

Relationship Between Producer Services Developing Level and Urban Hierarchy —A Case Study of Zhujiang River Delta

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Abstract: As the Central Place Theory indicates, the centricity of a central city can influence the extension of its service. Since the service industry in the theory is mostly consumer services, it is worth studying the relationship between the producer services and the centricity of the city in the service society with producer services becoming a more important part of the service industry. The paper takes the case of the Zhujiang (Pearl) River Delta (PRD), a developed region in China, to study the relationship between the developing level of producer services and the urban hierarchy. Based on the analysis about the spatial difference of the producer services in the nine cities of the PRD, and the division of the nine cities according to some economic indices, it is shown that there is a correlation between the developing level of producer services and the urban hierarchy. Furthermore, two deductions about the future status of the producer services in the city and the location of the producer services in a large region can be made from this correlation between the developing level of producer services and the urban hierarchy.

Keywords: producer services; urban hierarchy; correlativity; Zhujiang (Pearl) River Delta (PRD)

1 Introduction

As Christaller put forward in the Central Place Theory in the 1930s, the hierarchy of central cities was mainly divided by the extent to which they provided goods and service to the hinterland, and the centricity would affect the service extension directly—the higher the centricity, the larger the service area (Zhang, 2000; Zhou et al., 2001). This means that the developing level of the service industry correlates closely with the centricity of the city. However, the service industry mentioned in the Central Place Theory mainly referred to consumer services. Since then the producer services, a part of the service industry system, have played a larger and larger role in the national economies of Western countries and become the part impacting the regional development most deeply, having started their rapid growth in the 1970s and continuing on until today (Coffey and Polese, 1989). It thus becomes important to study the relation

between the development of producer services and the centricity of the city in this new service economy stage, and it will also be useful for advancing the Central Place Theory under the new background.

The higher the developed level of the producer services, the stronger the service function of the city that the producer services belong to, which also means the stronger the centricity of the city. Therefore, studying the relation between producer services and the hierarchy of the city that they situated in, will help to analyze the orientation of producer services in varied hierarchical city, and provide suggestions for the location of the producer services within the region. This article studied the relation between the producer services and the hierarchy of the cities in the Zhujiang (Pearl) River Delta (PRD), in which they situated, then deduced two implications about the location and development of producer services in China.

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According to the division of producer services in the Western countries, the need of the research, the statistical data available, and the classification of the service industry in the census and statistic yearbooks in China, the producer services in this paper include finance, insurance, real estate (FIRE) services, information consultant services, computer application services, and scientific research and technological services .

2 Status of Producer Services in Zhujiang River Delta

It has been proved that there was a close correlation between the developing level of producer services and national economy in China (Zhong and Yan, 2003). The

good developing conditions in the PRD provide a nice base for the development of producer services there.

Because the production values of the information consultant services and the computer application services have not been counted independently in most of the statistic books in China, the paper will take the number of employees as an index to reflect the developing status of producer services in the PRD. Although the divisions of the industries in the Fourth Census (1990) and First National Economic Census (2004) were a little bit inconsistent, whose absolute value of the producer services in these two censuses can not be compared directly, the change of the producer services in the PRD, Guangdong Province and China can still be seen in those 14 years via the proportion of the employees and the location quotient (Table 1).

Table 1 Developing level of producer services in PRD, Guangdong Province and China in 1990 and 2004

	PRD		Guangdong Province		China	
	1990	2004	1990	2004	1990	2004
Employee in producer services (person)	151476	1982897	248038	2279079	4194691	17297900
Proportion in whole workforce (%)	1.22	10.83	0.74	9.81	0.65	8.14
Proportion in tertiary industry (%)	5.05	39.12	4.23	29.64	5.07	21.52
Location quotient	1.88	1.33	1.14	1.21	-	-

Note: The producer services in the census of 1990 including finance, insurance, real estate, consultant services, and scientific research and technological services, while those of 2004 refer to information transfer, computer services and software industry, financial services, real estate, business services and scientific research & technological services

Sources: National Bureau of Statistics of China, 1992; 2006; OINECGP, 2006

From the proportion of the producer services' employees to the whole workforce, the producer services have shown great growth in the PRD, Guangdong Province and whole China in those last 14 years, with the greatest growth in the PRD, up from 1.22% to 10.83%. Comparing the growth in the proportion of the producer services' employees to the whole workforce in the PRD, the proportion of producer services' employees in the tertiary industry grew much greater (34.07%). While the number in Guangdong Province rose 25.41%, and that of Chinese average just rose 16.45%. It shows that the producer services in the PRD not only enlarged the scale of the employment and occupied a certain status in the tertiary industry in the past 14 years, but also took a leading status in the development of the tertiary industry

in the PRD.

From the location quotient, it can be seen that the location quotient of producer services in the PRD was always higher than that of Guangdong Province in the 14 years, which were both higher than 1 in those two regions. It is obvious that the promoting role of producer services to the regional development has strengthened in those two regions, and the base for exporting producer services in the PRD was better than the average of Guangdong Province.

In sum, the developing level of producer services in the PRD was higher than that of Guangdong Province and Chinese average as well as the developing speed was always faster all along, showing the effect of producer services as the basic economic activity.

The paper takes the Fifth Census as the main statistics to do comparison research of all Zhujiang River Delta cities' producer services, while economic census statistics are adopted in the paper for the analysis of producer services overall development in the Zhujiang River Delta, Guangdong and whole China, due to the unavailable presence of "Economic Census Yearbook 2004" in cities of the Zhujiang River Delta. In the meantime, the paper will take the industry category standard used in the 5th Census to define the producer services for the comparison of all cities' producer services in the Zhujiang River Delta, though there was new standard set in 2003. The choice will not impact on the final result.

Moreover, as to the accelerating pace, it can be said that the exporting capability of producer services in the PRD was stronger than that in Guangdong Province. However, as to the employees of the industry, the proportion of producer services in the whole workforce was still limited, though the proportion of the PRD was more than that of Guangdong Province and Chinese average. Hence, it can be seen that, as a new industry, the producer services are still in the primary stage of the development in the PRD, but the developing tendency here

is better than that in Guangdong Province and the whole China.

3 Spatial Disparity of Producer Services in Zhujiang River Delta

Although the producer services of the nine cities in the PRD are still of a relatively limited scale and not a high level, the developmental level here is higher than the average of Guangdong Province (Fig. 1, Fig. 2).

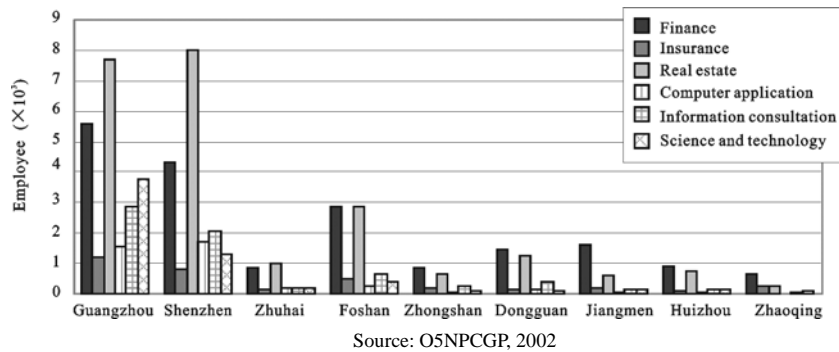
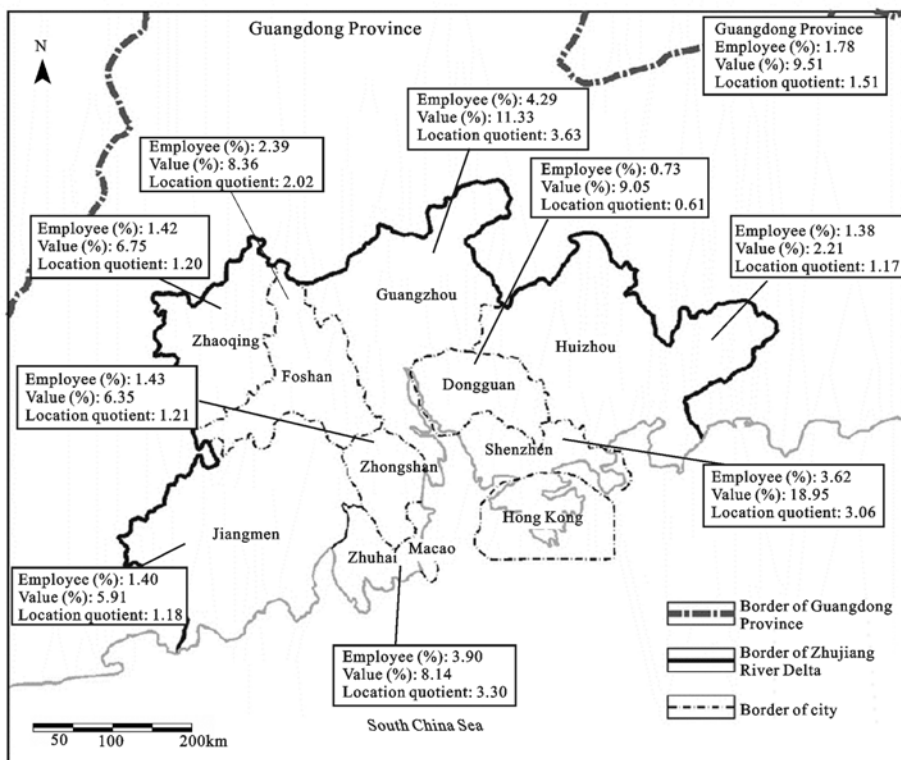


Fig. 1 Comparison of each sector of producer services in each city of PRD, 2000



Employee (%) refers to employee proportion of producer services in local whole employment;
 Value (%) refers to production value proportion of producer services in local GDP;
 Producer services include finance, insurance, real estate services, scientific research and technological services

Sources: National Bureau of Statistics of China, 1992; 2002; O4NPCGP, 1992; O5NPCGP, 2002

Fig. 2 Comparison of producer services development in PRD, 2000

3.1 Comparison of employee scale

According to the census in 2000, there were 22,655 persons employed in Guangzhou producer services, which was 4.29% of total employees of the city. The number and the proportion of producer services' employees in Guangzhou was the highest in the PRD. While the producer services' employees of Shenzhen came in next place to Guangzhou in the region, with 18,231. The two cities accounted for 65.26% of the employees producer services in the PRD. The producer services' employees of the other seven cities in the PRD were much fewer than that of Guangzhou, among which Foshan had 7514 employees, while the rest six cities were all less than 4000.

The employee proportion of producer services in Zhuhai (3.90%) was a little higher than that of Shenzhen (3.62%). Although this proportion was in the third place in PRD, the number of producer services' employees in Zhuhai was just the sixth place in the region. On the one hand, it is because the employees in Shenzhen were more than that in Zhuhai; on the other hand, it shows the character of industrial structure in Zhuhai, namely manufacturing is relatively weak in the local economic system.

The employee proportion of producer services in Zhongshan, Dongguan, Jiangmen, Huizhou, Zhaoqing were all lower than the average of Guangdong (1.78%). The manufacturing in Dongguan and Zhongshan developed rapidly after the Reform and Open-up, so a lot of labor-intensive industries still concentrated there, which made the number of employees in manufacturing occupy a large proportion, though there was some industrial diffusion with labor-intensive industries in the recent years. Especially in Dongguan, the employees of manufacturing accounted for 75.56%, while the proportion in producer services was just 0.74%. Therefore, although the number of producer services' employees in Dongguan was in the fourth place in the PRD, behind Guangzhou, Shenzhen and Foshan, the proportion of the producer services in the local whole employees there was just at the bottom of the nine cities in the PRD.

3.2 Comparison of location quotient

When the location quotient value becomes higher than 1, there are basic economic activities in a department. The higher the value, the better the export capacity of the department, and the stronger the economic growth driving ability (Xu et al., 1997). Except for Dongguan, the

location quotients of producer services in the rest of the eight cities of the PRD were all larger than 1, which shows that the producer services in them were all playing a role as basic economic activities in the city.

The location quotient of producer services in Guangzhou was the highest one in the PRD (3.62), showing that the industry in this central city possesses the character as an exporting service.

3.3 Analysis of production value

For the statistic reasons, the production value of producer services in Fig. 2 just includes FIRE services and scientific research and technological services, which means the accounting will be lower than the reality. The proportions of producer services in the local GDP of Guangzhou and Shenzhen were in the first two places in the PRD in 2000, which were 11.33% and 18.95% respectively. Since the GDPs in those two cities were also in the first two places in Guangdong Province, the producer services' production value of them was in the first two places in the region. And the information consultant services and the computer application services in these two cities were most developed within the region, which means the contribution of producer services to the local economy in those two cities would be much higher than those in the other cities in the PRD, if those two sectors were included.

In sum, the scale of the producer services in Guangzhou was the largest in the PRD, while the economic benefit of producer services was most obvious in Shenzhen, and the proportion of producer services in production value there was the highest in the region, which shows the producer services of these two cities were most mature in the PRD. As to Zhuhai, its absolute value of employee scale and production value of producer services were not at a high level, but the relative values not low. It was related to the fact that the manufacturing in Zhuhai developed at a relatively low speed after the Reform and Open-up, the tertiary industry was taken as an orientation for the economic development, while high-tech was regarded as the dominant industry. The scale and economic benefit of producer services in Foshan were both in the third place in the PRD. The producer services there were more developed than those in Dongguan, Zhongshan, Zhuhai, Jiangmen, Huizhou and Zhaoqing, but still not in the same developed class as Guangzhou and Shenzhen. As to Dongguan, the em-

employee proportion of producer services in the workforce was the lowest in the PRD, because the city was established as a manufacturing city. Its relative economic benefit of producer services was not low, which shows that labor efficiency of producer services there was relatively high. But the location quotient of producer services less than 1 shows that the services of the city were mainly for local consumption. The employee scales of producer services in Zhaoqing, Huizhou and Zhongshan were the smallest in the PRD, where producer services all possessed the function of basic economic activity sectors, but their contributions to the local development were limited.

3.4 Classification of producer services hierarchy

Based on the comparison of the three indices: employee, production value and location quotient, it shows that, as to the developing level of the industries in each city of the PRD and the developing potential of the new industries, the producer services in Guangzhou were at the highest developing level and with the strongest developing potential in the PRD. According to the overseas studies, the producer services are mainly concentrated in the metropolis, especially in the developed and central big cities (Coffey, 2000). As the capital city of Guangdong Province, which is one of the most developed province in China, Guangzhou possesses the producer services with obvious function of basic economic activity, which means the industries have a good basic for exportation. Though the producer services in Guangzhou are less developed than those in Hong Kong, the metropolis which is so closed to Guangzhou, the status of Guangzhou as central city has not been weakened by Hong Kong for various reasons (Zhong and Yan, 2006). Moreover, the developing speed and predominance of the producer services in Guangzhou are obvious, and the computer application services in Guangzhou are much more developed than that in most cities of the PRD. It shows that the developing speed of new industry in the capital city is obviously faster than that in the peripheral cities, all of which are in the primary stage, and only the status of producer services in Shenzhen can compare with that in Guangzhou.

It can be seen that the developing levels of producer services among the cities in the PRD are quite different. According to the analysis above, the producer services of

the nine cities in PRD can be divided into three classes. The first class includes Guangzhou and Shenzhen, which possess the most mature producer services in this region and whose employee scale of producer services are much bigger than that in other cities in the PRD. The second class includes Foshan, whose employee scale of producer services is the third in the PRD. Comparing with the cities in the first class, the information consultant services, computer application services, and scientific research and technological services in Foshan are still in a small scale. But the sum of employee for those three sectors is also the third in the PRD. The third class includes the other six cities in the PRD, which are Zhuhai, Dongguan, Zhongshan, Jiangmen, Huizhou and Zhaoqing. Though the relative values of producer services of some cities in this class are not low, the absolute values show that their scales of the industry in this class are still in a very small scale at present.

Clustering Analysis can be used to verify the conclusion drawn from the data analysis mentioned above. Because the data of information consultant services and computer application services are not available in the statistical yearbooks, the production value of the rest three sectors of producer services were taken as the only index which will affect the result of the analysis, and the amount of employees and location quotient of producer services in 2000 are employed as two indices for the Quick Clustering to classify the nine cities in PRD into three classes by their producer services' developing level. The result of the SPSS analysis is the same as that got from the data analysis.

4 Urban Hierarchy System in Zhujiang River Delta

The urban scale is usually expressed by the scale of population or land, while the first one will be used more often since the data are easier to be obtained (Xu et al., 1997). The paper will take the scale of population and the level of economic development of the nine cities in the PRD as the standards to classify the urban hierarchy. Eight indices are used in the analysis, including GDP, Per capita GDP, industrial output value, total population (year-end), total number of employee (year-end), total retail sales of consumer goods and total investment in fixed assets of 2002, and turnover volume of freight

The data of Huizhou and Zhaoqing are the data of their parts in the PRD

traffic of 2001. Firstly, the indices are used in the Factor Analysis, and then the component score variances got from it are used in the Clustering Analysis, finally, the nine cities in the PRD are sorted into three classes.

The results of Factor Analysis are showed in Table 2 and Table 3. After picking up the common factor by the Principal Component Analysis, only two factors' eigenvalues are higher than 1, while the eigenvalue of the

first factor occupies 79.28% of the total, and the squared loadings of the first two factors occupies 94.08% of the total. Thus, based on the initial analysis, it can be seen that the first two factors can take on most characters of all the indices, which means the first two factors can explain 94.08% of sums of squared loadings, and can be used as the principle components for this Factor Analysis (Table 2).

Table 2 Analysis of factor variance

Component	Initial eigenvalue			Extraction sum of squared loading			Rotation sum of squared loading		
	Total	Variance (%)	Cumulative (%)	Total	Variance (%)	Cumulative (%)	Total	Variance (%)	Cumulative (%)
1	6.343	79.284	79.284	6.343	79.284	79.284	5.974	74.681	74.681
2	1.183	14.793	94.076	1.183	14.793	94.076	1.552	19.396	94.076
3	0.383	4.783	98.859						
4	0.044	0.552	99.411						
5	0.035	0.441	99.852						
6	0.011	0.142	99.995						
7	0	0.005	100.000						
8	1.028E-05	0	100.000						

Note: Extraction method is Principal Component Analysis

The matrix of factor loading can reflect the relation between the first two factors and the original variances (Table 3).

Table 3 Matrix of factor loading

	Component	
	1	2
Total population in 2002 (year-end)	0.886	-0.430
Total number of employees in 2002 (year-end)	0.955	-0.268
GDP in 2002	0.993	0.074
Per capita GDP in 2002	0.354	0.928
Industrial output value in 2002	0.907	0.184
Total retail sales of consumer goods in 2002	0.990	0.011
Total investment in fixed assets in 2002	0.980	0.133
Turnover volume of freight traffic in 2001	0.878	-0.084

Note: Extraction method is Principal Component Analysis
Source: National Bureau of Statistics of China, 2006

Once getting the value of the component score variances, Clustering Analysis can be done by using the variances as indices.

Taking the two factors got from the Factor Analysis as the indices for the clustering analysis, and using the Quick Clustering as method, the nine cities in the PRD can be sorted into three classes according to the diversity of the urban hierarchy. The result shows that Guangzhou

and Shenzhen can be sorted into the first class; Zhuhai, Foshan, Dongguan and Zhongshan, which also located in the core of PRD, can be sorted into the second class; and Huizhou, Zhaoqing and Jiangmen, three cities in the periphery, can be sorted into the third class.

The result of the cluster analysis is in accord with the fact: the developing levels of Guangzhou and Shenzhen are the highest in the PRD, so the urban hierarchies of them are the highest in the region; the core area of the PRD is composed of six cities, besides Guangzhou and Shenzhen, the remaining four cities, Zhuhai, Foshan, Dongguan and Zhongshan, have better economic strength than the three cities in the periphery.

However, the quantitative analysis neglects some factors that are hard to be quantified, so, the empirical knowledge for the region should be used to modify the result. For example, after the adjustment of the administration district, "the third large city in Guangdong Province" was set as the development target for Foshan. Thus, the urban hierarchy of Foshan is a little bit higher than the other three cities in the class. Moreover, Guangzhou and Shenzhen will be all in the highest hierarchy of the urban system in the PRD if just relying on the economic development standard, but, actually, Guangzhou is in a higher hierarchy by considering its political status as the capital

city of the province.

5 Relativity between Urban Hierarchy and Development Level of Producer Services

The empirical studies in Western countries have pointed out the imbalance spatial location of producer services (Forstall and Greene, 1997; Coffey, 1995). General speaking, the advanced producer services tend to concentrate in the high hierarchy cities, though there is decentralization of producer services in some areas (Coffey, 2000). According to the comparison of the present developing level of producer services in the nine cities in the PRD, the paper tries to explore that if the discipline for the development of producer services in PRD is consistent with that in Western counties, namely, if the developing level of producer services relates to the hierarchy of the city where they are located.

Based on the result gained from the Clustering Analysis of the urban hierarchy and the developing level of producer services, the two outcomes are quite similar: no matter divided by the urban scale and the economic

developing level, or by the developing level of producer services, Guangzhou and Shenzhen are sorted into the same class, the first class; as the orientation of “the third large city of Guangdong Province”, the urban hierarchy of Foshan is different from the other three cities in the class, so, as to the developing level of producer services, Foshan can be put into a single class beyond other six cities, no matter by the qualitative analysis or the quantitative analysis.

Hence, based on the result of clustering analysis by the urban hierarchy and the developing level of producer services, it can be proved that there is relation between urban hierarchy and developing level of producer services to a certain extent. Since the paper uses the economic developing level as the main index for the division of urban hierarchy, that is to say, the developing level of producer services in each city of the PRD has relationship with the economic development of the city (Table 4). Though the indices for the Clustering Analysis are somewhat subjective, it could be remedied to a certain extent by the qualitative analysis of the statistic data.

Table 4 Classification result of Clustering Analysis by two standards

	By urban hierarchy and developing level of local economy	By developing level of producer services
First class	Guangzhou, Shenzhen	Guangzhou, Shenzhen
Second class	Foshan, Zhuhai, Zhongshan, Dongguan	Foshan
Third class	Huizhou, Zhaoqing, Jiangmen	Zhuhai, Zhongshan, Dongguan, Huizhou, Zhaoqing, Jiangmen

6 Conclusions

Because the development and location of the industry and the urban system could be interacted, and the urban scale could affect the urban function (Gu, 1999), based on the relativity between the developing level of producer services and urban hierarchy, the paper gets two deductions for the producer services' location in China:

(1) The central city of the region is the most suitable place to develop producer services preferentially. From the conclusion of the correlativity between the developing level of producer services and the urban hierarchy, we can give an answer to the questions such as where is the place that is most suitable for the development of producer services in China, namely how to choose the location for the producer services in the region. At present, the city with large scale, nice service industry, convenient external transportation system, mature ma-

nufacturing, abundant economic base, and as the central city of the region, is the most suitable place for the development of producer services in China.

This judgment accords with the conclusion that pointed out in the western studies, which refers that the producer services concentrate mainly in the metropolis, especially in the developed central city.

(2) The producer services would be able to become a new economic driving force in the central city. Corresponding to the various resources, the developing patterns for the original development in varied countries and regions will be different: some will depend on the internal resources, while the others will depend on external resources; some will develop manufacturing prior to agriculture; some will take the exportation strategy, etc. (Hao and An, 1999). Along with the coming of the service economy, it can be said that the service economy pattern will become a new growth pattern. In some

western countries and regions with developed service industry, the service industry has become the dominant industry of the city.

At the same time, the status of the central city should correspond with the function of the central city, while the service function is the function that can embody the central status best. As a part of the service industry that can promote the regional development most strongly, producer service becomes one of the main functions that the central city should have.

Therefore, a further conclusion can be drawn that under the service economy, an attitude should be established that the producer services should be developed as a dominant industry in the central cities of China, namely, the producer services could be established as the driving force for the urban development.

Overall, the paper puts forward the relation between the development of producer services and the central city, aiming to emphasize that a certain region should form a producer services center, and the best location for the center is the central city of the region. The issue about the hierarchy of the "central city" deserves further study and the two deductions of the paper should be proved in more detail.

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