The Structure Characteristic and Productive Attribute Evolution of Beijing Service Industry

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Abstract. The development of service industry is an important indicator of a region’s economic development and service has been the leading industry of Beijing. But, does the service industry play a supporting role in the production of the whole economy? This paper analyzes Beijing’s service industry, including its structure characteristics, productive attribute, service input structure, the demand for productive service, and the evolution over the past ten years. The results show that: (1) the industry structure of Beijing presents advanced features compared with developed countries, not only in structure of the three industrial, but also in structure of the service internal sectors; (2) the productive service attribute of Beijing service industry declined, among which the information service industry declined the most; as to the input structure of productive service, the share of the second industry decreased, which reflects the support on the secondary industry decreased; from the perspective of demand for producer service, the productive service demand ratio of Beijing economy as a whole decreased, and the decline demand of the secondary industry is the main reason.

Introduction

Many countries’ courses of economic development shows that service industry have been a major impetus for economic transition and growth. At present, the service industry has occupied an absolute dominant position in Beijing’s economic development. The rate of contribution of service industry in Beijing has basically reached the level of developed countries. However, the high proportion of service industry does not mean its development is rational. Led by the government, Beijing skipped the full development of secondary industry and strove to develop its service industry. In developed countries, market requirement of tertiary industry, especially some of advanced productive services, is based on full development of the secondary industry and increasing innovation activities. Therefore, it is necessary to further analyze the internal structure of Beijing’s service industry, the attribute characters and evolution trend of productive services inherent to upgrading of service industry.

Related Studies of Productive Service Attribute in Service Home and Abroad

Productive services were firstly put forward by the U.S. economist H. Greenfield in the study of service industry and its classification in 1966[1]. After that, Browning and Singelman[2] (1975), Coffer (2000) and others scholars did a lot of researches on the
functional segmentation of service industries and the scope and definition of productive services. In terms of empirical studies of productive services, foreign scholars are mainly concerned with how its development influences economic growth and industrial structure [3,4]. Others argue that by exporting to other regions productive services directly contribute to regional economic development (Illeris, 1996; Harrington, 1995) [5]. Hansen (1990) argues that productive services can promote industrial upgrading and transition of manufacturing enterprises and make them integrated more closely with manufacturing industries [6].

With the rapid development of productive services, in recent years domestic scholars have also begun to pay attention to productive services. Gao Juemin and Li Xiaohui [7] (2011), Gu Naihua [8], et al. (2006), Gao Chuansheng and Liu Zhibiao (2005) studied the relationship between productive services and manufacturing industry. Cheng Dazhong (2008) found that in China the growth of service industry cannot play its due driving function for national economy, and the service industry can hardly be promoted by demands of other sectors [9].

Different from former domestic researches, this paper deeply studied into attributive characters, evolvement and forming reasons of the productive service. Meanwhile, the paper applies the 2002, 2007 and the latest 2012 input-output table of Beijing, which can reflect the latest characteristics of development and trend of service [10] industry.

Measurements and Data Declaration for the Service Industry Structure and Its Productive Attribute

Model Methods

**Input Output Model Method.** The basic structure of the input-output table consists of three parts. The first part is an intermediate-use-use quadrant with the element $x_{ij}$. The second part is the final use quadrant. The element $Y_{ij}$ represents the j final demand of the national economy for the i-th sector. The third part is the value-added quadrant, where the element of the quadrant $N_{pj}$ is the p-th value added of the j sector.

Based on input-output data, calculate the structure coefficient of sector j, as in Eq. 1.

$$NP_j = \sum_{i=1}^{m} \frac{N_{pj}}{\sum_{j=1}^{n} \sum_{p=1}^{m} N_{pj}}, \quad p = 1,\ldots, m, \quad j = 1,\ldots, n. \quad (1)$$

Where $NP_j$ is the industrial structure coefficient of the j-th sector, $\sum_{i=1}^{m} N_{pj}$ is the total added value of the j-th sector, and $\sum_{j=1}^{n} \sum_{i=1}^{m} N_{ij}$ is the total added value of all the sectors.

The factor returns structure of each service sector is calculated as in Eq. 2.

$$CL_j = L_j / \sum_{i=1}^{m} N_{ij}; \quad CT_j = T_j / \sum_{i=1}^{m} N_{ij}; \quad CS_j = (S_j + D_j) / \sum_{i=1}^{m} N_{ij}; \quad (2)$$

Where $CL_j, CT_j, CS_j$ are labor return coefficient, net taxes on Production coefficient and
gross operating surplus coefficient (including depreciation) of the j-th sector, respectively; \( L_j \), \( T_j \), \( S_j \) and \( D_j \) are labor return, net taxes on Production, gross operating surplus, and depreciation for sector j, respectively.

The intermediate input column is the output part of the service industry to the productive industry. It has the attribute of productive service. So, we use the capital ratio of service to measure the productive attribute of each service industry, as in Eq. 3.

\[
SCR_i = \frac{\sum_{j=1}^{n} x_{ij}}{(\sum_{j=1}^{n} x_{ij} + C_i)}
\]  

(3)

Where \( SCR_i \) is the capital ratio of service for sector i, and \( C_i \) is the consumer output of the i-th service sector.

The productive service demand rate of the three industries can reflect the degree of servitization of the whole economy, and also reflects the demand for productive services of various industries. The productive service demand rate of the j-th industry is calculated as in Eq. 4.

\[
PSDR_j = \frac{\sum_{i=1}^{n} p_{ij}}{(\sum_{i=1}^{n} p_{ij} + N_j)}
\]  

(4)

Where \( PSDR_j \) is the productive service demand rate of the j-th industry, \( \sum_{i=1}^{n} p_{ij} \) is the intermediate product from the service industry to the j-th industry, and \( (\sum_{i=1}^{n} p_{ij} + N_j) \) is the total input of the j-th industry.

**Measurement of Comparative Advantage Structure.** Location entropy measures the degree of specialization and advantage of different industries or sectors. The formula of location entropy is in Eq. 5.

\[
LQ_{ij} = \frac{E_{ij}}{E_j} \times \frac{E_j}{E}
\]  

(5)

Where \( LQ_{ij} \) is the location entropy of sector i in city j. \( E_{ij} \) is the number of employees of sector i in city j. \( E_j \) is the number of employees in city j. \( E_i \) is the total number of employees of sector i in the whole country or in a certain region. E is the total number of employees in the country.

**Data Declaration**

The data of the service industry in Beijing come from the input-output table of Beijing in 2002, 2007 and 2012, and China Labor Statistical Yearbook in correspondent years. The data of the United States, Japan and Germany come from the input-output table of OECD countries published in OECD’s official website.
The Structure Features of Service Industry

Industrial Structure Characteristics

The first 7 industries that played a leading role in Beijing service are all producer services except wholesale and retail trade. The trends of internal service industrial structure from 2002 to 2012 show that, transportation, warehousing, and postal industry have an evident change in the proportion of service, which decreased by 2.27%. Wholesale and retail sales increased by 2.81%. Leasing and business service increased by 2.25%.

Beijing has an extremely similar proportion transportation, warehousing, postal industry, leasing, business service, wholesale and retailing, hotels and catering services with these in U.S.A, Japan and Germany. Another difference is that Beijing is 8.5% lower in proportion of R&D, residential service, education and other public service industry.

Structural Features of Factor Rewards

The data show that the structural features of Beijing service are the relatively low labor return coefficient and high net production taxes coefficient. The average labor return coefficient from 2002-2012 in Beijing is 48.39%, the lowest in 2007 is 45.41%. It increased to 53.03% in 2012. The labor return coefficient of U.S.A, Germany, Japan was 57.52%, 51.99% and 54.28% respectively. The average net production coefficient from 2002-2012 in Beijing is 12.33%, which is 7.93%, 1.34% and 4.22% in the USA, Germany, and Japan in 2005.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor return coefficient</td>
<td>53.03</td>
<td>45.41</td>
<td>46.74</td>
<td>48.39</td>
<td>57.52</td>
<td>51.99</td>
<td>54.28</td>
</tr>
<tr>
<td>net taxes on Production coefficient</td>
<td>14.6</td>
<td>10.87</td>
<td>11.51</td>
<td>12.33</td>
<td>7.93</td>
<td>1.34</td>
<td>4.42</td>
</tr>
<tr>
<td>gross operating surplus coefficient(Including depreciation)</td>
<td>32.37</td>
<td>43.72</td>
<td>41.75</td>
<td>39.28</td>
<td>34.55</td>
<td>46.67</td>
<td>41.30</td>
</tr>
</tbody>
</table>

It reflected that in the primary distribution of national income, the proportion of the primary distribution of national income flowing to laborers is relatively low, the proportion of which flowing to the government is relatively high. Many domestic scholars share the similar view that laborers in China getting relatively low proportion of primary distribution of national income.

From the subdivided industries, the labor return coefficient of finance, information transmission software and information technology service, wholesale and retail industry is far lower than these in other developed countries—28.06%, 22.01%, 21.48% respectively. But these in real estate, resident services, health and social work in Beijing are higher than the average level in developed countries, higher than 22.03%, 16.02% and 12.73% respectively.

Structural Characteristic of Comparative Advantage

The comparative advantage of service industry in Beijing is mainly the development of
producer service. From the ranking of location entropy in 2011, we can see that industries ranks well are mainly producer service—the first four are all producer service. These ranking in the middle are mainly consumer services including resident service, culture, sport and entertainment services, accommodation and catering, wholesale and retailing services, ranking from 5 to 8 places respectively. These low ranking industries are mainly public services including water environment and public facilities management, health social security and social welfare, public management and social organization, education industry, ranking from 11 to 14 respectively.

**Productive Service Attribute, Input Structure and Demand of Service**

**Productive Service Attribute Characteristics**

Table 2. The service capital ratio of Beijing service industries from 2002 to 2012(%).

<table>
<thead>
<tr>
<th>Sector</th>
<th>2012</th>
<th>2007</th>
<th>2002</th>
<th>Change from 02 to 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service average</td>
<td>43.21</td>
<td>38.94</td>
<td>48.02</td>
<td>-4.81</td>
</tr>
<tr>
<td>Transport, storage and post</td>
<td>73.92</td>
<td>70.38</td>
<td>68.82</td>
<td>5.1</td>
</tr>
<tr>
<td>information, computer &amp; software</td>
<td>25.16</td>
<td>22.38</td>
<td>39.62</td>
<td>-14.46</td>
</tr>
<tr>
<td>Wholesale and retail trade</td>
<td>54.32</td>
<td>67.10</td>
<td>15.51</td>
<td>38.81</td>
</tr>
<tr>
<td>Hotels and restaurants</td>
<td>61.51</td>
<td>67.26</td>
<td>62.38</td>
<td>-0.87</td>
</tr>
<tr>
<td>Finance and insurance</td>
<td>51.08</td>
<td>23.60</td>
<td>58.14</td>
<td>-7.06</td>
</tr>
<tr>
<td>Real estate activities</td>
<td>35.39</td>
<td>24.72</td>
<td>47.07</td>
<td>-11.68</td>
</tr>
<tr>
<td>Renting and commercial service</td>
<td>83.55</td>
<td>75.22</td>
<td>74.14</td>
<td>9.41</td>
</tr>
<tr>
<td>R&amp;D, technical services</td>
<td>21.53</td>
<td>29.64</td>
<td>46.98</td>
<td>-25.45</td>
</tr>
<tr>
<td>environment and public facility management</td>
<td>48.00</td>
<td>49.53</td>
<td>47.39</td>
<td>0.61</td>
</tr>
<tr>
<td>Residents service and other services</td>
<td>16.83</td>
<td>13.82</td>
<td>10.6</td>
<td>6.23</td>
</tr>
<tr>
<td>Education</td>
<td>1.64</td>
<td>0.86</td>
<td>21.01</td>
<td>-19.37</td>
</tr>
<tr>
<td>Health, social security &amp; social welfare</td>
<td>35.69</td>
<td>53.02</td>
<td>61.11</td>
<td>-25.42</td>
</tr>
<tr>
<td>Culture Sports and Recreation</td>
<td>3.65</td>
<td>4.05</td>
<td>1.18</td>
<td>2.47</td>
</tr>
</tbody>
</table>

The Table 2 shows that, the overall capital ratio of service sector in Beijing has shown a downward trend, falling from 48.02% in 2002 to 43.21% in 2012. That is to say, according to the trend of capital ratio of services, the service attribute of service industry is getting lower. For the specific service sector, the wholesale and retail trade underwent the biggest change, whose capital ratio of sector increased by 38.81 percentage points. Followed are R&D and technical services, sports and entertainment, which decreased by 25.45 and 25.42 percentage points.

**Input Structural Analysis**

The input structural analysis reflects the support function of the service industry to the three industries. Table 3 shows that the main input object is the service sector itself: from 2002 to 2012, the proportion wanders between 60%-75%, far higher than the proportion of the Primary industry and secondary industry. Moreover, as to the trend, the proportion of producer services to the service industry itself continued to rise, from 68.58% in 2002 to 75.42% in 2012, while the proportion to the secondary industry showed a downward trend
from 30.63% in 2002 dropped to 24.14% in 2012. It can be seen that Beijing’s service industry is more supportive to itself, that is, the "self-enhancing" effect of the service industry is expanding, while the supporting role for the secondary industry is weakening.

Table 3. The output structure of 2002-2012 Beijing producer service.

<table>
<thead>
<tr>
<th>Sector</th>
<th>2012</th>
<th>2007</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>primary industry</td>
<td>0.44</td>
<td>0.53</td>
<td>0.65</td>
</tr>
<tr>
<td>Secondary industry</td>
<td>24.14</td>
<td>23.68</td>
<td>30.63</td>
</tr>
<tr>
<td>Service industry</td>
<td>75.42</td>
<td>75.79</td>
<td>68.58</td>
</tr>
<tr>
<td>The Whole economy</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Analysis of the Demand for Producer Services in Three Industries

The demand for producer services in the primary industry has risen. From Table 7, it can be seen that from 2002 to 2007 the productive service demand rate of the whole economy declined from 24.86% in 2007 to 22.31% in 2007, and back to 23.87% in 2012.

The data shows that primary industry demand for productive services increased significantly, from 7.17% in 2002 sharply to 13.9% in 2012. The reason should be that Beijing agriculture has not taken a large-scale road, but a modernization and servitization road by strengthening the agricultural scientific and technological innovation, accelerating the integration of agriculture with the secondary and tertiary industry, especially with the tertiary industry, such as leisure and sightseeing agriculture, seed agriculture, facility agriculture, exhibition agriculture, creative agriculture, etc. The productive service demand rate of the service industry itself has not changed obviously.

Table 4. The productive service demand rate of Beijing from 2002 to 2012(%).

<table>
<thead>
<tr>
<th>Industry</th>
<th>2012</th>
<th>2007</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Whole economy</td>
<td>23.87</td>
<td>22.31</td>
<td>24.86</td>
</tr>
<tr>
<td>Primary industry</td>
<td>13.9</td>
<td>11.86</td>
<td>7.17</td>
</tr>
<tr>
<td>Secondary industry</td>
<td>13.1</td>
<td>12.67</td>
<td>16.59</td>
</tr>
<tr>
<td>Service industry</td>
<td>32.6</td>
<td>29.51</td>
<td>32.90</td>
</tr>
</tbody>
</table>

The demand for producer services in the secondary industry decreased significantly, from 16.59% in 2002 to 13.1% in 2012. This has a direct relationship with the adjustment of Beijing’s urban functional orientation besides the above reason, the weak function of the industrial cluster maybe another cause. The service demand rate of the service industry itself is not obvious [11].

Conclusion

Service Industry in Beijing Shows an Advanced Feature

Service industry has become an absolute pillar industry in the economic development in Beijing. It shows advancement whether in the economic service proportion of total GDP or the internal structure. From comparative structure, the most competitive industry is mainly service, then Consumer Service. The last one is Public Service.
The Decrease of Productive Service Attribute of Overall Service Industry

The productive service attribute of overall service industry has decreased overall. Among which the decreasing amplitude of information transporting and software service is relatively greater [12]. From the investment structure, the investment ratio to the second industry has decreased. Supporting function has been weakening. Investment to itself is the highest one. “Self-effect” is remarkable.

The Integration with Primary Industry has deepened, while with Secondary Industry has shrunk

The demand from primary industry for producer service has risen mainly for the development of agriculture in Beijing. By strengthening the innovation of science technology, accelerate the pace of integration of agriculture with secondary especially the third industry, making agriculture modernize, service-oriented including leisure and sight-seeing agriculture, seed agriculture, facility agriculture, convention agriculture, creative agriculture. So the endogenous demand has risen.

The demand rate for producer service from the secondary industry dropped obviously. On the one hand, there is a direct connection with the declining status of the secondary industry in Beijing and the shift of three high industries. On the other hand, there is a certain relationship with weak industrial cluster function, fragmentary industry chain, lacking of depth.

Summary

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References


