy method to determine the weight of the index can not only overcome the subjective problem of the subjective weighting method, but also solve the overlapping problem of information among multiple indicator variables. The calculation formula is as follows:

$$e_j = -\frac{1}{\ln n} \sum_{i=1}^n (p_{ij} \ln p_{ij}) \quad (3.7)$$

In Formula (3.7) : $(e_j \geq 0)$

(4) Calculate the difference coefficient of item j

$$g_j = 1 - e_j \quad (3.8)$$

(5) The difference coefficient is normalized to calculate the weight of the JTH index

$$W_j = \frac{g_j}{\sum_{j=1}^m g_j} \quad (3.9)$$

In Equation (3.9) : ($1 \leq j \leq m$), $\sum_{i=1}^p g_j = 1$.

3.3.2. Traffic superiority evaluation model

The traffic facility network density, traffic trunk impact degree and location advantage degree were weighted to obtain the traffic advantage degree evaluation index of different prefecture-level cities and autonomous prefectures in Yunnan Province, and set it as F_i . D_i' , C_i' , and S_i' respectively represent the final values of traffic facility network density, traffic trunk impact degree, and location advantage degree after standardization in region I. w_1 , w_2 , and w_3 are the weights of D_i , C_i , and S_i respectively. In this study, entropy method is used to assign values to the three indexes each year. Construct the evaluation model of traffic superiority degree:

$$F_i = D_i' \times w_1 + C_i' \times w_2 + S_i' \times w_3 \quad (3.10)$$

In equation (3.10) : $i=1,2,\dots, n$, the corresponding weights of each index w_1 , w_2 , and w_3 , in this paper, referring to the research achievements of scholars such as Wu Wei, Jin Fengjun, Wang Feng, Huang Xiaoyan, Cao Xiaoshu, and Li Tao, are all set as 1, that is, $w_1=w_2=w_3=1$.

3.3.3. Analysis of evaluation results of traffic superiority degree

The traffic superiority of prefecture-level cities and autonomous prefectures in Yunnan Province is standardized by network density of traffic facilities, impact degree of traffic trunk and location superiority degree, and then weighted and summed the standardized values according to equation (3.10) to obtain the comprehensive evaluation value of traffic superiority degree in 2013, 2016 and 2019, as shown in Table 1:

Table 1. Comprehensive evaluation value of traffic superiority degree in different years of prefecture-level cities and autonomous prefectures in Yunnan Province

prefecture-level city/autonomous prefecture	Comprehensive evaluation value of transportation superiority degree		
	2013	2016	2019
KUNMING	2.68	2.67	2.77
QUJING	1.84	2.15	2.13
YUXI	2.00	2.00	2.33
BAOSHAN	1.50	1.63	1.51
ZHAOTONG	0.89	1.17	1.07
LIJIANG	0.99	1.11	1.33
PUER	0.98	1.22	1.59
LINCANG	0.57	0.61	1.31
CHUXIONG	1.07	1.58	1.90
HONGHE	1.36	1.64	1.49
WENSHAN	0.90	1.28	1.37
XIASHUANGBANNA	0.86	0.85	1.30
DALI	1.60	1.75	1.57
DEHONG	1.26	1.40	1.55
NUJIANG	0.86	0.89	0.76
DIQING	0.75	0.75	0.89

Based on the data in the above table, the comparison bar chart of the comprehensive evaluation value of traffic superiority of various prefecture-level cities and autonomous prefectures in Yunnan Province in 2013, 2016 and 2019 is drawn, as shown in Figure 1 below:

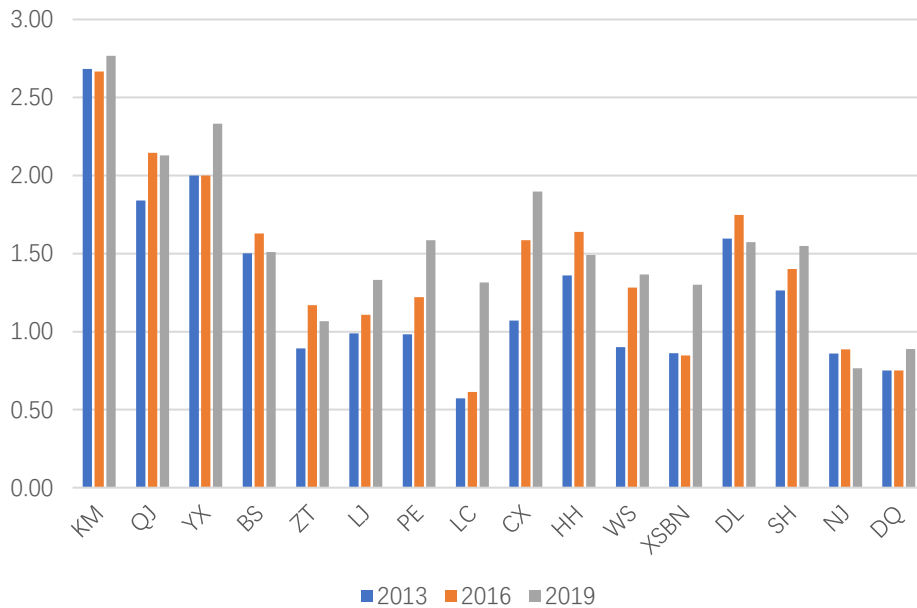


Figure 1. Column chart of comparison of comprehensive evaluation value of traffic superiority degree in different years in Yunnan Province

As shown in Table 1. and Figure 1, Kunming City has the most obvious traffic advantage degree in Yunnan Province, and in 2013, 2016 and 2019, Kunming City's traffic advantage degree has remained above 2.5. For a long time, Kunming City, as an important transportation transit and distribution area in southwest China, its transportation construction is of great significance to the whole Yunnan Province. Therefore, constantly improving the transportation network facilities in Kunming and accelerating the modernization of transportation facilities have a very good practical significance for improving the "13th Five-Year Plan" and accelerating the "14th Five-Year Plan". Nujiang Lisu Autonomous Prefecture and Diqing Tibetan Autonomous Prefecture had the lowest traffic advantage rating in Yunnan Province, and their traffic advantage rating was still lower than 1 by the end of 2019. As a major tourism province in China, Yunnan Province has tourist attractions all over the province. Only by accelerating the construction of transportation facilities in various regions of Yunnan Province, improving the coverage rate of transportation facilities network, and strengthening the accessibility of traffic arteries in tourist attractions can we enhance the willingness of tourists to travel and accelerate the growth of tourism economy in Yunnan Province.

Analyzing the overall traffic superiority of Yunnan Province, the average value of traffic superiority of prefecture-level cities and autonomous prefectures in 2013, 2016 and 2019 were 1.258, 1.418 and 1.554, respectively. Among them, Zhaotong City, Lijiang City, Lincang City, Wenshan Zhuang and Miao Autonomous Prefecture, Xishuangbanna Dai Autonomous Prefecture, Nujiang Lisu Autonomous Prefecture and Diqing Tibetan Autonomous Prefecture all failed to reach the average level in 2013, 2016 and 2019. In Kunming, Qujing, Yuxi and Dali Bai Autonomous Prefecture, the evaluation value of traffic advantage was always above the average level in 2013, 2016 and 2019. The traffic advantage evaluation value of Puer City and Chuxiong Yi Autonomous Prefecture showed an increasing trend year by year in 2013, 2016 and 2019, and the average value of traffic advantage evaluation value increased from lower than that of Yunnan Province in 2013 to higher than that of Yunnan Province in 2019. The traffic advantage evaluation value of Baoshan City and Honghe Hani and Yi Autonomous Prefecture showed an upward trend in 2013 and 2016, both of which were higher than the average value of Yunnan Province. However, the traffic advantage evaluation value of 2019 not only fell to lower than that of 2016. And it is also lower than the average value of Yunnan Province's traffic advantage degree evaluation in 2019; Dehong Dai and Jingpo Autonomous Prefecture has the most special traffic advantage evaluation value. Its traffic advantage evaluation value in 2013, 2016 and 2019 is above the average value of Yunnan Province.

From the evaluation value and change trend of transportation advantage of prefecture-level cities and autonomous prefectures in Yunnan Province, except Kunming City, Nujiang Lisu Autonomous Prefecture and Diqing Tibetan Autonomous Prefecture, the change and fluctuation of transportation advantage degree are relatively large. The main reason for this phenomenon is that the traffic facilities construction in Kunming, Nujiang Lisu Autonomous Prefecture and Diqing Tibetan Autonomous Prefecture did not change significantly in 2013, 2016 and 2019. Kunming's transportation facilities are constantly being updated and iterated, but the construction of transportation facilities in Nujiang Lisu Autonomous Prefecture and Diqing Tibetan Autonomous Prefecture tend to lag behind. By the end of 2020, there are no national expressways in the regions where Nujiang Lisu Autonomous Prefecture and Diqing Tibetan Autonomous Prefecture are located. Therefore, the renewal and construction of traffic facilities is the key to improve the traffic superiority.

4. EMPIRICAL ANALYSIS OF TRAFFIC SUPERIORITY DEGREE

As can be seen from Figure 3.9, the overall traffic dominance of Yunnan Province decreases from Kunming City and Yuxi City in central Yunnan to the periphery, and presents a conical decline trend in spatial structure. The closer they are to the border areas of Yunnan Province, the lower their location advantage degree is. Nujiang Lisu Autonomous Prefecture in western Yunnan and Diqing Tibetan Autonomous Prefecture in northwest Yunnan not only have the longest spatial distance from the middle of Yunnan, but also have the lowest traffic advantage degree. Then, the change of transportation advantage degree of prefecture-level cities and autonomous prefectures from 2013 to 2019 is observed. The closer the prefecture-level cities and autonomous prefectures are to the central Yunnan region, the faster the growth rate of transportation advantage degree and the more obvious the change. Among them, the most obvious ones are Lincang City, Pu'er City and Chuxiong City, which shows that Kunming's traffic advantage has played a very positive role in the traffic construction of the surrounding areas. As Kunming City is an important traffic distribution and transit area in southwest China, the completeness of traffic construction is relatively high. Therefore, from the perspective of spatial structure, the higher the impact of the radiation from Kunming City to the periphery on the traffic construction in the nearby area, on the contrary, the more distant the area from Kunming City, the lower the positive impact of the construction.

A good spatial distribution of traffic dominance can not only show the completeness of the construction of traffic facilities and the coverage of traffic networks, but also show the accessibility between regions and the convenience of traffic change between regions. Because traffic dominance is a comprehensive index, the spatial distribution of traffic dominance affects the construction of interregional traffic facilities. From the perspective of spatial distribution of the famous tourist attractions in Yunnan Province, it is not centralized distribution, but mainly in Kunming, scattered to the outside, just like Dali Bai Autonomous Prefecture, Xishuangbanna Dai Autonomous Prefecture and other areas with high tourism value are not distributed around Kunming. This indicates that, from the perspective of space, the traffic advantage of Kunming is not sufficiently radiated outward. In particular, Diqing Tibetan Autonomous Prefecture, which is far away from Kunming, has Shangri-La scenic spot, which is a paradise city on earth. However, the spatial radiation degree of traffic advantage of Kunming is low, and the traffic advantage degree varies greatly between regions.

From the perspective of the overall structure, the development balance of traffic superiority in Yunnan Province is not high, and the differences between some regions are large. In terms of space, although there is a decreasing trend from Kunming to the periphery, for the important border regions facing South Asia and Southeast Asia, its low traffic advantage cannot well meet the needs of domestic and overseas resources and culture transmission. As Xishuangbanna Dai Autonomous Prefecture and other regions as an important channel of the "Belt and Road", its lack of traffic superiority will not be able to perfectly support the development of the "Belt and Road" strategy. To promote the development of transportation advantages in various regions of Yunnan Province is not only to meet

the needs of people's travel and improve the convenience of people's travel, but also to promote the exchange and exchange of resources and culture in South Asia and Southeast Asia. In addition, it has gained a high degree of consensus and active participation of countries along the "Belt and Road", aroused widespread global attention, and injected strong vitality for development cooperation and mutual benefit.

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