

# Evaluation of Cooperative Development of Crossborder E-commerce of Chengdu-chongqing Economic Circle

Qifan Yu

Chongqing university of Posts and Telecommunications, China

## Abstract

On October 20, 2021, the CPC Central Committee and the State Council issued the Outline of the Plan for the Construction of the Twin Cities Economic Circle in Chengdu-Chongqing Region, which states that it is necessary to promote the overall and coordinated development of the Chengdu-Chongqing region and create a strong and distinctive economic circle in the Twin Cities. Cross-border e-commerce industry as an important industry to promote the development of regional foreign trade Chengdu-Chongqing cross-border e-commerce industry development to promote the economic development of Chengdu-Chongqing plays an important role. Based on the theory of cross-border e-commerce ecosystem, Chongqing and Chengdu are selected as the evaluation objects of the degree of synergy, the model of synergy of Chengdu-Chongqing cross-border e-commerce system is established by CRITIC method, which reveals the degree of synergy between Chengdu-Chongqing cross-border e-commerce systems, and provides relevant development suggestions for the government from a policy perspective to provide basis for the coordinated development direction of Chengdu-Chongqing cross-border e-commerce industry.

## Keywords

Chengdu-Chongqing; Regional Cross-border E-commerce Collaboration; Sequence Parameters; CRITIC Method.

## 1. Introduction

China's cross-border e-commerce is developing well, and the cross-border e-commerce industry ecosystem is gradually emerging. Cross-border e-commerce transactions are mainly conducted at the core level, namely producers, consumers and cross-border e-commerce platforms. At the same time, cross-border e-commerce activities cannot be separated from the support layer, namely, cross-border revenue and expenditure, cross-border logistics, cross-border supervision, talent and derivative services, providing support services for cross-border e-commerce activities in terms of capital flow, logistics flow, information flow and business flow. Cross-border e-commerce activities will also be affected by five environmental factors, namely, politics, economy, technology, law, culture and society. On this basis, cross-border e-commerce transaction entities form an organic whole through mutual coordination and cooperation. This is the cross-border e-commerce industry ecosystem, which is one of the most important and critical components of the entire cross-border e-commerce industry chain. The environment and supporting factors play a central role in ensuring the smooth completion of cross-border e-commerce and supporting cross-border e-commerce. Based on the theory of business ecosystem [1], combined with the relevant factors in the cross-border e-commerce model and the "four flows" (business flow, logistics, capital flow and information flow) in cross-border e-commerce transactions, this paper outlines the ecosystem of cross-border e-commerce industry.

## 2. Literature Review

With regard to the theory of business ecosystem, in 1996, Moore pioneered the definition of business ecosystem and the evolution law of its participants, indicating that this interdisciplinary research method of ecosystem research has been used in business [2]. Kwak et al. (2016) studied the role of e-commerce in relevant fields based on ecosystem theory. Research on cross-border e-commerce collaboration [3]. Yin Ping (2018) studied cross-border e-commerce supply chain collaboration from the perspective of composite collaboration system, verified the feasibility and applicability of cross-border e-commerce supply chain collaboration evaluation system through empirical research, and provided reference opinions for the improvement of cross-border e-commerce supply chain collaboration level [4]. Hao Juanjuan (2019) qualitatively described the cooperative evolution game and cooperative operation mechanism [5] by building the cooperative evolution game model of cross-border e-commerce and cross-border logistics. He Beibei (2019), based on the composite system theory and synergy theory, built a model of cross-border e-commerce and logistics collaborative development, analyzed the internal mechanism of collaborative development, and calculated the order degree of cross-border e-commerce and logistics subsystems in Henan Province and the synergy degree of the entire composite system [6] using the synergy model.

At present, most scholars mainly focus on the relationship between cross-border e-commerce and logistics, collaborative research on cross-border e-commerce supply chain and cross-border e-commerce related industries. Most of the research focuses on the national cross-border e-commerce industry, while the development of cross-border e-commerce in this region is a minority. However, with the continuous maturity of Internet technology and the acceleration of global economic integration, more and more enterprises begin to attach importance to the operation mode and future development direction of cross-border e-commerce. However, the existing research on regional cross-border e-commerce is not in-depth and comprehensive. In addition, due to the imperfection of the direct statistics of cross-border e-commerce indicators in some regions, the indicators of cross-border e-commerce regional cooperation in most regions have limitations and imperfections. Therefore, based on the ecosystem of cross-border e-commerce industry in Chengdu-Chongqing region, this paper will build a collaborative development model of cross-border e-commerce industry in Chengdu-Chongqing region from three dimensions of environment, support and core, and calculate the development trend of cross-border e-commerce industry synergy in Chengdu-Chongqing region based on objective data and empirical analysis, so as to provide reference for the development of cross-border e-commerce industry in Chengdu-Chongqing region.

## 3. Research Method

### 3.1. Indicators of Chengdu-Chongqing Cross-Border E-Commerce from the Perspective of Ecosystem

#### 3.1.1. Indicators of Environmental Layer of Chengdu-Chongqing Cross-Border E-Commerce

The environmental layer is the external macro environment that affects the development of cross-border e-commerce in Chengdu-Chongqing region. This paper analyzes the environmental layer of cross-border e-commerce in Chengdu-Chongqing region from four aspects: political policy environment, economic environment, technical environment and social environment.

The political policy environment is the premise and guarantee for the development of cross-border e-commerce industry. A stable policy environment can promote the orderly and coordinated development of cross-border e-commerce industry. At present, China has formed

an all-round opening up pattern under the "the Belt and Road" strategic framework, providing unprecedented historical opportunities for Chongqing's cross-border e-commerce industry. However, due to its late start and poor foundation, it faces many challenges. Therefore, on the basis of reviewing and summarizing the relevant policies of cross-border e-commerce in Chongqing and Chengdu from 2010 to 2020, this paper determines the evaluation indicators of the cross-border e-commerce policy environment in Chengdu-Chongqing region from six levels: industrial special planning policy (X1), cross-border e-commerce business policy (X2), cross-border e-commerce talent policy (X3), cross-border e-commerce platform policy (X4), cross-border e-commerce capital policy (X5), and cross-border e-commerce land park policy (X6).

The technological environment reflects the progress of science and technology and the use of new technologies in the region. Cross-border e-commerce, with its low cost, high efficiency and other characteristics, has rapidly risen and occupied an increasing market share, but also has a huge impact on traditional international trade. Technological progress has promoted the transfer of cross-border trade from offline to online, providing necessary conditions for cross-border e-commerce. Therefore, this paper determines the technical environment evaluation indicators of Chengdu-Chongqing cross-border e-commerce from three aspects: the development of scientific and technological achievements, the construction of infrastructure and scientific research facilities, and the investment in scientific research facilities: the number of patents in the region (X7), the number of web pages (X8), the total number of telecommunications services (X9), the number of regional scientific research institutions (X10), and the investment in regional medical research funds (X11).

The economic environment includes economic globalization, industrial structure and economic development. In the context of global integration, China's regional economy also presents the characteristics of internationalization. With the advent of the e-commerce era, cross-border e-commerce has gradually become a new form of trade and has an important impact on regional economy. The development of regional economic strength has strengthened consumption capacity, changed consumption mode and promoted the optimization of consumption structure. Therefore, this paper determines the economic environment evaluation indicators of Chengdu-Chongqing cross-border e-commerce from three dimensions: service industry, commercial development, economic globalization, and regional economic development: the proportion of the tertiary industry in GDP (X12), total imports and exports (X13), total regional GDP (X14), regional per capita disposable income (X15), and total retail sales of social consumer goods (X16).

The social environment reflects the openness of society and the quality of workers and consumers. The higher the openness of society, the more active social commerce will be, and create a good environment for the development of regional cross-border e-commerce. At the same time, a large number of high-quality talents are the basis for the development of cross-border e-commerce. Therefore, this paper determines the evaluation indicators of the social environment of Chengdu-Chongqing cross-border e-commerce from two dimensions: the degree of social commerce activity and the number of Internet access users: market openness (X17), the number of broadband access users (X18) and the number of wholesale and retail employees above the quota (X19). Among them, market openness is measured by the ratio of imports to regional GDP.

### **3.1.2. Indicators for the Support Layer of Chengdu-Chongqing Cross-border E-commerce**

Cross-border logistics refers to logistics services conducted between two or more countries, which is a manifestation of the development of logistics services to an advanced stage. Therefore, this paper determines the evaluation indicators of Chengdu-Chongqing cross-border e-commerce cross-border logistics from three dimensions of regional traffic turnover,

international express industry scale and regional logistics infrastructure construction investment: railway cargo turnover (X20), highway cargo turnover (X21), civil aviation cargo turnover (X22), international and Hong Kong and Macao express business (X23), international and Hong Kong and Macao express business income scale (X24), transportation Fixed asset investment in warehousing and postal industry (X25), number of cross-border logistics enterprises (X26).

Cross-border payment is the core of the development of cross-border e-commerce. The development of cross-border e-commerce cannot be separated from the support of third-party payment platforms. As an integral part of cross-border e-commerce transactions, third-party payment platforms play an important role in promoting the development of cross-border e-commerce. At present, China's third-party payment market is still in its infancy. With the economic and social development and the improvement of living standards, the public's demand for online shopping is rising. In order to meet people's demand for online shopping and facilitate the electronic consumption of social groups, the use of third-party payment platforms in cross-border e-commerce transactions is the main channel of cross-border e-commerce in China at this stage. Therefore, this paper determines that the evaluation index of cross-border payment of Chengdu-Chongqing cross-border e-commerce is the number of cross-border payment service enterprises in the region (X27).

Cross-border e-commerce talents and professional services include the training of cross-border e-commerce talents in the region and professional service institutions related to cross-border e-commerce. This paper determines that the evaluation indicators of Chengdu-Chongqing cross-border e-commerce talents and professional services are the number of ordinary colleges and universities in the region (X28), the number of college students (X29), the number of customs declaration service agencies (X30), and the number of enterprises operating in the regulatory sites (X31).

### **3.1.3. Indicators of Chengdu-Chongqing Cross-border E-commerce in Core Layer**

The core layer of cross-border e-commerce mainly includes the operation of cross-border e-commerce enterprises and platform operation. It is the central system in the ecosystem and the main object of the whole ecosystem. This paper determines the evaluation indicators of cross-border e-commerce talents and professional services in Chengdu-Chongqing cross-border e-commerce as the number of cross-border e-commerce enterprises (X32), the number of customs 3A credit enterprises (X33), the number of customs declaration enterprises (X34), the total amount of cross-border e-commerce transactions (X35), and the number of operating cross-border e-commerce platforms (X36).

## **3.2. Chengdu-Chongqing Cross-border E-commerce CRITIC Method Weight Model**

This paper adopts the standard importance thinking method (standard CRITIC thinking [7]) as the method to determine the index weight. When constructing the indicator system, this method mainly considers the differences between indicators under different attributes, rather than just one or several aspects; At the same time, it also avoids the shortcomings of traditional subjective weighting method, such as strong subjectivity and easy to produce deviation. CRITIC method, as an objective weighting method, is widely used by scholars. Its core idea is to comprehensively evaluate the objective weight of the index value by calculating the contrast strength and conflict between the standard deviations.

## **3.3. Data Collection**

The research object of this paper is the cross-border e-commerce industry between Chengdu and Chongqing. The sample range of the indicators is from 2010 to 2020. The subjective data of the three-level indicators corresponding to the policy environment is from expert scoring, and

the objective data is from official data such as Chongqing Statistical Yearbook, Chengdu Statistical Yearbook and Sichuan Statistical Yearbook, as well as the major databases in the EPS global statistical data platform. If the same evaluation index is inconsistent with the national statistical data and urban statistical data, the national statistical data shall prevail. The customs data is sourced from the website of the import and export credit information platform of Chinese customs enterprises. The website is <http://credit.customs.gov.cn/>

### 3.4. Evaluation Index Weight of Chengdu-Chongqing Cross-border E-commerce Collaborative Development based on CRITIC Method

According to the statistical data of Chongqing and Chengdu from 2010 to 2020. The index weight calculated by the CRITIC method, as shown in the table.

**Table 1.** The weight of indicators

indicator	weight	indicator	weight
X1	0.031122385	X19	0.038004838
X2	0.027970862	X20	0.067619622
X3	0.031441623	X21	0.024162404
X4	0.02227777	X22	0.019877291
X5	0.056282582	X23	0.020616329
X6	0.042227152	X24	0.019202848
X7	0.017716713	X25	0.016638582
X8	0.057159761	X26	0.02068632
X9	0.020591458	X27	0.050711357
X10	0.053152835	X28	0.02943179
X11	0.014330202	X29	0.01479123
X12	0.020912194	X30	0.015834326
X13	0.027336374	X31	0.016000989
X14	0.015780563	X32	0.015219419
X15	0.01489337	X33	0.023248065
X16	0.017320944	X34	0.015145659
X17	0.072257023	X35	0.018357788
X18	0.016172023	X36	0.01550531

## 4. Result Analysis

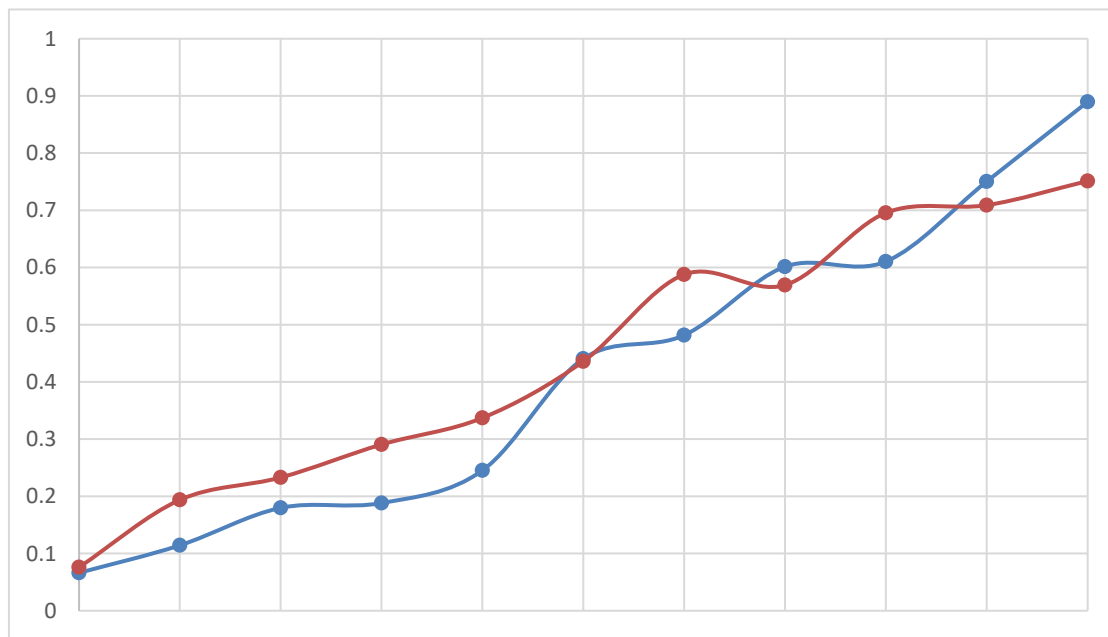
Calculate the order degree of Chongqing and Chengdu from 2010 to 2020, and the results are shown in the table below.

**Table 2.** Orderliness of evaluation indicators in Chongqing and Chengdu

Year	Orderliness of Chengdu	Orderliness of Chongqing
2010	0.066284055	0.076101081
2011	0.114460429	0.193822878
2012	0.179983881	0.232995291
2013	0.188229586	0.290838724
2014	0.245392318	0.337201404
2015	0.440611517	0.436004641

2016	0.481812295	0.587975421
2017	0.601494691	0.569393636
2018	0.610654816	0.695599683
2019	0.750465383	0.709100752
2020	0.889744161	0.751180357

According to the above data, draw the trend of the order of the cross-border e-commerce system in Chongqing and Chengdu, as shown in the figure below.



Note: 1) the blue line stands for Chengdu, and the orange line stands for Chongqing  
 2) each dot stands for the data in each year between 2010 and 2020

**Figure 1.** Orderliness of cross-border e-commerce systems in Chongqing and Chengdu

It can be seen from the figure

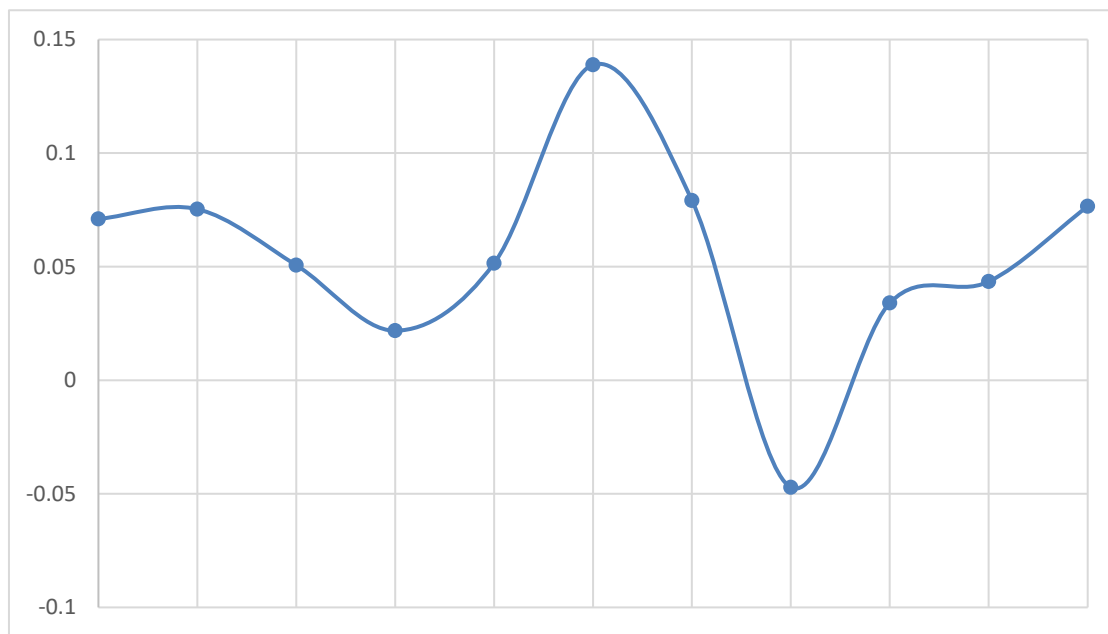
(1) The overall order measurement of Chengdu is on the rise. In the eight years from 2010 to 2017, the cross-border e-commerce industry in Chengdu maintained a stable development trend under the encouragement of policies. Among them, from 2014 to 2015, with the in-depth implementation of the "the Belt and Road" strategic layout, Chengdu's cross-border e-commerce has developed rapidly. The cross-border e-commerce industry in Chengdu has shown a rapid development trend in the three years 2018-2020. According to the survey data, the People's Government of Sichuan Province issued the Notice of the Three-Year Action Plan for the Promotion of Foreign Trade in Sichuan (2018-2020) in 2017 and the implementation of the development strategy of other related supporting industries, spurring the urban cross-border e-commerce industry to develop vigorously in the three years.

(2) The order of Chongqing showed an upward trend in 2016 from 2010, and a downward trend from 2017 to 2020. Among them, Chongqing ushered in an inflection point in 2017. After sorting out and analyzing the economic data of Chongqing from 2015 to 2019, we can see that the overall economic level of Chongqing shows an upward trend year by year. However, compared with other provinces and cities, their per capita GDP is still at a low level. According to the data, this may be due to the slowdown in the growth of Chongqing's total import and export volume after 2017, as well as the decline in the number of patents from 42738 in 2016



to 34780 in 2017 and other indicators related to the technological environment. In 2017, the automobile industry, electronic industry and other industries as the pillar of Chongqing also declined, leading to the downturn in the cross-border e-commerce industry. At the same time, from 2018 to 2020, the growth rate of cross-border e-commerce in Chongqing slowed down, mainly because the strength of Chongqing's cross-border e-commerce industrial policy was weaker than that of Chengdu in recent years, and the development of cross-border e-commerce industry was not strong enough.

Calculate the degree of cooperation development of Chengdu-Chongqing cross-border e-commerce from 2010 to 2019, and the results are shown in Figure 2.



Note: 1) each dot stands for the data in each year between 2010 and 2020

**Figure 2.** The degree of cooperation development of Chengdu-Chongqing cross-border e-commerce

It can be seen from the above figure that the overall synergy of the cross-border e-commerce system in the Chengdu-Chongqing region is fluctuating. Among them, the synergy of Chengdu-Chongqing cross-border e-commerce system reached the highest value in 2015. Comparing the degree of order between the two cities, we found that the degree of order between Chengdu and Chongqing was very similar in that year, indicating that Chengdu-Chongqing cross-border e-commerce system was highly collaborative in that year. In 2017, the degree of cross-border e-commerce synergy between Chengdu and Chongqing was negative. Comparing the degree of order between Chengdu and Chongqing in 2017, we found that the degree of order of the cross-border e-commerce system in Chengdu increased, while the degree of order in Chongqing decreased, and the development direction of the two cities was different, so the degree of synergy was negative. In addition to 2017, the synergy of the Chengdu-Chongqing cross-border e-commerce system was positive in the other ten years. The reason for the fluctuation was that the development speed of the cross-border e-commerce system in Chengdu and Chongqing was different in that year, so the synergy was different.

## 5. Conclusion and Discussion

This paper calculates the weight of each indicator in the Chengdu-Chongqing cross-border e-commerce system, and ranks the weight of 36 indicators. Among them, the top five indicators

are market openness, railway freight turnover, number of web pages, cross-border e-commerce capital policy and the number of regional medical research institutions.

This paper has drawn the trend chart of Chengdu-Chongqing cross-border e-commerce system collaboration, and analyzed the collaboration of each subsystem of Chengdu-Chongqing cross-border e-commerce through the three subsystems of environment layer, support layer and core layer. The conclusions are as follows. From 2010 to 2020, the order of the cross-border e-commerce system in Chengdu showed a trend of increasing year by year, while the order of the cross-border e-commerce system in Chongqing showed a trend of increasing first, then decreasing, and then increasing. In terms of system synergy, the synergy between the two regions was negative in 2017, and positive in the other ten years. The cross-border e-commerce industry in Chengdu and Chongqing basically showed a collaborative development trend. As far as the environmental level is concerned, the coordination degree of the two environmental level indicator subsystems was negative in 2017 and 2019, and positive in the rest of the years; As far as the supporting layer is concerned, the degree of synergy between the two places was negative in 2014 and 2020, and positive in the rest of the years, which basically showed a state of synergy; As far as the core layer is concerned, the degree of synergy between the two places is positive, and the core layer presents a state of collaborative development.

In terms of the uncoordinated development of the two places, this paper analyzes the following reasons. First, the policies related to cross-border e-commerce in the two places are different. In contrast, the policy support of Chengdu for cross-border e-commerce industry in recent years is relatively strong, while the support of Chongqing for cross-border e-commerce industry is relatively insufficient. Secondly, the supporting development of cross-border e-commerce supporting industries in the two cities is different. For the development of cross-border logistics, cross-border payment, cross-border e-commerce talent training and cross-border e-commerce supporting service industries, Chengdu is a little better than Chongqing.

The changing trend of the synergy of the Chengdu-Chongqing cross-border e-commerce system shows that the Chengdu-Chongqing cross-border e-commerce industry is developing rapidly. As the regulator of the cross-border e-commerce industry, the government should, on the one hand, coordinate and plan the cross-border e-commerce industry to promote the development of the cross-border e-commerce industry from the aspects of capital, land, talent training, etc. On the other hand, cross-border logistics, cross-border payment, cross-border e-commerce talent training and supporting industry services are the pillars of the sound development of cross-border e-commerce industry. The government should promote the coordinated development of cross-border e-commerce support industries in Chengdu and Chongqing through tax support, talent introduction, information exchange and other ways.

## References

- [1] Herman Hacken Synergetics - the mystery of nature [M] Shanghai Translation Publishing House, 2005.
- [2] Moore, JF. The death of competition: leadership and strategy in the age of business ecosystems[J]. Harper Business New York, 1996(7): 121-146.
- [3] Kwak, D.-H., Jain, H. The role of web and [A]. Sugumaran V., Yoon V., Shaw M.J. Lecture Notes in Business Information Processing[C]. Springer Verlag, 2016, 258: 143-154.
- [4] Yin Ping Research on collaborative evaluation of cross-border e-commerce supply chain [D]. Jiangsu University of Science and Technology, 2018(in Chinese).
- [5] Hao Juanjuan Research on the evolutionary game and operation mechanism of the coordinated development of cross-border e-commerce and cross-border logistics [D]. Southwest Jiaotong University, 2019. (in Chinese).



- [6] He Beibei Research on the coordinated development of cross-border e-commerce and logistics [D]. Henan University of Finance, Economics and Law, 2019(in Chinese).
- [7] Xiao Zhihong, Zhang Yuhuan, Gong Nailin. Comprehensive evaluation of high-quality development of national central cities - grey correlation analysis based on CRITIC method [J]. Journal of Chongqing Three Gorges University, 2022(in Chinese).