Study on the coupled coordination of the coordinated development of Circulation industry and Regional economy --An empirical analysis of the Tibet Autonomous Region

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Abstract. By constructing the evaluation index system and system coupling model of Circulation industry development and Regional economic development, an empirical analysis of the coupling and coordination degree of Circulation industry development and Regional economic development in Tibet from 2016 to 2020 was conducted, the results show that the development and Regional economic development trend, the coupling coordination level increased year by year, the two gradually reach the development stage of coordinated development. In view of this result, this paper puts forward three development suggestions, hoping to provide a certain theoretical basis for relevant decisions.

Keywords: Tibet; Circulation industry; Regional economy; System coupling model.

1. Introduction

The industrial concept of the Circulation industry refers to the general term of the wholesale, retail, logistics and catering industries.

In recent years, China's Circulation industry has developed rapidly, driving the rapid growth of Regional economy. However, the development of China's Circulation industry is still passive, mainly reflected in the unbalanced industrial development, scattered layout, inadequate development, and imperfect infrastructure. Under the trend of "slowing growth" in recent years, China takes steadily improving the income and quality of economic development as the core task to "improve the quality and efficiency" of the economy. How to integrate related industries and information on a large scale, build a high-quality and efficient industrial chain, and complete the core goal of "improving quality and efficiency" of Regional economy is an urgent problem to be solved in the process of coordinating Regional economic development and Circulation development in China industry.

1.1 Literature review

Liu Chao (2019) reported that the Circulation industry and economic development with the coupling model decreased even under the economic growth. In this case, the author proposed suggestions for innovative economy and industry, further adjust and optimize the industrial structure, improve the development environment and improve the scale of foreign trade.Lu Baoyi (2020) report, Through the coordinated development of center of gravity model and Regional economy and GM1.1 grey prediction model, It is found that the coordinated development of the two coupling is increasingly significant and shows an obvious spatial aggregation effect; at the same time, The coupling of the two is obvious, On the whole, it shows the highest coupling and coordination degree of the tourism industry in the eastern coastal areas of China and the Regional economy, The trend of decreasing coupling and coordination in eastern, central and western China; The authors propose that the proposed, With the implementation of China's new normal of economic development and the implementation of China's innovation-driven development strategy, The combination of tourism and the Regional economy will be increasingly closely integrated, Provinces should make adjustments to their own restrictive factors.Li Yongping (2020) report, through TEE system coupling coordination evaluation model of Shanxi Province tourism industry, Regional economy and ecological

environment, found that Shanxi Province Regional economic development degree and tourism, ecological environment development difference, three coupling is relatively low in other provinces, the author proposed that Shanxi Province should give full play to the ecological environment support and Regional economic role, maintain ecological environment to the good trend, to promote the steady development of Regional economy.Guo Hubin (2018) Report, Based on the composite system theory, The study of the coordination relationship between logistics system and Regional economy by coupling model shows, Between 2001 and 2016, The coupling and coordination degree between the logistics system and the Regional economic system in the Yangtze River Delta region are constantly improving, As of writing and before issuing the post, The coordination level of the two has reached the intermediate stage of coupled and coordinated development; At the same time, the order degree of logistics system in this region is significantly lower than that of Regional economic system, It has a certain constraint on Regional economic development; The authors propose that the proposed, The Yangtze River Delta region should further improve the operation efficiency of logistics development, To achieve the benign and coordinated development of Regional logistics and Regional economy.

Based on the existing research results, the coupling system has a certain reliability and practicability in studying the Regional economic development and the coordinated industrial development.Therefore, this paper believes that the coupling model can take Tibet Autonomous Region as an example and combine the entropy power method to study the coordinated development relationship between Regional economy and Circulation industry in the autonomous region from 2016 to 2020.

2. Methodology

2.1 System coupling theory

Coupling (Coupling) originates from physics, and mainly refers to the result of two systems interacting and combining into one, or finally integrating through the interaction.In the development of interdisciplinary application, the application of this concept to economics can not only effectively reveal the economic principles, but also provide new ideas for scholars to conduct research.Nowadays, the concept of coupling is mostly applied in industrial economic research. For example, two economic systems are divided. Each economic system is developed through its own economic elements, and these elements can interact, so that the development of the two systems will interact with each other, and this process can be understood as coupling.Some scholars will also study a certain industry and the whole economy as two systems, that is, the coupling of subsets and complete works.Therefore, it is feasible to use the coupling theory to study the dynamic and coordinated development relationship between the circulation industry and the regional economy.

2.2 Standardized processing of the sequence parameters

Because the data units of the sequence parameter are different and cannot be directly compared, it is standardized.This paper uses extreme standardization with the following formula:

$$\text{Forward pointer:} X_{ij}' = X_{ij} - \min_j / \max_j - \min_j \quad (1)$$

$$\text{Negative indicator:} X_{ij}' = \min_j - X_{ij} / \max_j - \min_j \quad (2)$$

Since the indicators selected in this paper are positive indicators, only formula (1) is necessary to standardize the initial data.

2.3 The index weight is determined by the entropy weight method

The Entropy weight method is an objective assignment method to determine the objective weight according to the size of the variability of the index, which can reduce the data bias caused by the subjective influence. The calculation steps are: build a judgment matrix

$$P=(b_{ij})_{m*n} \quad (3)$$

The initial data were also normalized, with the index bij The proportion of

$$b_{ij}=b_{ij}/\sum b_{ij} \quad (4)$$

$$\text{Entropy value: } e_j=-k\sum u_{ij}\ln u_{ij},\ k=1/\ln m \quad (5)$$

$$\text{Difference coefficient: } g_j=1-e_j \quad (6)$$

$$\text{The weight of the metric bij: } wj=g_j/\sum g_j,\ (j=1, 2, 3, \ldots, n) \quad (7)$$

2.4 Calculation of the coupling coordination level between systems

The coupling defined by physics is the phenomenon that two or more systems influence each other in motion through a variety of interactions.When close coupling is promoted between systems or between elements within the system, it is called benign coupling; otherwise, it is called bad coupling.Coupling degree (C) is to describe the degree to which the system or elements interact with each other, is a relatively static measure; coupling coordination degree (D) is the degree of development between systems or within the system, reflecting the trend of the system from disorder to order, reflecting the level of coordination level and dynamic development process between systems.The coupling degree and the coupling degree between the coupling degree indicate the degree of benign coupling in the interaction and the degree of coordination condition.

This paper uses the capacity coupling coefficient model in physics, which are as follows:

$$C=n[(u_1*u_2*u_3*\ldots*u_n)/\prod(u_i+u_j)]^{1/n},\ u=\sum_{i=1}^{m}\omega_{ij}*u_{ij}\ ,\ \sum_{i=1}^{m}\omega_{ij}=1 \quad (8)$$

Among them, u is the system comprehensive sequence parameter, and this study involves two systems, n=2. obtained by (3)

$$C=2\sqrt{f(x)*g(x)/[f(x)+g(x)]^2}\ ,f(x)=\sum_{i=1}^{m}a_i*x_i'\ ,\ g(x)=\sum_{j=1}^{n}b_j*y_j' \quad (9)$$

$x_1', x_2', \ldots, x_n'$ represents the Circulation industry index, $a_1, a_2, \ldots, a_n$ for the indicator weight; $y_1', y_2', \ldots, y_m'$ represents the economic development indicators $b_1, b_2, \ldots, b_m$; the x_i' and y_j' denote the normalized values; $f(x)$ and $g(x)$ indicate the development level of circulation industry and regional economy respectively.

Considering the development of the system, the coupling development degree (D) of the index T as follows:

$$T=\alpha f(x)+\beta g(x)\ ,\ D=\sqrt{C*T} \quad (10)$$

α, β for the evaluation coefficient, the value is 0.5; the coupling development degree (D) reflects the coordinated development level and correlation degree of the Circulation industry and the economic development, and the level of coordinated development is divided according to the values of (D).

Referring to the criteria for coordinated development types judged in the Ren Jizhou (1999) report, This paper divides the coupling development degree (D) into 10 grade intervals, and each interval corresponds to a coordinated development level, so as to achieve a more intuitive coupling development level of reaction Circulation industry and Regional economy.The specific division criteria are as follows:

Table 1. Coupling Development Degree (D) Grade interval division standard and the corresponding coordinated development level of each interval

Order number	Coupling development degree interval	Coordinated development level	Order number	Coupling development degree interval	Coordinated development level
1	0—0.1	Extreme imbalance	6	0.5001—0.6	Forced coordination
2	0.1001—0.2	Serious imbalance	7	0.6001—0.7	Primary coordination
3	0.2001—0.3	Moderate imbalance	8	0.7001—0.8	Intermediate coordination
4	0.3001—0.4	Mild imbalance	9	0.8001—0.9	Good coordination
5	0.4001—0.5	On the verge of imbalance	10	0.9001—1	Quality coordination

3. Results and discussion

3.1 Evaluation index system and data preprocessing

Based on the sample data of the Tibet 2016-2020 Statistical Yearbook and the actual situation of the Tibet Autonomous Region, the index evaluation system shown in Table 2 is selected, and the weights of each index calculated by using the above entropy power method are shown in Table 2

Table 2. Evaluation System for Coordinating Development of Regional Circulation Industry and Regional Economy

Circulation industry development index f (x)			Economic development index, g (x)		
Level 1 indicators	Secondary indicators	Weight	Level 1 indicators	Secondary indicators	Weight
Essential productive factors	Number of employees	0.22518	Economic benefits	Market turnover of more than 100 million yuan (100 million yuan)	0.02412
	Ownership of civil vehicles	0.01574		consumer price index	0.00006
	Highway mileage within the territory	0.20272		The GDP annual growth rate is (%)	0.55899
Development conditions	average wage	0.47947	Pecuniary condition	Local fiscal revenue (RMB ten thousand yuan)	0.09818
	Total retail sales of social consumer goods (ten thousand yuan)	0.04297		Gross industry product (RMB 100 million)	0.22319
Horizontal competition	Number of wholesale enterprises with limit and above	0.01668	Quality of life	Per capita disposable income of urban and rural residents	0.05826
	Total sales of wholesale enterprises with quota or above (ten thousand yuan)	0.01723		Per capita consumption expenditure for urban and rural residents	0.03721

Table 3. Some index data of the Tibet Autonomous Region

A particular year	Regional GDP	Market turnover of more than 100 million yuan (100 million yuan)	Consumer price index	Highway mileage within the territory	Total retail sales of social consumer goods (ten thousand yuan)	Ownership of civil vehicles
2016	1173	22.46	102.5	82096	5390532	404589
2017	1349	23.88	101.6	89343	6188437	446772
2018	1548.4	26.96	101.7	97784	7117624	582377
2019	1697.8	26.9	102.3	103951	7733966	636137
2020	1902.7	25.38	102.2	118831	7457784	702134

(Data source: Tibet Statistical Yearbook)

3.2 Evaluation of the coupling level of Circulation industry and Regional economy in Tibet Autonomous Region

Using the formula mentioned above, the coupling degree of Circulation industry and Regional economy in Tibet Autonomous region are C, T and coupling development degree (D), and the evaluation and judgment of Circulation industry and Regional economy on the coordinated development level in Tibet Autonomous region as shown in Table 1, as shown in Table 4

Table 4. Coupling degree and coupling development degree of the coordinated development of Circulation industry and Regional economy in Tibet Autonomous Region

A particular year	g(x)	f(x)	C	T	(D)	Coordinated development level	Stage of development
2016	0.54998	0.01258	0.29566	0.28128	0.28838	Moderate imbalance	Disorder recession stage
2017	0.63115	0.02392	0.37514	0.32753	0.35053	Mild imbalance	
2018	0.76641	0.09403	0.62400	0.43022	0.51813	Forced coordination	Transition period
2019	0.77264	0.55860	0.98699	0.66562	0.81053	Good coordination	Coordinated development stage
2020	0.41732	0.99688	0.91217	0.70710	0.80311	Good coordination	

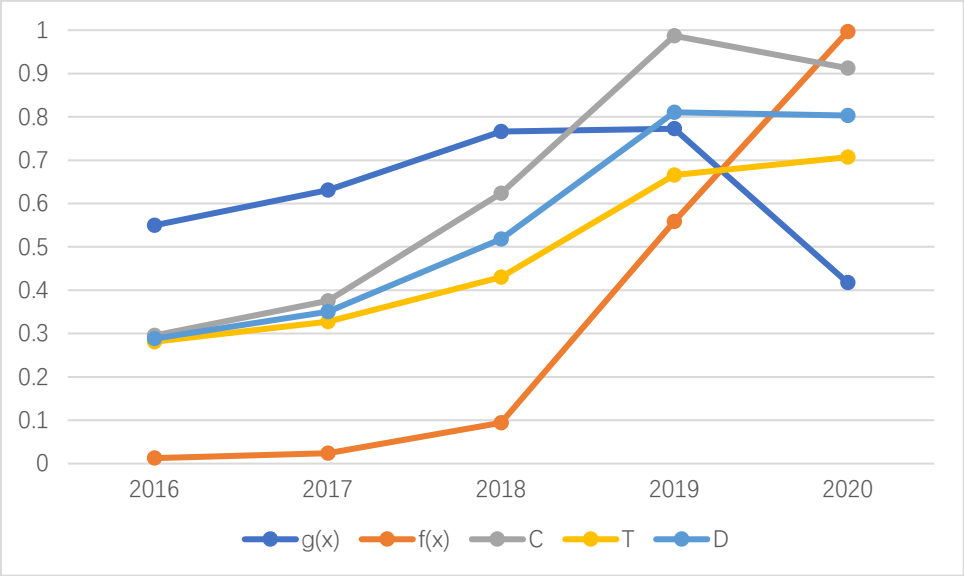


Figure 1. Trend of coupling degree and coupling development degree of Circulation industry and Regional economy in Tibet Autonomous Region

4. Conclusion

4.1 Data analysis

4.1.1 Timing analysis of the comprehensive development level

Compare the $f_{(x)}$ and $g_{(x)}$ between 2016 and 2020, the average development level $f_{(x)}$ of circulation industry in Tibet Autonomous Region was 0.3372, while the average regional economic development level$g_{(x)}$was 0.6274. The overall development of circulation industry lags behind its regional economic development. The general type of regional economic and circulation industry development in Tibet Autonomous Region is the industrial lag type.

During 2016 to 2017, due to the influence of imperfect regional transportation infrastructure and small population base, $f_{(x)}$ and $g_{(x)}$ were low and in the stage of disorder decline.In this stage, the circulation industry is dominated by the traditional business form, with a small scale, low organization degree, and lacks the core competitiveness in the competition with the real commercial market; Due to the small market scale, the regional economic development level of Tibet Autonomous Region is also low compared with the development level of other provinces in China in the same period.From 2018 to 2019, the gradual improvement of transportation infrastructure in Tibet and the effectiveness of the 13th Five-Year Development Plan for industry, tourism and ethnic handicrafts in Tibet Autonomous Region kept the regional economy of Tibet Autonomous Region rising steadily. Under such favorable conditions, the development of circulation industry accelerated, and $f_{(x)}$ jumped to 0.55860. In 2020, affected by the new crown outbreak, the Tibet autonomous region regional economic development is greatly hindered, regional economic development level $g_{(x)}$ fell to 0.41732, but the Tibet autonomous region circulation industry benefit from excellent epidemic prevention and control level (2020 Tibet autonomous region outbreak infection 1 person, cure 1) and the Chinese government support can still maintain a stable momentum of development.

4.1.2 Temporiming analysis of coupling degree (C) and coupling coordination degree (D)

Combined with Table 4 and Figure 1, it can be found that between 2016 and 2020, the coordination between the Circulation industry and the Regional economy in Tibet Autonomous Region improved rapidly, and the coupling degree (C) once jumped to 0.98699 in 2019. From 2016 to 2019, the improvement of infrastructure of Tibet Autonomous Region and the effectiveness of the 13th Five-Year Development Plan of Tibet Autonomous Region continuously improved the coupling between

Tibetan Circulation industry and Regional economy, indicating that the development of the two promoted each other.At the same time, the high development speed also makes the coordinated development of Tibet's Circulation industry and Regional economy enter a relatively mature and coordinated development stage in 2018.In 2020, the coupling was slightly reduced, while the comprehensive evaluation index T was still rising steadily. On the one hand, the further improvement of infrastructure and the promotion of the 13th Five-Year Plan kept the high development rate of the economic development and the coordinated development of Regional economy and Circulation industry, but the fact shows that the Tibetan economy could remain stable under the strong leadership of the Chinese government.

During 2016 to 2020, under the infrastructure improvement and related policies to promote the Tibet Circulation industry and Regional economic coupling development degree (D) overall steady growth, the average annual growth rate of 29.2%, although under the outbreak in 2020, the Circulation industry development level exceeds the Regional economic development degree (D) slightly decreased, but the two systems still remain in a relatively stable stage of good coordinated development.

4.2 Development recommendations

4.2.1 Strengthen the support for small, medium and micro enterprises

Small, medium and micro-sized enterprises play an extremely important role in the economic development of Tibet, and their development degree plays a crucial role in the development of the Regional economy in Tibet.In the current epidemic environment, the economic development has been greatly hindered, and the capital operation and management of small, small and medium-sized enterprises have shown different degrees of difficulties.The government can increase support for small, medium and medium-sized enterprises and actively promote the steady development of micro enterprises.

4.2.2 Give full play to Tibet's advantages in geography and resources

First, Tibet has rich natural landscape resources without other provinces, and with the further improvement of transportation infrastructure, Tibet and the mainland more convenient and extensive, should make full use of its unique rich natural landscape resources to accelerate the economic recovery and development of Tibet; second, Tibet has outstanding geographical advantages of border ethnic areas, can fully use the "Belt and Road" development strategy Achieving international circular development, facing South Asia, has provided a vast space for Tibet's economic development through strengthening foreign trade and cooperative development.

4.2.3 Actively promote the innovative development of the Circulation industry

On the whole, the development of Circulation industry in Tibet Autonomous Region is still slightly delayed by the Regional economic development. Although the Regional economic development plays a certain role in supporting the development of Circulation industry, the development of Circulation industry in the region still needs to find new development points.Innovation is an important factor affecting the industrial development space, we should focus on the development of independent innovation, with a more efficient Circulation industry, With the help of cloud computing, artificial intelligence, big data analysis and other information technologies, to improve the core competitiveness of the Circulation industry in the region.

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