

# Research on the Measurement of China's Sharing Economy Development Level

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**Abstract**— Based on relevant data from 31 provinces and cities in China (excluding Hong Kong, Macao, and Taiwan) from 2015 to 2017, the evaluation index for the development level of the sharing economy is constructed from two aspects of development potential and development effectiveness, and the level of China's sharing economy is measured using the entropy method. The results show that the sharing economy development index of China's provinces and cities showed an upward trend from 2015 to 2017. However, the overall development level of China's regional sharing economy is not high, and the geographical differences are significant. With the Yangtze River Delta, the Pearl River Delta, and Beijing-Tianjin-Hebei as the core, it gradually decreases to the west and north, forming low-value areas in Tibet, Qinghai, Xinjiang, and Inner Mongolia.

**Keywords**— Sharing economy; entropy method; development level; measure.

## I. INTRODUCTION

Since the reform and opening up, China's economy has been driven by the "three carriages" of consumption, investment, and exports for more than three decades of rapid growth. However, after 2010, China's GDP growth rate continued to decline. In 2014, the GDP growth rate was 7.3%, and it has fallen to 6.6% in 2018. The Chinese economy has switched from high-speed growth to medium-speed growth, and the traditional "three carriages" that drive economic growth Weakness is in urgent need of new growth momentum.

The sharing economy is a new economic model that improves resource utilization. It is conducive to integrating idle resources, alleviating the contradiction between supply and demand, and helping supply-side reforms. Entering the new normal, the development of the sharing economy has positive significance for the successful transformation of China's economy and the realization of high-speed growth, and the sharing economy will have great promise.

In October 2015, the Fifth Plenary Session of the Eighteenth Central Committee of the Communist Party of China was held in Beijing, and the communique of the Fifth Plenary Session of the Eighteenth Central Committee came out. The communiqué proposed the development of the sharing economy. In March 2016, Premier Li Keqiang proposed that "the system and mechanism innovation promote the development of the sharing economy and build a sharing platform". From "proposed" to "promoted", the term sharing economy has quickly become a hot word in the economics and industry circles. This economic model has also officially entered the stage of history and has begun to play an increasingly important role in China's economic development pattern.

However, the overall research on the sharing economy in China is still in its infancy. The classification and definition of the sharing economy is not clear enough. Data statistics have certain limitations-its statistical indicators cannot be compared with GDP and other shortcomings that limit the accuracy of current statistics. More importantly, there is no way to measure the externalities of the sharing economy. This has led

to our inability to accurately evaluate the level of development of the sharing economy in a region. Therefore, the establishment of a reasonable evaluation system for the development level of the sharing economy has important reference value for the government to formulate scientific and effective macroeconomic policies.

Based on the above analysis, this article builds the evaluation index of the development level of the sharing economy based on the relevant data of 31 provinces and cities in China from 2015 to 2017, and uses the entropy method to investigate the development level of the sharing economy in China.

## II. LITERATURE REVIEW

China National Information Center's research group (2016) defines the sharing economy as the sum of economic activities that use modern technologies such as the Internet to integrate and share massive decentralized idle resources to meet diversified needs. The sharing economy has created good market conditions for economic development, and the leading role of regional economic development has also emerged. The China Sharing Economy Development Report Research Group (2016) believes that the sharing economy eliminates interregional market segmentation through the Internet, increases the possibility of regional external market entry, promotes the flow of resource elements and labor products, enables efficient matching of supply and demand, and enables efficient resource allocation. improve. Therefore, it is urgent to find a reasonable and effective evaluation system for the sharing economy, which will help relevant Chinese departments to fully understand the true level of the development of the sharing economy and promote the orderly and healthy development of the sharing economy.

At present, scholars' research on the sharing economy mainly involves the connotation, driving factors, influences, and challenges of the sharing economy. In terms of accounting and measurement of the sharing economy, domestic and foreign literature is very limited. British scholar Vaughan R et al. (2016) used a quantitative method to evaluate the size of the sharing economy market, they divide the market into five

main areas: accommodation, transportation, family needs services, professional skills and finance, and then use the total transaction volume of each platform to represent the level of development in this area. The China Sharing Economic Statistics Group (2017) pointed out that the indicators of sharing economic statistics should at least include the sharing economic income, the number of participants, the size of transactions, the number of employees, and the number of sharing platforms; Lu Benfu (2017) proposed a more feasible statistical method. The basic idea is to select several most representative companies in each type of sharing economy for measurement, and then, based on the representative companies' share in the industry, the total share of the entire industry is reversed, and the four items are added up to calculate the share economy of the enterprise based on this value; In the context of lack of direct corresponding data, Qiu Haiyang (2018) used the MIMIC model as a latent variable to use the MIMIC model to estimate the regional sharing economy development level; Niu Cuiping and Geng Xiulin (2019) based on the principle of satellite account (SA) The accounting method and process of value-added sharing economy are discussed, and the precautions for value-added accounting are put forward.

The above researches on the scale and value-added of the sharing economy provide ideas for the measurement of the level of development of the sharing economy, but still need to face the following problems: first, the difficulty of data collection and investigation; Consumers' boundaries; Third, the boundaries between the sharing economy and the traditional economy are blurred, and it is difficult to separate them clearly.

### III. EMPIRICAL ANALYSIS

The scale of the sharing economy determines its scope and extent. Both governments and businesses need relevant data to fully understand the scale of the sharing economy in order to formulate reasonable policies and investment decisions. On the one hand, the government can understand the contribution of China's sharing economy to the macro economy through data, and help government departments monitor the macro economy; it can also compare the development differences in corresponding fields at home and abroad, and find bottlenecks to further expand the economy. On the other hand, this helps companies understand the gap with competitors and fully grasp the status of business operations.

#### A. Index System Construction

As it is difficult to accurately grasp the definition of the sharing economy and the composition of the influencing factors at this stage, this paper starts from the two aspects of the development and effectiveness of the sharing economy based on the reference system of many scholars to study, using as few as possible, but with evaluation Indicators with strong subject correlation and high data availability are used to measure the sharing economic development index. The specific indicators are shown in Table I.

Based on the above principles, the evaluation index system for the development of the sharing economy includes two primary indicators of development potential and development

effectiveness, and two secondary indicators are set under each primary indicator, including a total of eight secondary indicators (see Table I for details).

TABLE I. China's sharing economy development evaluation index system

Evaluation Object	First-level indicators	Secondary indicators
Sharing Economy Development Level	Development potential	Investment in fixed assets for information transmission, computer services and software Number of students in regular colleges and universities Internet broadband access port
	Development effect	Sharing economy transaction scale Baidu Index Number of creative space Annual increase in employment in the tertiary industry Annual reduction in emissions of major pollutants in exhaust gas

#### (a).Development potential

There is a close relationship between the development of the sharing economy and policies, the level of social subjects, and the hardware foundation. They are the external environment for the development of the sharing economy and determine the future development of the sharing economy. The role of the government and society in promoting the sharing economy At the same time, the attitude of the government and society towards the sharing economy, especially in the initial stage of the development of the sharing economy, the government's attitude towards the development of the sharing economy plays a major role. This attitude can be adopted through policies, regulations, and development strategies Or investment and other means, and therefore this part of the index mainly considers the expenditure on the sharing economy, the selection index is "information transmission, computer services and software industry fixed asset investment"; participation in the sharing economy is an advanced and essential factor Economic laborers possess the latest and most advanced knowledge and technology, and transform the level of technologically advanced labor methods, which can reflect the level of shared economic products and operations. Therefore, to measure the level of national shared economic needs, indicators of labor factors must be included. The number of students in the school "; the development of the sharing economy is closely related to the development of the regional Internet. Therefore, to measure the level of development of the sharing economy in China, it is necessary to consider factors such as information technology and network infrastructure. The " Internet broadband connection ports "can reflect the Level of economic development hardware foundation level.

#### (b).Development effect

This indicator is a core part of the measurement of the level of development of the sharing economy, and reflects the size of the sharing economy and the value of externalities, including the role and contribution of the sharing economy to the development of the national economy, the degree of participants' awareness of the sharing economy, and even attempts to reflect the promotion of " "Double innovation"

(mass innovation, entrepreneurship), and the "externalities" of the development of the sharing economy to China's economy, society, and environment. There are a total of 5 evaluation indicators: the scale of the sharing economy transaction, the Baidu index, the number of creative spaces, the annual increase in the number of employees in the tertiary industry, and the annual reduction in emissions of major pollutants in the exhaust gas.

The "sharing economy transaction scale" is the most direct manifestation of the sharing economy development level. The size of the sharing economy transaction scale can reflect the development level of the sharing economy. This article intends to reflect the sharing economy according to the 2015-2017 sharing economy development report released by the National Information Center scale.

The sharing economy is an Internet economy, and its rapid development will inevitably lead to a large increase in the number of corresponding mobile app users. It is obvious to everyone that the sharing economy is active at this stage, but it lacks traditional statistical indicators to measure it. Therefore, under the first-level indicator system of development effectiveness, this paper sets the second-level indicator of "Baidu Index". The Baidu Index is a data sharing platform based on Baidu's massive netizen behavior data. It can tell users how large a search term for a keyword is in Baidu, reflecting the active search needs of netizens, that is, after the promotion and promotion of merchants, the sharing economy platform is formed. Certain brand effects, users actively search and understand, all activities that affect the search behavior of netizens may affect the Baidu index.

The development of the sharing economy has facilitated the socialized use of production factors, and has promoted the evolution of traditional singles and self-employed innovation and entrepreneurship to shared collaborative innovation and entrepreneurship. It has also lowered the threshold for innovation and entrepreneurship, lower costs, faster speed, and participation Wider. From the perspective of practical development, the most active areas of "mass entrepreneurship and innovation by all people" are mostly with the genes of the sharing economy. As a natural carrier leading "double innovation", various types of crowd-creation space are also an important part of the field of knowledge sharing. Therefore, this article sets the "creative space number" as one of the secondary indicators reflecting the social externalities of the sharing economy.

The sharing economy has become the engine of the development of China's tertiary industry, and it has led to an increase in employment. Therefore, under the first-level indicator system of development effectiveness, this paper sets a second-level indicator of "annual increase in the number of employed persons in the tertiary industry" to reflect the externality of the sharing economy on society.

The sharing economy as a low-carbon economy can reduce energy consumption and pollution emissions, which is conducive to the improvement of ecological efficiency. The more obvious example is in the field of travel sharing. When the sharing economy model in the transportation field prevails, then gasoline consumption and exhaust emissions will be

significantly reduced. This paper measures the external effect of the sharing economy on the environment through the secondary indicator of "annual reduction of emissions of major pollutants in exhaust gas".

### B. Entropy Weight Method

Entropy was originally a concept of thermodynamics and can be used to measure the uncertainty of a system. The amount of entropy is inversely proportional to the amount of information in the original data. The smaller the entropy value, the greater the amount of information, and vice versa. The entropy method is to determine the small weight by the proportion of the information provided by each indicator of the original data in the total information. This method can fully reflect the amount of information of the original data, and can also eliminate the overlap of data of similar indicators. And subjective factors, a more scientific, reasonable, and objective evaluation result is obtained. The traditional entropy method can only perform horizontal comparison of different regions in a certain year or vertical comparison of different years in a certain region, but if there is time, area, and index three-dimensional evaluation information, using traditional entropy method will make the evaluation results in different years. It is not comparable. Therefore, this paper introduces a global idea, uses all the data to calculate the weights, and then comprehensively evaluates the development level of the sharing economy in different years and regions. The evaluation steps using the global entropy method to evaluate the model are as follows:

Because the dimensions of different indicators are different, according to equation (1), the original data is first dimensionlessly processed by means of averaging, where  $x_{ij}$  in the equation represents the value of the  $j$ -th variable in the  $i$ -th province.

$$V'_{ij} = \frac{X_{ij}}{X_j} \times 99 + 1 \tag{1}$$

Then use  $V_{ij}$  to indicate the contribution of the index value of the  $i$ -th area to the index. Furthermore, the entropy  $E$  and the difference coefficient are:

$$V_{ij} = \frac{V'_{ij}}{\sum_{i=1}^m V'_{ij}} \tag{2}$$

$$E_j = -\frac{1}{\ln(mT)} \sum_{i=1}^{mT} V_{ij} \ln V_{ij}, F_j = 1 - E_j \tag{3}$$

The weight of index  $j$  is:

$$W_j = \frac{F_j}{\sum_{j=1}^n F_j} \tag{4}$$

The weighted sum formula is used to calculate the comprehensive indicator value of the level of development of the sharing economy:

$$S_i = \sum_{j=1}^n W_j V'_{ij} \tag{5}$$

The final formula (5) gives the comprehensive indicator value of the level of development of the sharing economy. Obviously, the larger S, the better the sample effect. Finally, all S values are compared to obtain an evaluation conclusion.

C. Result Analysis

It can be seen from Table II that the largest of the weights of the indicators is the sharing economy transaction scale, which is also in line with the sharing economy transaction scale indicator that best reflects the development of e-commerce. The weight of development potential is 0.2567. The development potential also represents the future development direction, and has a certain degree of contribution to the development of the sharing economy.

TABLE II. Evaluation index weight of sharing economy development

First-level indicators	Weights	Secondary indicators	Weights
Development potential	0.2567	Investment in fixed assets for information transmission, computer services and software	0.0825
		Number of students in regular colleges and universities	0.08085
		Internet broadband access port	0.0934
Development effect	0.7433	Sharing economy transaction scale	0.2915
		Baidu Index	0.1190
		Number of creative space	0.1806
		Annual increase in employment in the tertiary industry	0.0176
		Annual reduction in emissions of major pollutants in exhaust gas	0.1345

Calculate the comprehensive indicator value of the sharing economy development level of each province and city from 2015 to 2017 by using the numerical values obtained by normalizing the weights and the original data. The specific results are shown in Table III.

From Table III, we can see that the sharing economy development level of each province, autonomous region, and municipality, except for individual regions, has shown an increasing trend, indicating that China's sharing economy has been booming in recent years and is on the rise. However, the imbalance in regional development is still relatively serious, and generally shows a decreasing trend from the eastern coast to the western inland. Guangdong Province ranks first; eastern coastal provinces such as Jiangsu, Shandong, and Zhejiang have higher levels of development and gradually spread inland; the levels of shared economic development in Qinghai, Hainan, Xinjiang, and Inner Mongolia are relatively low.

From the ranking results, we can see that Guangdong's sharing economy has always ranked first, indicating that Guangdong is not only the largest province in China's economy, but also always leads the development of the sharing economy. The sharing economy and economic development are mutually reinforcing. Jiangsu's sharing economy development ranks second in the last three years. However, due to the gap between Jiangsu's overall economy and Guangdong, it is reasonable to rank second. The sharing economy development rankings of Gansu, Xinjiang, Hainan, Ningxia, Qinghai, and Inner Mongolia are relatively low. Most

of these areas are remote areas or underdeveloped areas in China.

TABLE III. China's Provincial Sharing Economy Development Level from 2015 to 2017

Area	2015	2016	2017
Beijing	18.4591	28.4476	35.9461
Tianjin	10.7815	18.6642	19.7598
Hebei	19.8444	34.4036	38.6965
Shanxi	10.8756	24.6731	20.7469
Inner Mongolia	9.2440	23.8026	18.6104
Liaoning	17.4433	27.4134	24.8031
Jilin	10.2071	18.2619	18.7766
Heilongjiang	11.9680	18.8804	19.6844
Shanghai	12.5609	18.7732	25.3327
Jiangsu	39.2758	58.4980	75.1239
Zhejiang	24.0851	36.8539	42.2911
Anhui	17.2248	26.7847	26.7554
Fujian	14.3838	20.7834	27.2398
Jiangxi	12.0775	19.2683	22.6197
Shandong	34.1923	54.8956	70.6570
Henan	22.0036	42.1453	41.3420
Hubei	17.6043	27.9703	30.1224
Hunan	15.4934	26.7616	30.7165
Guangdong	42.2922	69.2885	85.7282
Guangxi	11.0173	18.1734	19.7177
Hainan	4.1949	6.1300	7.9630
Chongqing	10.4645	18.3536	19.0395
Sichuan	21.2762	32.5951	32.0010
Guizhou	8.9693	13.4143	14.7421
Yunnan	9.3460	16.1153	19.7684
Xizang	1.8741	2.0847	2.9983
Shanxi	15.5603	27.9596	25.7003
Gansu	7.6277	13.3979	12.3489
Qinghai	3.6104	5.2542	6.2775
Ningxia	3.6643	6.7938	7.3393
Xinjiang	10.3259	14.6258	15.7020

IV. SUGGESTIONS

First, accelerate the construction of information infrastructure. The rapid development of the sharing economy depends entirely on the development of the Internet, so the Internet is the basis for the development of the sharing economy. The premise of the rapid spread of the sharing economy in the country is to increase the construction of Internet technology. Only in this way can its status in the national economy be greatly improved. Therefore, the Chinese government should increase fiscal expenditure on informatization construction to ensure the steady development of China's informatization infrastructure. Second, use market mechanisms to accelerate China's network infrastructure construction, increase broadband speed, and reduce Internet access costs. Finally, encourage and support the development of information infrastructure related enterprises.

Second, improve the social environment for the development of the sharing economy. The government should continue to actively create a social atmosphere of the integration of the Internet, the sharing economy and traditional industries, and raise the awareness of the public, especially entrepreneurs, on the importance of "Internet +"; the government should actively emancipate the mind, break industry monopolies, break institutional constraints, and promote The sharing economy is applied to various industries, especially traditional industries such as industry and agriculture. This can not only promote the development of the



sharing economy industry, but also promote the reform and innovation of traditional industries; managers of the tertiary industry should actively promote enterprises and The integration and development of the Internet, upgrading its traditional marketing channels and management methods, taking advantage of the situation, leading to avoid disadvantages, reducing the impact of the Internet, and actively fostering new performance growth points.

Third, strengthen the formulation and improvement of laws and regulations. The Chinese government should gradually improve the construction of laws and regulations related to the sharing economy, fill legal gaps in a timely manner, and provide reliable legal guarantees for the development of the sharing economy industry.

The newly formulated sharing economy system must not only conform to China's basic national conditions, but also be in line with countries around the world, so that the development of the sharing economy in China has a safe and harmonious environment.

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