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# Research on the Influencing Factors of Producer Services Agglomeration
## —Based on the Yangtze River Delta Urban Group

**Chunmei Ye**

School of Business, Nanjing Normal University, Nanjing, China
Email: chunmeiye@foxmail.com

## Abstract

Based on the panel data of 16 cities between 2003 and 2018 in China City Statistical Yearbook, this paper analyses the current situation and the influencing factors of Producer Services Agglomeration in the Yangtze River Delta. The research adopts spatial econometric methods with spatial weight matrix. The empirical result shows that the agglomeration trend of producer services in Yangtze River Delta is obvious, and the spatial agglomeration pattern is gradually formed. Opening degree and human capital have positive impacts on producer services agglomeration. The agglomeration is negative. And city scale has no effect on the agglomeration. At last, the paper puts forward some suggestions to improve the level of producer services agglomeration in the Yangtze River Delta.

## 1. Introduction

As the high-end industry types in the value chain, producer services are of great importance to promote China's economic quality development. In the development process, producer services have the characters of industrial agglomeration. As the representative of industrial agglomeration, gathering centers like Singapore Science Park, Shanghai World Financial Center, Hangzhou and Ningbo International Shipping Service Center develop rapidly in recent years. Conceptually, the agglomeration of productive services refers to the fact that producer services companies are linked together and concentrated in specific geographical

areas because of their commonality and complementarity. The performance is manifested in two aspects. At the industry level, the producer service industry is unevenly distributed across the country. At the regional level, the producer service industry is concentrated in specific regions. Domestic and overseas scholars have found that the external effects [1] and the scale effect have brought a positive impact on the regional development pattern and economic growth. Mukesh *et al.* suggested that productive service industry agglomeration would promote regional economic development by improving the investment environment and strengthening technical exchanges [2]. Chen Jianjun considered that producer services agglomeration make economic factors flowing freely and spontaneously, improve space contact pattern between areas, bring scale economy and knowledge spillovers to the regions [3]. Zeng Yi found that the producer service industry can improve the quality of regional economic growth significantly [4]. Since producer services agglomeration has played a very important role in China's sustainable economic development, this paper creates the influencing factors model of producer services agglomeration, trying to analyze how various factors influence productive service industry and whether there is a difference in the role and the effects between different factors. About the influencing factors model of producer services agglomeration, domestic scholar Chen Jianjun constructed an analysis framework for the agglomeration factors of productive service industries earlier, and analyzed agglomeration factors from four aspects: knowledge intensity, city size, information technology and the system [5]. Wu Fu, Cao Lu start the research from the relationship between the two global and domestic value chains, analyzed agglomeration factors from four aspects: the degree of concentration in manufacturing, dependence on external demand, the level of information and the city grade [6]. Chen Hongxia analyzed from three aspects: traditional location factors, policy factors and agglomeration factors [7]. With reference to the above analysis framework, this paper attempts to select human capital, city size, manufacturing level, and degree of openness as explanatory variables from the four aspects of factors: cities, space and systems, as to study the state and influencing factors of productive service industry agglomeration and figure out how to promote the level of regional agglomeration. Due to the differences in the level of producer services in various regions [8] and the development of the productive service industry in the Yangtze River Delta is better [9] [10], this paper selects the Yangtze River Delta city as the research object to analyzes the state and influencing factors of the agglomeration of the producer service industry.

## 2. The Theoretical Assumptions

From neoclassical economists Alfred Marshall proposed the external economic theory; scholars began to focus on aspects of industrial agglomeration, pointed out that enterprises gather together due to the pursuit of external scale effect. The external economic theory explains the increasing income of agglomeration from the three aspects of sharing labor market, intermediate product input and

specialized market. Further, Edgar M Hoover divided external economic theory into regional economic externalities and urbanization economic externalities for supplementary. By the 1990s, the new economic geography is on the rise. Economists such as Paul Krugman have included location factors such as transportation costs into the analytical framework, re-study location selection and inter-regional trade issues, and believe that all economic behaviors are spatially non-uniformly distributed, and explain why economic behaviors are concentrated in some areas and the reasons for the differentiation in the regional space. Neoclassical economists have summarized the reasons for agglomeration into three categories: market demand, external economy (including labor market sharing, specialized input and the flow of knowledge) and contingency factors. Based on the above review, this paper created the "elements-space-city-institutional" framework to study the reasons of productive service industry agglomeration.

## 2.1. The Angle of Production Factors

The productive service industry, as a high-knowledge industry, has human capital as its main input and higher requirements for the quality of labor factors. The increase and free flow of high-level personnel can promote innovation ability of enterprises, which makes enterprises have access to collective learning and tacit knowledge in the industry. Due to the special attributes of the producer service industry, it is very likely that the new enterprise will be separated from the original enterprise. The professional talents will leave the original enterprise and set up a new enterprise, thus promoting the production service industry to gather in the region. Therefore, this paper proposes hypothesis 1: the improvement of human capital level plays a positive role in the agglomeration of urban productive service industry.

## 2.2. The Angle of Space

The producer service industry was originally located between the secondary industry and the tertiary industry. With the refinement of the division of labor, it gradually became independent from the manufacturing industry. The consumption target of the producer service industry is not the ordinary consumer but the producer of the manufacturing industry. It is attached to the secondary industry and is the supporting service industry of the secondary industry. Therefore, the development of the productive service industry cannot be separated from the manufacturing industry development. According to the definition of the producer service industry, the level of manufacturing development is a factor that affects the producer service industry agglomeration. Therefore, this paper proposes hypothesis 2: the improvement of manufacturing level is conducive to the agglomeration of productive services.

## 2.3. The Angle of City

The producer service industry is the product of the improvement of the social

division of labor and the high level of specialization. Only when the scale of the city develops to a certain extent will the producer service industry form an agglomeration. The expansion of the city scale means that the increase in the number of labor required for industrial development and the increase in industrial services related to agglomeration, which will help the producer service industry to reduce production costs and obtain agglomeration benefits and comparative advantages. The agglomeration of productive services brings diversity of services to the region, attracts consumers and producers from other regions, and further promotes the snowballing agglomeration of the producer service industry. Therefore, this paper proposes hypothesis 3: The increase in city scale has a positive impact on the agglomeration of productive services.

### 2.4. The Angle of Institution

The level of agglomeration in the producer service industry is often closely related to the degree of openness. According to the new economic geography theory, when a certain critical point is exceeded, the agglomeration force will increase faster than the dispersion force. At this time, the increase in the degree of openness in the region will prompt sudden agglomeration occur in the industry, and expand the local market effect and the price index effect because of the cumulative cycle, and finally promote the degree of industrial agglomeration. The lower the degree of opening up of the region, the easier it is to hinder the free flow of production factors and the formation of agglomeration of productive services. Therefore, this paper proposes hypothesis 4: the degree of openness is positively related to the agglomeration of productive services.

## 3. The Agglomeration Level of Producer Services in Yangtze River Delta

At present, the most commonly used indicators of industry agglomeration level are herfindahl index, spatial gini coefficient, location entropy, E-G index and so on. Considering the availability of data and the target of measuring the degree of industrial agglomeration in each different region, this paper selects the location entropy ($LQ$) index to measure the agglomeration level of the productive service industry. The specific expression is shown in Equation (1). In which $q_i$ represents the number of employees in industry $i$ of productive service industry in Yangtze River Delta, $q_t$ represents the number of all industrial employment in the city; $Q_i$ on behalf of the number of employees in 16 cities of the industry in Yangtze River Delta, $Q_t$ represents the total number of all industrial employment in the Yangtze River Delta. The more the value of $LQ$, indicating the greater specialization and higher agglomeration of producer services of the city. In general, a coefficient value greater than 1 indicates that the city has a significant agglomeration in the Yangtze River Delta.

$$LQ = \frac{q_i/q_t}{Q_i/Q_t} \tag{1}$$

From Table 1, there are differences in producer services agglomeration level between cities, and in general the overall agglomeration trend is evident. Represented by three cities of Shanghai, Nanjing and Hangzhou, each city has formed a scale gathering to a certain extent, and the spatial agglomeration pattern of the productive service industry in the Yangtze River Delta is taking shape. According to the average of the regional entropy of each city, the 16 central cities in the Yangtze River Delta can be divided into four grades. The location entropy values of the six major producers in Shanghai are all greater than 1, and the average location entropy is 1.7609, in the interval of [1.50 - 2.0], far greater than the average of 0.7784 in all cities. The degree of agglomeration of Shanghai production service industry is highest among the 16 cities; therefore Shanghai is the central city in the central-peripheral model. According to the numerical values from large to small, the location entropy of Nanjing is 1.4436, Hangzhou is 1.3831, Zhoushan is 1.2420, Zhenjiang is 0.8268, Ningbo is 0.7978, the location entropy of five cities is all in the range of [0.70 - 1.50], showing that the agglomeration level of five cities is great in the rank, the average values of the location entropy of the six sub-sectors of the five cities are higher than the average level of the city, so this article will rank Nanjing, Hangzhou, Zhoushan, Zhenjiang, Ningbo as the second level. The third level includes six cities, which

**Table 1.** Location entropy of productive service industry in the Yangtze River Delta in 2017.

| | Transportation, warehousing and postal services | Information transmission, software and information technology services | Financial industry | Real estate industry | Leasing and business services | Scientific research, technical services and geological exploration industry | Industry average |
|---|---|---|---|---|---|---|---|
| Shanghai | 1.8809 | 1.6469 | 1.4489 | 1.7001 | 2.2136 | 1.6750 | 1.7609 |
| Nanjing | 1.6182 | 2.4044 | 0.6200 | 1.2191 | 0.9815 | 1.8185 | 1.4436 |
| Wuxi | 0.6139 | 0.7871 | 0.9691 | 0.6993 | 0.3364 | 0.6521 | 0.6763 |
| Changzhou | 0.6497 | 0.3201 | 0.9688 | 0.4365 | 0.6358 | 0.8630 | 0.6457 |
| Suzhou | 0.5851 | 0.4832 | 0.5718 | 0.8166 | 0.4250 | 0.3900 | 0.5453 |
| Nantong | 0.3062 | 0.1668 | 0.5947 | 0.2457 | 0.3798 | 0.3171 | 0.3350 |
| Yangzhou | 0.5545 | 0.3177 | 0.4917 | 0.4589 | 0.4142 | 0.4968 | 0.4556 |
| Zhenjiang | 0.6684 | 0.3243 | 1.2643 | 0.9872 | 0.8841 | 0.8327 | 0.8268 |
| Taizhou | 0.5392 | 0.2037 | 0.6003 | 0.3273 | 0.2785 | 0.3536 | 0.3838 |
| Hangzhou | 0.9214 | 1.9016 | 1.0733 | 1.5832 | 1.1025 | 1.7162 | 1.3831 |
| Ningbo | 0.8864 | 0.5055 | 1.3918 | 0.7116 | 0.7792 | 0.5121 | 0.7978 |
| Jiaxing | 0.5289 | 0.2362 | 0.9275 | 0.8575 | 0.6774 | 0.7798 | 0.6679 |
| Huzhou | 0.4162 | 0.2894 | 1.2316 | 0.5145 | 0.3924 | 0.3919 | 0.5394 |
| Shaoxing | 0.2829 | 0.1376 | 0.5824 | 0.2072 | 0.2057 | 0.2284 | 0.2740 |
| Zhoushan | 2.3525 | 0.4504 | 1.4858 | 1.1434 | 1.4805 | 0.5392 | 1.2420 |
| Taizhou | 0.3095 | 0.1870 | 1.4377 | 0.3563 | 0.2853 | 0.2892 | 0.4775 |
| City mean | 0.8196 | 0.6476 | 0.9787 | 0.7665 | 0.7170 | 0.7410 | 0.7784 |

Source: 2018 China Urban Statistical Yearbook.

are Wuxi, Changzhou, Suzhou, Jiaxing, Huzhou, Taizhou, the value of location entropy is in the range of [0.47 - 1.70], indicating that the concentration level of the six cities is relatively low. The location entropy of Nantong, Yangzhou, Taizhou and Shaoxing is in the range of [0.25 - 0.40], which shows that the specialization rate of the production service industry in these four cities is low and the concentration is low. From the perspective of the industry, the average value of the location entropy of the 16 cities in the financial industry is 0.9787, the agglomeration level is the most obvious; the transportation, warehousing and postal industry is 0.8196, the real estate industry is 0.7665, and the scientific research, technical services and geological exploration industry is 0.7410, the average value of the location entropy of these three industries is in the range of [0.74 - 0.82], which shows that the level of agglomeration is relatively high; while the location entropy of leasing and commercial services is 0.7170, and the information transmission, software and information technology services is 0.6476, in the interval of [0.60 - 0.73], indicating that the concentration level of these three industries is not high and is ranked last. In general, there are differences in the level of agglomeration in the production service industries of the Yangtze River Delta agglomerations. Generally, Shanghai, Nanjing, Hangzhou, Zhoushan are the center in the Yangtze River Delta, and Nantong, Yangzhou, Taizhou, Shaoxing are peripheral areas in the agglomeration. And there are differences in the level of agglomeration in various industries, the financial industry is of the highest rate of specialization, the transportation, warehousing and postal services, real estate industry, scientific research, and technical services and geological prospecting are of high level of agglomeration, while the agglomeration of leasing and business services, information transmission, software and information technology services is relatively weak.

## 4. Empirical Analysis

### 4.1. Data Description

This paper refers to the international industrial classification and China's "national economic industry division standards", select transportation, warehousing and postal services, information transmission, software and information technology services, financial industry, real estate industry, leasing and business services, scientific research, technical services and geological exploration industry as sample industries for the producer service industry. The data source is from the China Urban Statistical Yearbook from 2004 to 2018, the relevant variables of 16 cities in the Yangtze River Delta region (Shanghai, Nanjing, Wuxi, Changzhou, Suzhou, Nantong, Yangzhou, Zhenjiang, Taizhou, Hangzhou, Ningbo, Jiaxing, Huzhou, Shaoxing, Zhoushan and Taizhou) are analyzed. The specific variables are shown in Table 2.

### 4.2. Spatial Correlation Analysis

This paper first constructs a spatial weight matrix based on geographic distance,

Table 2. Related variable description.

| Variable | Indicator name | Indicator definition |
|---|---|---|
| Dependent variable | Productive service industry agglomeration level ($S$) | Location entropy of productive service industry in each city. |
| Independent variable | Human capital ($H$) | The ratio of the number of university students in higher education institutions in cities and the number of students in 16 cities in the Yangtze River Delta. |
| Independent variable | City size ($CS$) | The ratio of population of each city in the Yangtze River Delta and the total number of urban population. |
| Independent variable | Manufacturing level ($I$) | The ratio of industrial production value of each city to the total industrial production value of 16 cities in the Yangtze River Delta. |
| Independent variable | Degree of openness ($O$) | The ratio of the actual amount of foreign investment in each city to the amount of foreign investment in 16 cities. |

and then judges whether there is correlation between city groups through Moran index. The Moran index is an important indicator for measuring spatial auto-correlation and can be divided into global and local Moran indexes. This paper choose global Moran index to measure spatial correlation, the specific expression is shown in Equation (2), in which $x$ refers to the representatives of regional observations, $w_{ij}$ is spatial weight matrix representing close relationship between regions [11]. Moran index is between $[-1,1]$, a value less than 0 represents a negative correlation, indicating the presence of significant gaps between adjacent cities' development level; value greater than 0 represents a positive correlation, indicating significant agglomeration of regional economic activity; value 0 represents not relevant, the economic activities in the region are randomly distributed.

$$I = \frac{\sum_{i=1}^{n}\sum_{j\neq i}^{n} w_{ij}\left(x_i - \overline{x}\right)\left(x_j - \overline{x}\right)}{S^2 \sum_{i=1}^{n}\sum_{j\neq i}^{n} w_{ij}} \tag{2}$$

$$S^2 = \frac{1}{n}\sum_i x_i - \overline{x} \tag{3}$$

$$\overline{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \tag{4}$$

### 4.3. Econometric Model

Based on the latitude and longitude coordinates of 16 cities in the Yangtze River Delta, this paper constructs a binary $16 \times 16$ spatial matrix by using Geoda software. This paper uses location entropy of productive service industry in each city to represent productive service industry agglomeration level and the Moran index value is −0.1634, shown in Figure 1. The index values within the section, which shows that there are obvious correlations in spatial distribution of 16 cities
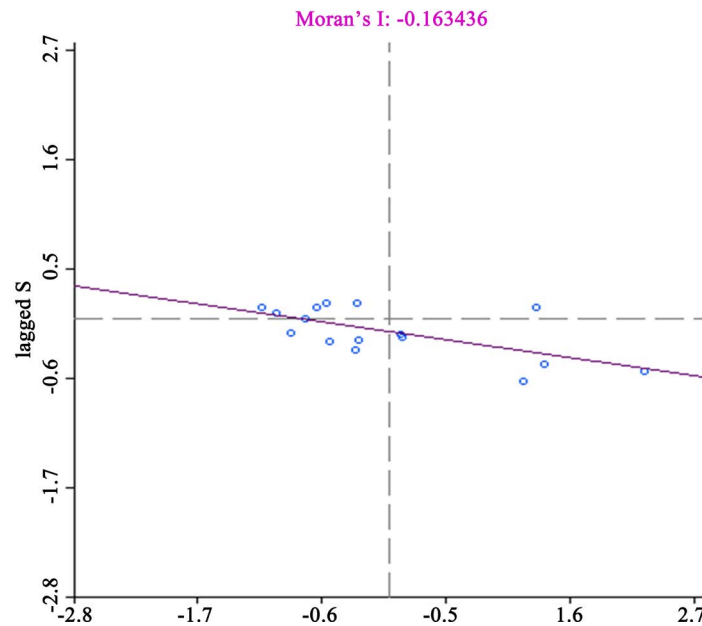
**Figure 1.** Moran scatter plot of production services in the Yangtze River Delta in 2017.

and consider the space factor in the econometric model is required.

Because the data of the Yangtze River Delta has spatial correlation and does not satisfy the assumption that the ordinary least squares data are independent of each other, this paper selects the spatial constant coefficient regression model considering the spatial correlation, which includes the following two models:

1) Spatial Lag Model to measure variables in the region is whether there is room for spillover effects that affect the variables will affect other regions. The model expression is shown in Equation (5), where $Y$ is the dependent variable, $W$ is the spatial weight matrix, $X$ is the explanatory variable, and $\beta$ is the parameter vector, $\mu$ is the random error vector.

$$Y = \rho W_y + X\beta + \mu \tag{5}$$

2) Spatial Error Model to measure the impact of error shocks of dependent variables in other regions on the local region. The model expression is shown in Equations (6) and (7), where $\varepsilon$ is the random error vector, $\lambda$ is the spatial error coefficient and $W$ is the spatial weight matrix.

$$Y = X\beta + \varepsilon \tag{6}$$

$$\varepsilon = \lambda W_\varepsilon + \mu \tag{7}$$

According to the general discriminant criterion proposed by Anselin and Florax in 1995: In the spatial correlation test, it is generally more appropriate to determine the select of the spatial lag model and the spatial error model by comparing the Lagrangian statistic LMERR and LMLAG. If the LMLAG statistic is more significant than the LMERR statistic, the spatial lag model is more appropriate. On the contrary, it shows that the spatial error model is more suitable. If both LM tests are significant, then the robust LM statistic is compared and the model with more robust statistic is selected. The LM test results (see Table 3)

show that LMLAG statistic value of 0.033 is less than the significance level, pass the significance test, LMERR statistic value of 0.604, LMLAG statistics is more significant than LMERR statistics. According to the criterion, the spatial lag model (SLM) analysis is more appropriate.

Based on the theoretical framework of "element-space-city-institution" proposed in the second part of the article, this paper attempts to construct a spatial lag model to test the influence of various factors on the agglomeration of productive service industry in the Yangtze River Delta region in China, to verify the impact of capital level, manufacturing development level, city size and degree of openness on agglomeration in hypotheses 2.1, 2.2, 2.3, and 2.4. The econometric model takes the level of production service agglomeration ($S$) as the dependent variable, human capital ($H$), city size ($CS$), manufacturing level ($I$), and degree of openness ($O$) as independent variables. The specific model is shown in Equation (8), where $W$ is a spatial weight matrix, which $\beta$ is a parameter vector and $\mu$ is a random error vector.

$$S = \rho W_y + \beta_0 + \beta_1 H + \beta_2 CS + \beta_3 I + \beta_4 O + \mu \tag{8}$$

Next, a Holsman test of the spatial econometric model is adopted to further determine whether a random effect or a fixed effect analysis should be used. The results of the Holsman test show that the statistical probability value of the spatial lag model is 0.3297, which is greater than the significance level, which indicating that the random hypothesis model should be adopted [12]. Based on the above Lagrangian multiplier statistic test results, this paper uses the spatial lag model, random effect to analyze.

## 4.4. Empirical Results

This paper uses Matlab software to analyze the influencing factors of the agglomeration of the production service industry in the Yangtze River Delta. The specific results are shown in Table 4. The empirical results show that degree of openness and human capital level is positive to the agglomeration of production service, which verify hypothesis 2.1 and 2.4. The impact of changes in the size of the city to productive service industry is not obvious, upgrading of the manufacturing level is not conducive to productive services agglomeration. The empirical results reject the hypotheses 2.2 and 2.3, which will be further analyzed below. As the degree of openness to the outside world can accelerate the flow of

**Table 3.** Spatial dependence test value.

| Test statistics | Test value | Probability value |
|---|---|---|
| LMLAG | 4.5409 | 0.033 |
| R-LMLAG | 27.5498 | 0.000 |
| LMERR | 0.2684 | 0.604 |
| R-LMERR | 23.2773 | 0.000 |

Table 4. Estimation results of spatial lag model random effect.

| Variable | Coefficient | Variable | Coefficient |
|---|---|---|---|
| Human capital | 2.7862*** (10.42) | Constant term | 0.6389*** (17.11) |
| City size | 0.6484 (0.75) | R-squared | 0.5354 |
| Manufacturing level | −3.9927*** (−5.47) | Sigma 2 | 0.0553 |
| Openness to the outside world | 3.1884*** (5.57) | Loglikols | 8.9036 |

Note: "***", "**", "*" indicate it is significant at 1%, 5%, and 10% levels, and the values in parentheses are t values.

capital within the Yangtze River Delta, it is conducive to the inflow of production factors such as entrepreneurs. The free flow of production factors and the inflow of high-level talents have created favorable conditions for the development of productive service industries. Relevant enterprises can use the spillover effect to enhance industrial agglomeration by attracting investment, technology and learning excellent management experience. Therefore, the improvement of the degree of openness can effectively promote the accumulation of productive service industries. Secondly, the improvement of human capital level can significantly promote the agglomeration of productive service industries. As a knowledge-intensive industry, the producer service industry has higher requirements for talents than other types of industries. In the production process, a large amount of human capital needs to be invested to promote the flow and dissemination of knowledge. The improvement of human capital level will help the collection and sharing of talents in the Yangtze River Delta region, bring about ideological collisions and mutual exchange of knowledge, accelerate the generation of new knowledge and new ideas, lead to technological innovation, and promote the agglomeration of productive service industries.

The coefficient before the city scale did not pass the significance test, indicating that the impact of city size on the agglomeration of the producer service industry is not obvious. This may be caused by the fact that when the size of the city is too large, the company tends to spread the layout in various places to cut down the costs of factors such as transportation, which is not conducive to the agglomeration of the productive service industry. The expansion of city scale will also be accompanied by the emergence of non-economic factors such as rising living costs, traffic congestion and environmental pollution, which will make the producer service industry change to non-aggregation. This shows that the city size and the agglomeration economy are not necessarily linear. The city size is not the better the bigger it is. The coefficient value before the manufacturing level is negative and passed the significance test, indicating that the improvement of the manufacturing level is not conducive to productive services agglomeration, rejected the hypothesis 5. The possible reason is that the economic

level of the Yangtze River Delta region would be limited due to the limitation of space. Whether the Yangtze River Delta region can accommodate the rapid development of the manufacturing level and the rapid accumulation of the productive service industry, not only decided by the size constraints, are also affected by other factors such as matchability between industry chains. Although the productive service industry originates from the manufacturing industry, it has become an industry independently. Therefore, the industrial policies and technology systems that promote the development of the manufacturing industry may not necessarily promote the development of the productive service industry. And even the rapid development of the manufacturing industry may have a "squeezing effect" on the producer service industry, leading to the uncoordinated development of the manufacturing and production services industries. Since the technical content and information intensity of each industrial chain in the manufacturing industry are different, different service industries are needed to match. In the Yangtze River Delta, a high-tech industry chain often concentrated in the central city like Shanghai, Nanjing, whereas low-tech industrial chain are more likely to appear in the peripheral cities, due to the inconsistencies of industry chain, the improvement of manufacturing level in peripheral cities might to bring about negative effect to producer services. The other possible reason is that compared with the wide-area provincial spatial data, there will be some space discrete when the paper gather producer services down to the city level. Therefore the higher level of manufacturing sector may be not conducive to the improvement of the level of agglomeration of the producer service industry.

## 5. Conclusions and Recommendations

### 5.1. Conclusions

The article found the agglomeration of producer service in Yangtze River Delta was evident and the pattern of spatial concentration is forming gradually. The empirical analysis shows that the degree of openness and the increase of human capital level are conducive to the agglomeration of productive services. The changes in the city size do not have an impact on the agglomeration of productive services, which may be caused by uneconomic factors such as rising costs and increased costs. Upgrading of the manufacturing level is not positive to the agglomeration of producer services; the possible reason is that the economic level of the Yangtze River Delta region would be limited due to the limitation of space and the mismatch of industry chains. Producer services agglomeration is in favor of deepening regional production, increasing productivity, promoting the overall development of economic. This paper puts forward some suggestions to accelerate the agglomeration of service industry.

### 5.2. Recommendations

On the one hand, in view of the fact that the development of the manufacturing

industry is not positive to the improvement of the level of agglomeration of the producer service industry, the government can enhance the macro guidance for the industrial upgrading of the Yangtze River Delta. At present, the development level of the production service industry in Shanghai, Hangzhou and Nanjing is in a leading position in 16 cities, and the development levels of other cities such as Taizhou, Nantong and Shaoxing are relatively low. There is a problem of mismatch between the manufacturing industry and the production service industry chain. Therefore, it is necessary to upgrade the industrial structure of the Yangtze River Delta based on the manufacturing level in the Yangtze River Delta region. Focusing on the development characteristics of each city's manufacturing industry, supporting the production service industry, promoting the match between the industrial chains, upgrading the overall industrial structure of the Yangtze River Delta region, will finally bring about the sustained and stable development of the Yangtze River Delta economy. Specifically, Shanghai can take the construction of international financial centers and trade centers as an entry point, focus on the development of high-end productive service industries, strengthen the aggregation level of various production factors and the ability to serve outwards; Nanjing can rely on the advantages of science and technology education resources, developing knowledge-intensive and high-tech service industry, expanding the scope of financial services, modern logistics, exhibitions, information and other service industries; Hangzhou can take the reform of the national service industry as an opportunity to build regional specialization services for small and medium-sized private enterprises and private enterprises, and the financial service center will drive the development of service industries such as real estate service industry and logistics industry, together with Ningbo, Hangzhou will become a productive service center in the southern part of the Yangtze River Delta. For Zhoushan, the deepwater coastline can be used as a pivot for the development of the service industry, with a focus on the development of the port-based logistics service industry. On the other hand, we could increase the degree of openness. From regional perspective, Shanghai can be positioned as a global production service center, with the construction of shipping centers as an entry point to improve the level of opening degree to the outside world; Nanjing can be built into a financial center city, a logistics center city and a cultural and creative center city to raise the level of concentration; Ningbo and Zhoushan can use geographical advantages to promote the integration of modern logistics, and build an international shipping center with Shanghai to promote the development of the productive service industry in the Yangtze River Delta; Jiaxing can take advantage of the Hangzhou Bay Industrial Belt as an opportunity to build a modern logistics center, serving as a bridgehead for Shanghai, becoming a model city for service outsourcing in China. From industrial perspective, information transmission, software and information technology services; scientific research, technical services and geological exploration industry of the production service industry, are high-tech, high value-added industries with high

requirements for capital and technology. For this type of producer services, the introduction of foreign capital, high-tech talent and advanced management concepts is necessary, to make full use of foreign technology spillover effect., For financial industry; leasing and commercial service industries in the producer service industry, we can expand the market scale of the industry by exploring foreign markets, which would improve the standards and quality within the industry. Enterprises may actively participate in international competition in the market to enhance the status of the industry in the international market, promote the level of agglomeration, and finally bring about long-term economic development.

### 5.3. The Deficiencies and Prospects

Producer services agglomeration research is an emerging research direction in the field of industrial agglomeration research and is in the initial stage of research. The research in this paper only analyzes the status quo, characteristics and influencing factors of producer service industry agglomeration in the Yangtze River Delta. Although some research conclusions have been drawn, due to the limited academic knowledge of author, this research still has some shortcomings. First, in the analysis of the factors affecting the agglomeration of productive service industry, although this paper proposes four influencing factors using the "element-space-city-institution" framework, this paper does not use mathematical model to deduct and analyze this. In future research, we can consider putting various influencing factors into the mathematical model for analysis, and then using numerical simulation to obtain more general conclusions. Secondly, this paper takes the Yangtze River Delta region as an example to study the influencing factors of the agglomeration of productive service industries. It has not been studied and analyzed with national data. Since the producer service industry itself is a relatively large departmental category, which has a wide distribution range. In the subsequent research, we can study from other regions or the whole country to get more general conclusions. These are the deficiencies of this research, and also some prospects of future research.

### Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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