

Chinese Service Industry Agglomeration Mode Analysis

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Abstract-The objective of this paper is to study the industrial agglomeration of Chinese service industry by the use of various concentration measurement method. First, we examine the overall service industrial agglomeration and that of three geographical agglomeration regions: western, central and eastern regions of China. Additionally, in order to achieve a comprehensive understanding of the agglomeration development of China's service industry, we also measure the concentration degree of subdivided segments of China's service industry. The study concludes that the agglomeration pattern of China's service industry consists of a core area, which consists primarily of eastern China, and spreads gradually to the central and western regions. Ultimately, this paper proposes policy suggestions to Chinese related departments and policy-makers.

Keywords- Industrial Agglomeration; Concentration Measure; Services

I. INTRODUCTION

In today's world economy, industry agglomeration is the trend of industry development, with the goal of promoting economic development. Industry agglomeration can have the following economic effects: knowledge spillover, technology spillover, economies of scale, regional branding, and, regional innovation, among others. This paper studies the mode of the service industry agglomeration as a valuable analytical contribution. The main representatives of early research on industrial agglomeration (e.g., Marshall, Weber, etc.) followed, Krugman (1991a, 1991b), Porter (1990) etc. continue development theory of industry agglomeration, and were done a lot of empirical research, related literature [1-3]. Their important discoveries on economic geography make industry agglomeration the focus of economics once again. Service industry agglomeration has gradually attracted the attention of scholars as an important branch of industry agglomeration. In 1994, Sassen analysed the concentration and diffusion of commercial services in Chicago [4]. Hansen research spillover effect between different industries with India in 1993-1994 input-output table. The analysis results show that service industry agglomeration can produce more economic benefit in comparison to other industries [5].

For the study of service agglomeration mode [6-12], Burges was an early representative (1925). He studied the land use of urban institutions, and built a concentric circle pattern of urban morphology. This model primarily focused on the developed region, which spread outward ring by ring, and promoted the development of service industry agglomeration of surrounding areas. X. E. Hu (2008) studied the producer services agglomeration of China's Yangtze River delta region. The results of his research found that Shanghai's service industry consists of an endogenous structure, Zhejiang's service industry is made up of exogenous structure, and Jiangsu's service industry consists of diversified characteristics.

The objective of this paper is to study the industrial agglomeration of China's service industry by using various concentration measurement method, and to analyze the specific service industry agglomeration models of the western, central and eastern region of China. Additionally, in order to achieve a comprehensive understanding of the agglomeration development of China's service industry, we also measure the concentration degree of subdivided segments of China's service industry. Our conclusions can not contribute to the development of China's service industry, but also promote the development of the theory of service industry mode in China.

II. CONCENTRATION MEASUREMENT METHOD

There are numerous methods to measure industrial concentration, such as: concentration factor, space gini coefficient, location entropy, the hull seaman index, input-output method, factor analysis, and methods of capital stock. Most scholars generally adopt the methods of concentration factor, space gini coefficient, and location entropy.

A. The Coefficient of Concentration

Based on the research of Wagstaff et al., the concentration factor can be expressed by the coefficient of concentration C_{ij} to measure the industry's degree of concentration [13]. Its expression is:

$$CC_{ij} = (e_{ij}/P_j) / (E_{in} / P_n) \quad (1)$$

In Eq. (1), e_{ij} is j th area of the i th industry production value, E_{in} it the region's i th industry output value, P_n is the Chinese population. If the CC_{ij} value is larger, can derive the j region i th industry sector per capita output is higher relative to the whole of China, shows that the j area i th industry concentration degree is higher, the i th industry cluster phenomenon is more obvious, Contrarily, the smaller the j th regional i th industrial agglomeration degree, or without formation of agglomeration phenomenon.

B. Spatial Gini Coefficient

The spatial gini coefficient is primarily used to depict the degree of industry agglomeration. This calculation method is adopted in regard to a certain area in a certain industry, and accounted for the industry employment as a percentage of total employment, and full employment in the region as a percentage of the total employment measure index of an industry's spatial distribution balance. Its spatial gini coefficient G_i is expressed as:

$$G_i = \sum_j^n (S_j - X_j) \left(S_j = \frac{e_{ij}}{E_{in}}, X_j = \frac{E_j}{E_n}, "n" \text{ is the number of regions} \right) \quad (2)$$

In Eq. (2), e_{ij} is j area i th industry employment number, E_{in} is China's i th industry employment number, E_j is j region's number of employees, E_n is overall employment in China. If the greater the G_i value indicates that the j area i th industry agglomeration phenomenon is more obvious. The gini coefficient can describe the industry concentration degree; therefore, many scholars will use this parameter to calculate values of industrial agglomeration.

C. Location Entropy

The location quotient referred to as LQ, is primarily used to depict a regional industry's degree of specialization; different sectors in different regions with a relative degree of specialization reflects regional economic ties between the institutions and the region. The calculation can be expressed as:

$$LQ_{ij} = (e_{ij}/e_j) / (E_i / E) \quad (3)$$

In Eq. (3), LQ_{ij} represents j area i th industry location quotient (industry specialization degree), e_{ij} represents j region i th industry employment, e_j represents j area employment, E_i represents overall Chinese i th industry employment, E represents all Chinese employees. Of course, we can also use out-put value (GDP) or a fixed asset investment to take the place of employment number, here this paper by calculation of GDP. When location entropy $LQ_{ij} > 1$, it indicates that the i th industry has formed agglomeration in the j region. If the greater the LQ_{ij} value indicates that the j area i th industry agglomeration phenomenon is more obvious, has strong industry specialization degree.

D. Hector Fender Index

The index refers to the main body of market competition in an industry sector, or the square sum of the total assets of its proportion of the total. It is a comprehensive measure of industrial concentration index, and can be expressed as:

$$D = \sum_{i=1}^n (E_i)^2 ; E = \frac{E_i}{E_n} \quad (4)$$

In Eq. (4), D is the Hector fender index, E is the i th market share of the enterprise, E_i is the scale of the i th enterprise, E_n is the industry's total market size, n is the total number of enterprises in the industry. When the D value is greater, the industry concentration is higher. When the relative space gini coefficient, Hector fender index of enterprise scale, and regional scale effect are all taken into consideration, this can relatively better reflect the regional industrial agglomeration. However, the data required is higher because of the lack of statistical data. This article does not have the data indices to measure regional service industry agglomeration.

III. CHINA'S SERVICE INDUSTRY AGGLOMERATION MODE

A. Service Industry Agglomeration Measure

This article studies the service industry agglomeration of China, over the years 2003-2011. Data is taken from the China Statistical Yearbook and China Labor Statistical Yearbook. The following Figs. 1-4 illustrate three major industry employment trends of China's eastern, central, and western regions, and employment trends in overall China.

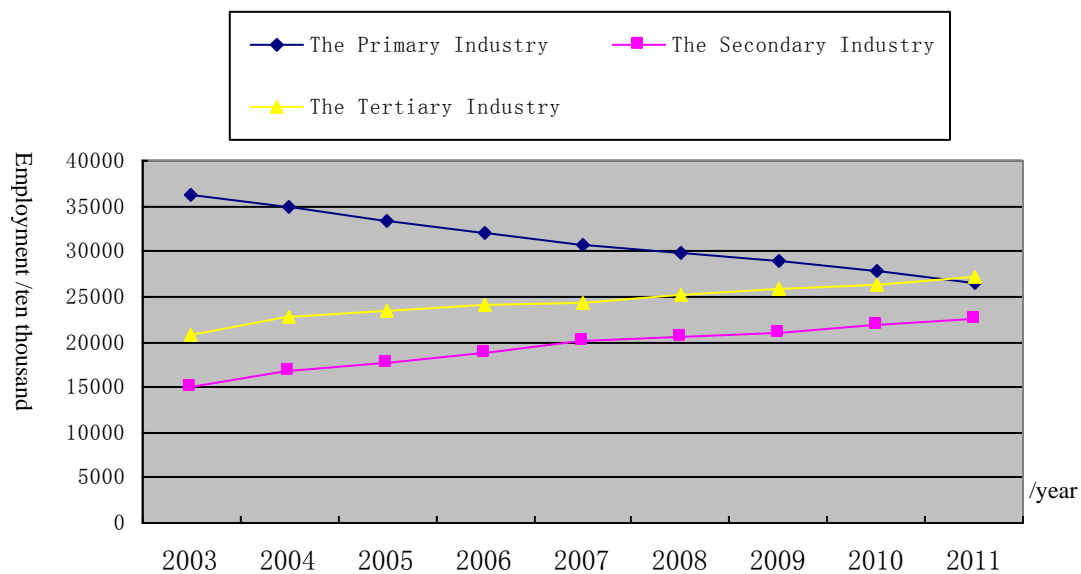


Fig. 1 China's three major industry employment trends

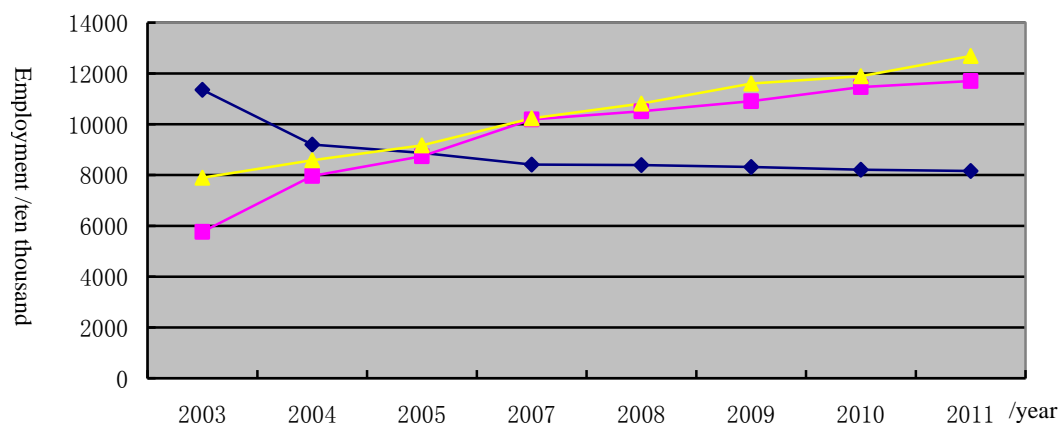


Fig. 2 The eastern region of China, three major industry employment trends

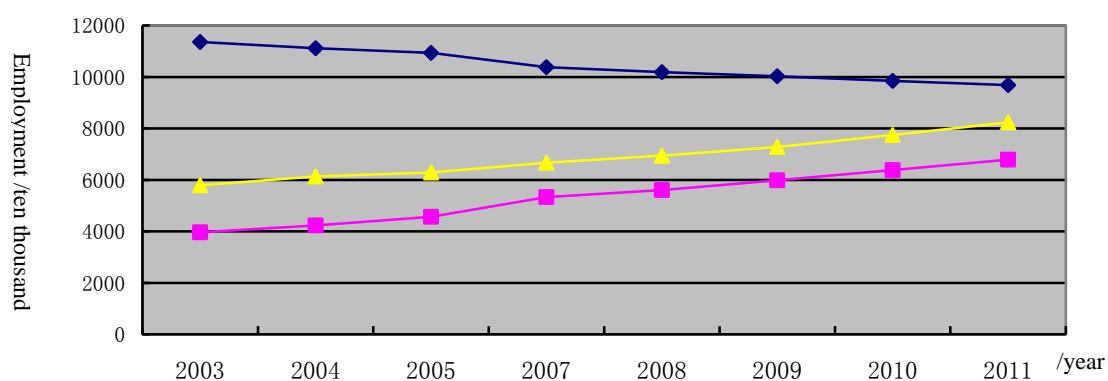


Fig. 3 The central region of China, three major industry employment trends

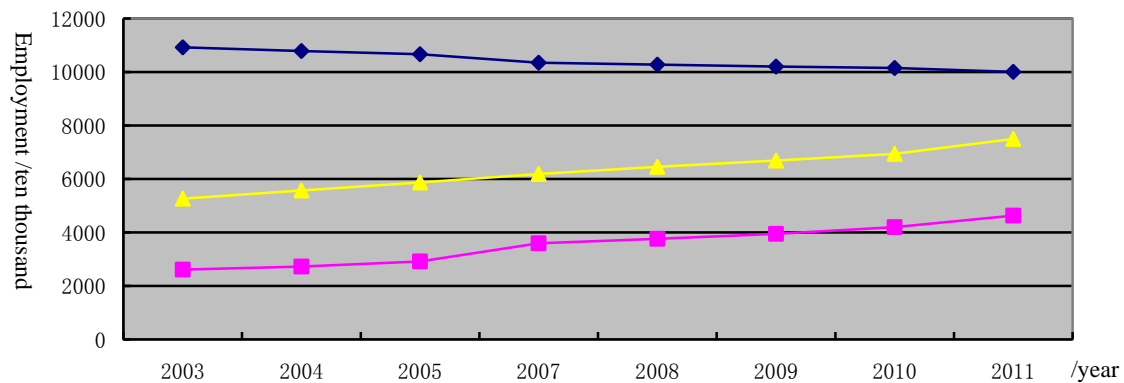


Fig. 4 The western region of China, three major industry employment trends

As shown in Fig. 1, China's secondary and tertiary industry employments are gradually increasing, while primary industry employment is gradually decreasing. Tertiary industry employment surpassed primary industry employment, reaching a maximum in 2011. This demonstrates that the development of China's service industry is very rapid.

As shown in Figs. 2-4, the primary industry employment is gradually declining while the secondary and tertiary industry employments are gradually rising in China's eastern, western and central regions. In the eastern region, after 2005, the secondary and tertiary industry employment surpassed than the number of first industry employment. However, in China's central and western regions, second and tertiary industry employment is lower than the first industry employment, especially in China's western region.

In order to achieve a comprehensive understanding of the agglomeration development of China's service industry, this article analyzed the service industry agglomeration of the western, central and eastern region of China using the location entropy measurement method. Table 1 displays location entropy measurements of China's service industry agglomeration for 31 provinces.

TABLE 1 PROVINCIAL SERVICE INDUSTRY LOCATION QUOTIENT (BY CALCULATION OF GDP)

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Provinces of the Eastern Region of China									
Beijing	1.6066	1.6352	1.7566	1.8071	1.8275	1.8933	1.8372	1.8605	1.8873
Tianjin	1.1861	1.1800	1.0539	1.0246	1.0279	0.9806	1.1012	1.1382	1.1452
Hebei	0.8737	0.8588	0.8455	0.8609	0.8623	0.8585	0.8564	0.8652	0.8585
Liaoning	1.0814	1.1198	1.0065	0.9766	0.9284	0.8924	0.9420	0.9192	0.9107
Shanghai	1.2645	1.3042	1.2823	1.2892	1.3329	1.3870	1.4438	1.4189	1.4402
Jiangsu	0.9564	0.9504	0.9005	0.9241	0.9473	0.9848	0.9621	1.0243	1.0529
Zhejiang	1.0348	1.0622	1.0168	1.0211	1.0321	1.0600	1.0494	1.0779	1.0885
Fujian	1.0206	1.0467	0.9774	0.9955	1.0135	1.0149	1.0036	0.9833	0.9719
Shandong	0.9019	0.8775	0.8128	0.8296	0.8475	0.8624	0.8445	0.9070	0.9501
Guangdong	1.0006	1.0031	1.0901	1.0888	1.0969	1.1096	1.1122	1.1149	1.1236
Hainan	1.0556	1.0808	1.0613	1.0178	1.0319	1.0402	1.1008	1.1442	1.1299
Total average	1.1014								
Provinces of the Central Region of China									
Henan	0.8355	0.8200	0.7633	0.7589	0.7619	0.7402	0.7119	0.7088	0.7362
Hubei	0.9771	0.9913	1.0239	1.0339	1.0672	1.0464	0.9622	0.9390	0.9158
Hunan	1.1014	1.0887	1.0301	1.0387	1.0077	0.9768	1.0063	0.9837	0.9510
Shanxi	0.9050	0.8769	0.9505	0.9263	0.8954	0.8830	0.9543	0.9186	0.8745
Jilin	0.9230	0.9378	0.9920	1.0057	0.9716	0.9829	0.9211	0.8891	0.8638
Heilongjiang	0.8227	0.8017	0.8551	0.8589	0.8806	0.8880	0.9552	0.9225	0.8972

Anhui	0.9583	0.9686	1.0338	1.0245	0.9897	0.9667	0.8852	0.8405	0.8068
Jiangxi	0.9615	0.9265	0.8841	0.8532	0.8082	0.7998	0.8379	0.8180	0.8313
Total average	0.9129								
Provinces of the Western Region of China									
Chongqing	1.0862	1.0765	1.1152	1.1421	1.0749	1.0589	0.9217	0.9004	0.898
Sichuan	0.9859	1.0275	0.9757	0.9639	0.9247	0.8991	0.8936	0.8692	0.8276
Guizhou	0.9205	0.9298	1.0057	1.0140	1.0607	1.0676	1.1724	1.1717	1.2102
Yunnan	0.9453	0.9586	1.0023	0.9822	0.9907	1.0104	0.9934	0.9917	1.0327
Xizang	1.3561	1.4249	1.4121	1.4012	1.3989	1.4340	1.3274	1.3414	1.3210
Shanxi	1.0280	1.0129	0.9610	0.8984	0.8852	0.8509	0.9360	0.9026	0.8637
Gansu	0.9207	0.9079	1.0342	1.0076	0.9729	1.0105	0.9789	0.9236	0.9705
Qinghai	1.0685	1.0583	0.9976	0.9564	0.9137	0.8778	0.8966	0.8637	0.8023
Ningxia	0.9333	0.9223	1.0595	1.0089	0.9679	0.9348	1.0133	1.0298	1.0172
Xinjiang	0.9281	0.9233	0.9066	0.8855	0.8972	0.8766	0.9030	0.8048	0.8427
Neimenggu	0.9178	0.8778	0.9995	0.9650	0.905	0.8604	0.9232	0.8932	0.8666
Guangxi	1.0254	1.0018	1.03	1.0120	0.9743	0.9659	0.9151	0.8756	0.8463
Total average	0.9975								

As shown in Table 1, a location entropy $LQ_{ij} > 1$ is mainly present in provinces concentrated in the eastern region, but were relatively less in the central and eastern regions. Among them, the eastern region's Beijing has the highest location entropy, followed by Shanghai, and Tianjin. Although in Jiangsu and Zhejiang, services have reached a concentration relative to the western region, the development of service industry agglomeration is still smaller relative to Beijing and Shanghai. This illustrates that the agglomeration of China's service industry consists of a core area which contains mainly eastern China, while the central and western regions are more gradually forming an agglomeration phenomenon. The eastern Chinese service industry also has a very large developmental space.

However, the location quotient method cannot fully reflect China's service industry agglomeration situation, because China's service industry consists of 14 subdivided segments. Even if the service industry didn't reach a certain level of agglomeration as a whole but enough subdivided segments of service industry had reached the agglomeration level, it is dominant in China.

In order to comprehensively study Chinese service industry agglomeration, this paper analyze the service industry agglomeration of the western, central and eastern regions of China, using the gini coefficient method. Figs. 5-8 show China's overall services gini coefficient trend as well as the trend in the eastern, central and western regions from 2003 to 2011.

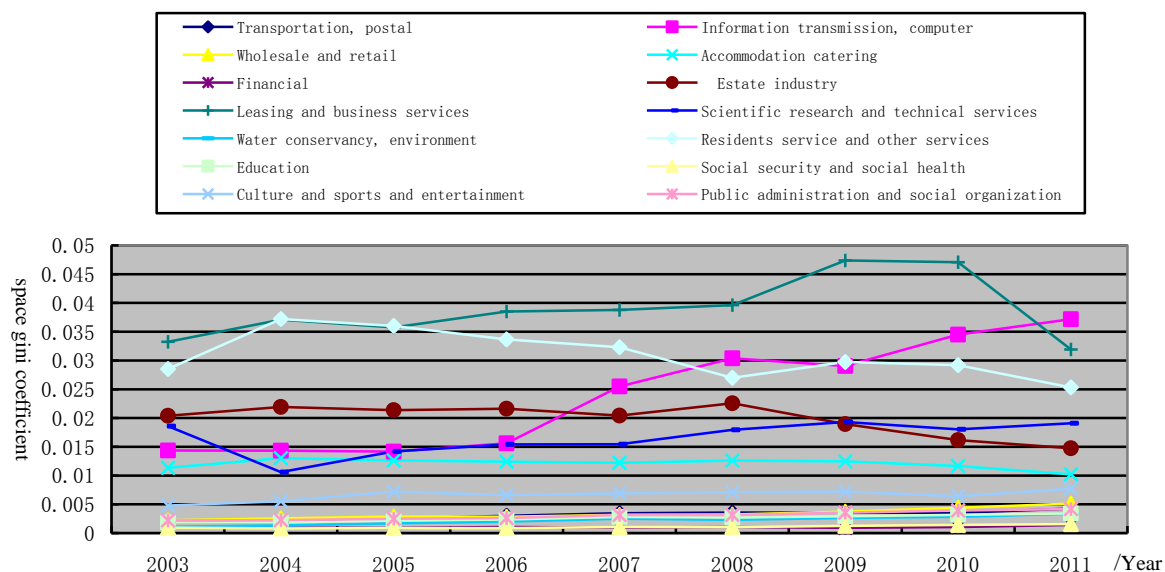


Fig. 5 China's spatial gini coefficient of 14 services

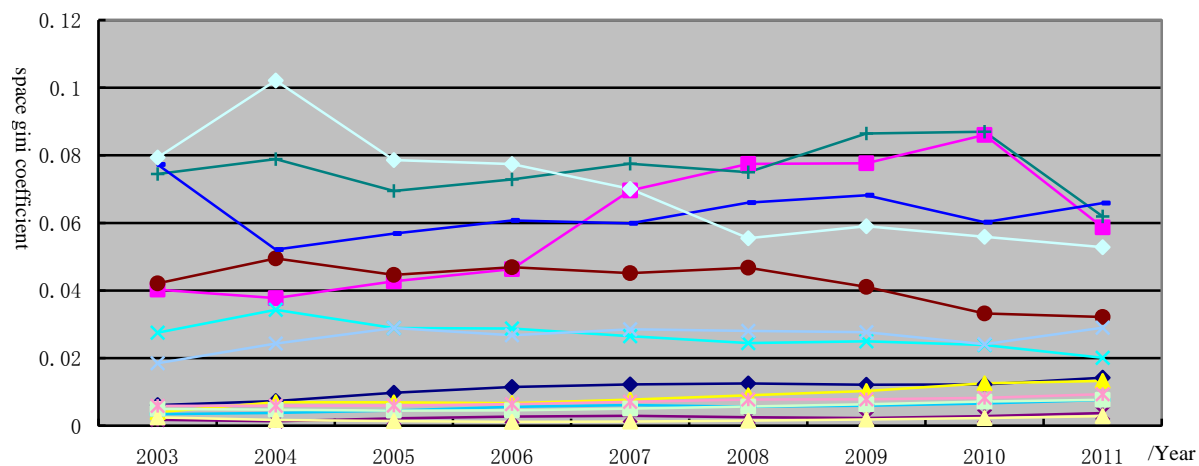


Fig. 6 Spatial gini coefficient of 14 kinds of services in the eastern region of China

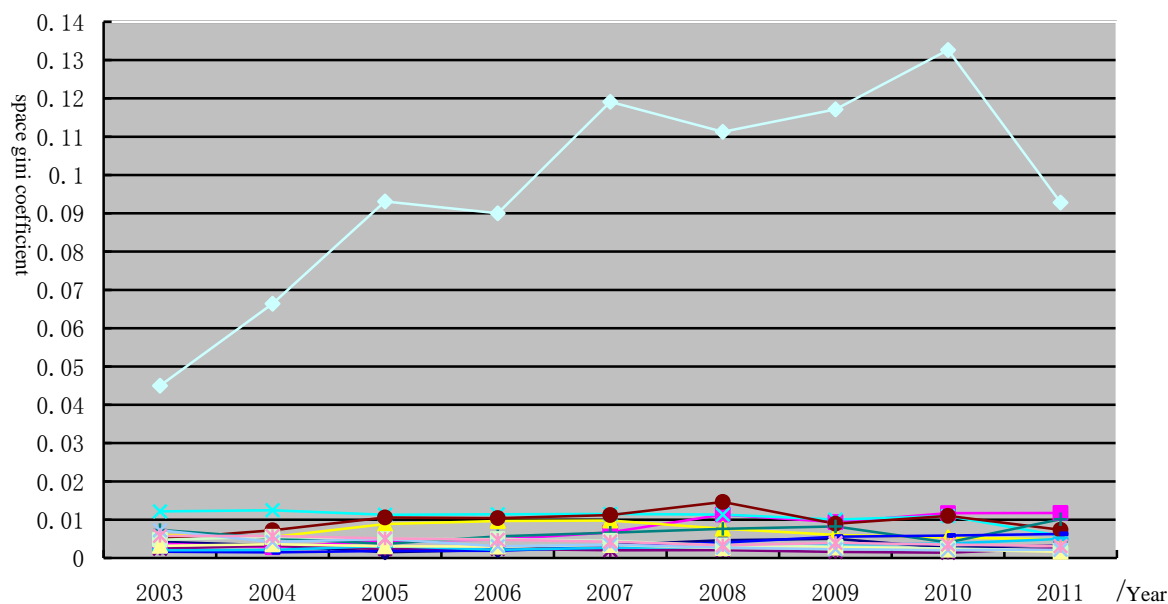


Fig. 7 Spatial gini coefficient of 14 kinds of services in the central region of China

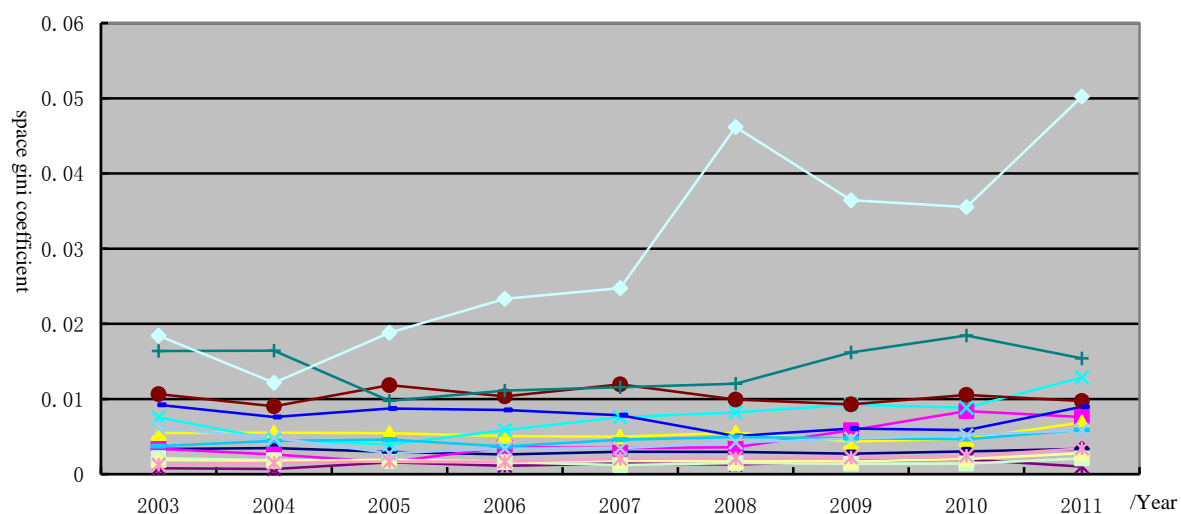


Fig. 8 Spatial gini coefficient of 14 kinds of services in the western region of China

As shown in Fig. 5, we found that the gini coefficient of Chinese industry is relatively high in the industries of information transmission, computer services and software, leasing and business services, residents service and other services. The next highest industries were real estate, scientific research, technical services and geological prospecting, and the accommodation and catering industries. The rest of the services in the subdivided industry displayed relatively low spatial gini coefficients. Additionally, we can also found that some of them industry spatial gini coefficients showed a rising trend, while some demonstrated a decline. Among the industries with the higher spatial gini coefficients, we found rising trends in the industries of information transmission, computer services and software, as well as scientific research, technical services and the geological prospecting industry. In particular the information transmission, computer services and software industries demonstrated large spikes in 2011, when many industries reached their highest point. Unfortunately, we found that the spatial gini coefficient presents a tendency of decline in the residents service, other services, and real estate industries.

As shown in Figs. 6-8, we found that some spatial gini coefficients of the subdivided service industries hovered between 0.06 and 0.09 in eastern China, particularly in information transmission and computer services, scientific research and technical service. However, in the central and western regions, we found only the residents service and other services space gini coefficients to be at a relatively high level; the rest of the industry space gini coefficients remain between 0 and 0.01. This shows that the development of China's service industry in the central and western regions is opposite to developments in the eastern region, indicating that the eastern region is an important part of China's service industry development.

Finally, as shown in Figs. 5-8, in the spatial gini coefficient analysis of 14 kinds of services, we also found that only Figs. 5 and 6 remain similar, indicating only the eastern part of China and the overall Chinese service industry agglomeration is similar. This shows that China's service industry agglomeration consists of a core area, which is primarily eastern China.

B. Agglomeration Mode Analysis

Due to the defects of the data, we analyzed the service industry agglomeration of the western, central and eastern region of China only using the gini coefficient and location quotient method. According to previous literature, the industry agglomeration model can be divided into these categories: CBD as the core of the concentric circles agglomeration mode, related industries with service agglomeration mode, and the service outsourcing model of agglomeration. We found that the development of China's service industry has already formed the agglomeration phenomenon, mainly in the eastern region. The conclusion is that China's service industry agglomeration consists of a core area, which contains mainly eastern China, and spreads gradually to the central and western regions.

In this paper, according to the distribution characteristics of China's service industry agglomeration, we found that China's service industry agglomeration mode are mainly composed of CBD concentric circles agglomeration mode, with simultaneous various cluster modes. The CBD as the core of the concentric circles type cluster model framework roughly indicates that: China's eastern conditions are ripe to form service industry agglomeration phenomenon, which subsequently stimulates the development of nearby industry. This agglomeration of industries, according to the shape of concentric circles, gradually spread to the western and central parts of China. Of course, this agglomeration mode must meet certain conditions, such as the concentration of the external environment, the government's related system implementation, the development of related industries, and urban management ability. Additionally, the formation and development of the agglomeration model is highly dependent on the eastern region, necessitating China's eastern region to have a strong economic foundation, a large amount of high-tech talent, an optimized industrial structure, a good environment, as well as urbanization and modern information. In the eastern region of China, where Shanghai, Beijing and other places fully meet the conditions, it is entirely possible to develop the agglomeration mode.

We examined the overall Chinese service industrial agglomeration, and also that of three geographical agglomeration regions: the western, central and eastern regions of China. We also measure the concentration degree of subdivided segments of China's service industry. The conclusion is that the agglomeration pattern of China's service industry consists of a core area, which contains mainly eastern China, which spreads gradually into the central and western regions.

IV. POLICY SUGGESTIONS

This paper examined the overall Chinese service industrial agglomeration, and also that of three geographical agglomeration regions: the western, central and eastern regions of China. We also measure the concentration degree of subdivided segments of China's service industry. The conclusion is that the agglomeration pattern of China's service industry consists of a core area, which contains mainly eastern China, which spreads gradually into the central and western regions. The eastern region therefore plays a leading role in the development of the central and western regions.

At present, China is in a transitional period of industrial structure; the middle and west of China is behind eastern China in industry development, so the relevant department must pay special attention to the timing, striving to increase the cohesion of the service industry as the engine of economic growth. The idea is narrow, for service industry agglomeration only affects the service itself. According to the previous scholarship by H. J Li, studies have shown that the service industry can promote the development of manufacturing industry agglomeration; of course, the manufacturing cluster development will in turn affect the cluster development of the service industry, to promote each other under certain conditions. However, the studies have shown

that realization of the mutual promotion of the relationship between the industries needs a related department to create and establish relevant policies [14].

According to the Zhi-xian Chai, research proves that the specialization of agglomeration needs and diversified agglomeration integration can better promote the growth of the economy [15]. In first part of this study, we found that the service industry agglomeration of the eastern region is a diversified agglomeration, rather than a single service industry agglomeration. Their concentration degrees are close to each other, particularly in information transmission, computer services and software, leasing and business services, residents service and other services, the real estate industry, scientific research, technical services and geological prospecting industry, and the accommodation and catering industry. However, we found that service industry agglomeration is monotonous in China's western region, with only residents service and other service industries with high agglomeration degrees; other service industry agglomeration degrees are small. This shows the development of a service industry imbalance in western and central of China. In order to maintain the stability, health, and growth of the economies of the central and western regions, relevant departments should take corresponding measures to encourage the eastern region of China's service industry to spread to western and central of China, to ensure the diversified development of the service industry. The industry agglomeration mode has core competencies, which can strongly support the development of regional industry.

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