How producer services contribute to the economic growth in China?

----based on the Input-Output statistics method

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Abstract

Since the 1980s, the global economical center of gravity is inclining to service industry. The producer services, as a part of service industry, obtains the power of development under the major tendency in the transformation. The purpose of this essay is to examine how much the development of the producer services influences on the industrial structure of China.

In the beginning part, the essay discusses the concept, producing mechanism and developmental stage of the producer services in China, using the national statistics data in the Chinese statistics yearbook from 1995 to 2005. Then in the main part, four indexes (intermediate input rate, intermediate consumption rate, influence coefficient and induction coefficient) are calculated by the input-output national account method. Based on results, it is concluded that the intermediate input property of producer service is more particularly evident than other industries. Furthermore, the industrial relation between producer service and other industries is shown by influence and induction coefficients. The result shows that compared with the average level of the whole industry, the producer service evidently influences other industries’ development and it is influenced less by other industries. In the last part, a general conclusion can be drawn on the close relation between the development of producer services and the change of economical structure in China. Through the growth rate of internal producer services and the cumulative circle and causation, the great potential of internal producer services development can be forecasted.

Key words: producer services, economical structure, input-output method
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1. Introduction

1.1 Background of the Research

The general strength and the international competitiveness of the industry in a country or region depend on two factors: one is the competitiveness of the single industry or factor’s link, the other one is the competitiveness of the product system of whole country. Modern industry is the leading product of the national economy, it joint the modern agricultural and the modern service. These products depend on each other, while they limit each other too, which compose the entire dynamic product chain. Meanwhile, the producer services, act as an adhesive on this chain, are the intermediate input in production in the modern service. It does not play a role in the production and transform, however, the producer services is inseparably associated with the development of the social labor the progress of the science and technology, which provide the guarantee of the promotion in product structure. According to the above, it is very important to develop the producer services to construct the modern product system.

The service in the national economy contains nearly 30 sections. It can be defined that producer service is a services section to satisfy the intermediate demand of other product sections, and provide intermediate input to product sections. But it is not to satisfy the final needs and individual needs. As the progress of the information era, the product systems all over world have been changed, especially in the developed countries.

According to the World Investment Report 2002, more than one third of the American overseas direct investments has been put into the areas of the financial and the insurance; the European overseas direct investments mainly has been put into the areas of the public service, media and finance; while half of the investments in Japanese transnational corporations, which have been focused on the finance and insurance sections in Britain. It is obvious that the main part of the economy has transferred from the product industry to service industry. However, the increasing of
the service producer grows much faster than the average rate of the other kinds of services. In OECD countries, the additional value in the producer services of financial, insurance, real estate and other services has occupied the one third of the national economy. Therefore, it will get much more inference value to study the contribution of the producer services to the increasing of economy in China.

![Chart 1 Chinese GDP constitution changes](image)

**Chart 1 Chinese GDP constitution changes**

Data from: *Chinese Yearbook 2007*

### 1.2.1 The Background of the Production in China

The product background of the development in the producer services in China. According to the Chenery Model, the productions of the three industries increase in turn. The increasing rate of industry exceeds the rate of agricultural at first, then the rate of service exceeds that of agricultural, the rate of service exceeds that of industry at last. In China, the additional value of the agricultural decrease continuously, while the additional value of the industry increase irregularly, the service decrease at first and increase later, divided by the year 1982. In the picture, it is obvious to see the change. In the present stage in China, the industry is the main part, followed by the service. It depends on the condition in China. The industry has developed so fast during the second half of last century. However, the service has been encouraged since the year 1978. The speed of the increase in productions in the service exceed that in the industry, which can easily be check in the picture.
1.2.2 The Average Level of the Producer Services in China

According the picture, the service in China increased fast between the year 1997 and year 2003, at the same time, the productions of the producer services occupy half of those of the whole economy. The average increasing rate is 37.89% during this period. Meanwhile, addition of the education and government services and the social group services grows fast, which provide the nice environment for the continuous, fast, stable development of the producer services.

![Chart 2 1978-2007 Year China Gross Domestic Product](image)

**Chart 2 1978-2007 Year China Gross Domestic Product**

Data from: Chinese Yearbook 2007

![Chart 3 Compositions Value-added of the Tertiary Industry Year 1978-2007](image)

**Chart 3 Compositions Value-added of the Tertiary Industry Year 1978-2007**

Data from: Chinese Yearbook 2007
1.3 Limitation:

More scientific, there are some new ideas have been raised in the research in the area of the services resent years, such as knowledge services and modern services. However, both of these ideas cannot replace the producer services. There are two reasons, one is that these new ideas don not satisfy the definition of the services, the producer services should be satisfied the intermediate needs, and provide intermediate input to production of other organization. The other one is the producer services have been discussed for forty years. It has already become the core of the economy research. But the study in China has limitation.

1.4 The Aim of the Research

China’s statisticians and economists want to define producer service, while there is already a mature definition of producer services in the developed countries. However, since it can be destroy the model in China, it has high risk to follow the ways in developed countries. Thus, it is not wise to make a conclusion without analyzing the practical situation especially in China. The services in the economy in China did not develop until the 1980s last century, since the decision maker did not find the effectively way to develop the economy. Compared with the rate in the developed countries, the increase rate of the services in China was very low. Most of them are the region studying. The economy system in China has some differences with other countries. It is essential to solve the questions as followed, what role does the producer services play in the economy. Are the contributions of the producer services same in the different develop periods? The essay base on the macroeconomics, it uses the data to prove the hypotheses.
2. The basic theory and indexes

2.1 The concept of the producer services

The producer services is defined upon the functionality classify, which firstly raised by Machlup, while some other economist who study on the services. In order to classify the producer services clearly, it is necessary to summarize the theory of the classification on the services.

It always depends on two starting point:

The first one is to reveal the different model in different period, in order to reflect the relationship between the different sections and the increase of the entire economy. The second one is to reveal the change in the inner structure of the services. It divides to four parts: current services, product services, social services and individual services, according to the method which rose by Singelman.

The classification play a part in the theory of the producer services, it points out that some parts of the producer services are from the product industry, while not all the services drove by final needs.

2.2 Methodological framework

2.2.1 Data sources

Basic data comes from *China statistics yearbook 2003-2007*, *China Input-Output table in the year* in year 1997, 2000, and 2002. Among these tables, in the 1997 *Chinese Input-output table*, production activities to the national economy is divided into 124 production sections, of which five sections of primary industry, 85 sections of secondary industry, 34 sections of the tertiary industry; In the 2000 *Chinese input-output table*, production activities to the national economy is divided into 124 production sections, of which five sections of primary industry, 85 sections of secondary industry, 34 sections of the tertiary industry; In the 2002 *Chinese*
The input-output table, production activities to the national economy is divided into 122 production sections, of which six sections of primary industry, 82 sections of secondary industry, 34 sections of the tertiary industry.

There are three points which need special explanation. First, since the preparation of the national economic input-output tables are especially complex, the data is not updated annually. In this paper, it is 2002 that the latest year of China's input-output table was updated. Secondly, the Chinese input-output tables involved in the division of the service section is relatively coarse. For example, the 2000 input-output tables only five major categories involved in the service section, namely, transport, post and telecommunications, commercial catering, public utilities and residents services, finance and insurance industry and "other service industries." Third, as the National Bureau of Statistics has formulated newly National industry Standard (sees appendix) in the year 2003, there are some differences in the statistical caliber between 2003 and 2002. The difference should be list separately only if necessary. In normal circumstances this research only utilizes the data prior to 2002 in order to maintain comparability of data.

**2.2.2 Research method**

The input-output method which was first proposed is by U.S. economist Wassily W Leontief in 1936, mainly using input-output table in the quantitative analysis of economic issues. Complete national economic value of input-output tables, including the middle of use, end-use, value-added and income redistribution four parts. For individual sections and the national economy as a whole, if

\[
\text{The total output} = \text{intermediate goods, part of the end-use part}
\]

is equal to

\[
\text{The total investment} = \text{intermediate input + value-added},
\]

then the intermediate use table (X), direct consumption or input coefficient table (A), Leontief inverse table (B), and total consumption of Dmitriyev coefficient table (C) The relationship between:
\[ X = (X_{ij})_{n \times n} \]
\[ A = (a_{ij})_{n \times n}, \quad a_{ij} = \frac{X_{ij}}{\sum X_{ij}} \]
\[ B = (b_{ij})_{n \times n} = (1 - A)^{-1} \]
\[ C = (c_{ij})_{n \times n} = B - I \]

Where, \( X \), showed the industry \( j \) output used in the \( i_{th} \) industry intermediate inputs, \( a_{ij}, b_{ij}, c_{ij} \), respectively for direct consumption coefficient, Leontief coefficient and the total consumption of total consumption coefficient Dmitriyef.

1) Concepts and indicators:

(1) Intermediate demand rate (\( h_i \)): 
\[ h_i = \frac{\sum_{j=1}^{n} X_{ij}}{\sum_{j=1}^{n} X_{ij}} (i = 1, 2, ..., n) \]  
(2)

(2) Intermediate input rate (\( k_j \)): 
\[ k_j = \frac{\sum_{i=1}^{n} X_{ij}}{\sum_{i=1}^{n} X_{ij}} (j = 1, 2, ..., n) \]

(3) Influence coefficient (\( F_j \))

Influence coefficient refers to a national increase of one unit of end-use industries, the right of the national economy resulting from the production needs of industry, affect the degree of correlation coefficient, also known as backward. The formula is as follows:
\[ F_j = \frac{\sum_{i=1}^{n} b_{ij}}{\sum_{i=1}^{n} \sum_{j=1}^{n} b_{ij}} (i = 1, 2, ..., n) \]

Where: \( \sum_{i=1}^{n} b_{ij} \) Leontief inverse matrix for the first \( j \) columns sum; 
\[ \frac{1}{n} \sum_{i=1}^{n} \sum_{j=1}^{n} b_{ij} \] for the Leontief inverse matrix of columns and averages.
(4) Induction coefficient ($E_i$)

Induction coefficient means in the national economy, when all industries are adding a unit of final use, thereby subject to the needs of an industry level sensors, also known as prior to the correlation coefficient. The formula is as follows:

$$E_i = \frac{\sum_{j=1}^{n} b_{ij}}{\frac{1}{n} \sum_{i=1}^{n} \sum_{j=1}^{n} b_{ij}} (j = 1, 2, ..., n)$$

Where: $\sum_{j=1}^{n} b_{ij}$ for the Leontief inverse matrix of the first $i$ rows and;

$\frac{1}{n} \sum_{i=1}^{n} \sum_{j=1}^{n} b_{ij}$ for the Leontief inverse matrix of rows and average. When $E_i = 1$, it means that the first $i$th section’s degree of induction is equal to the social average level of induction.

3. Result and analysis

3.1 The input-output analyze of the producer services

In order to comprehend the important role the producer services play in the production, and to know the influence to the national economy development, it is necessary to calculate some indexes of the input-output product.

The test of the character of producer services and analyze of how the producer services promote the other manufactory. It is essential to calculate two indexes: intermediate consumption rate and the intermediate input rate.

3.1.1 Intermediate use rate

Intermediate use rate is a ratio, the numerator is intermediate use of the each section in the national accounts to the particularly section, while the denominator is the sum of the intermediate and final consumption. It can be seen that the two line charts as follows, which clearly illuminate to what extend the producer services industry is influenced by the change of national economy both in Beijing and the whole country.
Comparing the two charts, it is clear that the average level of the intermediate use rate for Beijing is almost two third of that for China. The biggest change happens in the integrated technical services section, and both Beijing and the whole country experience the same up-and-down journey. The most gently wave is the real estate section. Moreover, the intermediate use rate of all the sections of producer services
increased more or less, though most of them had a merely fluctuation during the past eight years. That is to say, the products from producer services are mainly used in the process of national manufactory, which is not in the final use of the circle of national economy. According to this point, the conclusion can be made reasonable: as intermediate product, the producer services section, which is mainly used in the process of national manufactory, has been turned to less influence by the whole economy fluctuation.

3.1.2 The intermediate input rate

The intermediate input rate is the ratio of the intermediate input to the total input. The total input is the sum of the intermediate input and the added value. It is obvious that the two line charts as follows, which clearly illuminate to that the factor to extend the producer services industry, the influenced by the change of national economy both in Beijing and the whole country.

![Chart 6: The Rate of intermediate input for Beijing producer services](image)

*Data from: Chinese Yearbook 2007*
Comparing the two charts, the average level of the intermediate use rate for China is almost at the same value level for Beijing. The biggest change happens in the integrated technical services section and social services section, but Beijing and the whole country have experienced different up-and-down journey, while the most gently wave is the posts and telecommunications section. Moreover, the intermediate input rate of producer services changed separately, though most of them had a merely fluctuation during the past eight years. That is to say, the products from most sections in the producer services are mainly used in the process of national manufactory, not in the final use of the circle of national economy. From this point, the conclusion can be made reasonable: the character of producer services section, which is mainly used in the process of national manufactory as intermediate product, increasing obviously.

### 3.1.3 Analyze the property of producer services

Calculate the intermediate demand rate and the intermediate input rate then draw a picture.
The Y-axis is intermediate input rate and the X-axis is intermediate demand rate.

Chart 8: The analyzing of the input-output in producer services

Data from: Chinese Yearbook 2007.

As the intermediate services to other sections, the total outputs of the producer services join the product process again. The intermediate use rate is the ratio of the output of them to the total output in the services sections. It reflects the character of producer services is as the mains production. View from the picture, the higher intermediate use rate grows, the more it denotes intermediate productions character. While the intermediate input rate can reflect the direct promotion of one section to other sections.

The definitions of the intermediate input rate and the intermediate output rate are similar; both of them reflect the character of the intermediate input production. Of course, not all the producer services like this. For instance, the mains of productions in real estate cause little wave in the product industry.

3.2 The correlate analyze of the producer services and other sections

In order to analyze the correlation between them, it is better to choose influence coefficient and induction coefficient.
3.2.1 The influence coefficient

The influence coefficient is also called backward correlation coefficient, it mainly reflect when add one unit final use in one section, the fluctuation in the product demand in other sections in the national economy. When some section’s influence coefficient is more than 1, it shows that this section can influence the national economy more powerful than the average level of all the sections’ influence. It is obvious that the two line charts as follows, which clearly illuminate to what extend the producer services industry influence the national economy both in Beijing and the whole country.

![Chart 9: Beijing producer services influence coefficient](image)

Data from: Chinese Yearbook 2007.
Comparing the two charts, the average level of the influence coefficient for China is almost two third of that for Beijing. The biggest change happens in the finance insurance in Beijing, and both Beijing and the whole country has experienced the same up-and-down journey. The most gently wave is the social science section. Moreover, the influence coefficient of producer services increased, though most of them had a merely fluctuation during the past eight years. That is to say, most sections in the producer services mainly influenced other sections in the process of national manufactory. From this point, the conclusion can be made reasonable: the producer services section, which is mainly used in the process of national manufactory as intermediate product, has turned to take gentle impact on the whole economy development.
3.2.2 The induction coefficient

The induction coefficient is also called forward correlation coefficient, it mainly reflect when add one unit final use in every section, the fluctuation in the product demand in one sections in the national economy. When some section’s induction coefficient is more than 1, it shows that this section can be influenced for each adding unit in GDP more than the average level of all the sections. The two line charts as follows, which clearly illuminate to what extend the producer services industry influence the national economy both in Beijing and the whole country.

![Chart 11: Beijing producer services induction coefficient](chart11.png)

*Data from: Chinese Yearbook 2007.*
Comparing the two charts, the average level of the intermediate use rate for China is almost the same for Beijing. The biggest change happens in the science research in China, and both Beijing and the whole country experience the same up-and-down journey, while the most gently wave is the integrated technical services section. Generally, the induction coefficient all the sections of producer services decreased more or less and was smaller than 1, though most of them had a merely fluctuation during the past eight years. That is to say, most sections in the producer services mainly fed the influence of fluctuation of national economy back less than the average level. From this point, the conclusion can be made reasonable: the producer services section, which is mainly used in the process of national manufactory as intermediate product, has endured little influence by the whole economy development.
4. Conclusion

It is easily to find out from the analyzing table, the forward correlate induction coefficient of products is very high, such as financial, insurance, real estate, comprehensive technology, information transformation, computer services, software and science study, which demonstrate that their developments depend much more on the demand of other sections. It proves that producer services play a role as intermediate input. Meanwhile, some parts in the producer services need to improve later which affect little by other products, such as rent and business services, traffic and transport services.

When refer to the backward correlate, it is better to use influence coefficient to estimate the contribution of the producer services to the whole products. The influence coefficient is low in China, which means the science technology does not play the important role in the product progress. At the same time, the influence coefficient of the information transform, computer, software, rent and business services are not high enough to drive other products.

The conclusion can be draw from the research on the develop progress of producer services and the states of the producer services now:
1. The producer services in China have developed for 30 years since early 1980s. Resent years, the useful information progress has been formed, which base on the development of the producer services. In 1982, the ratio that the producer services to the China’s GDP is less than 15%, but the number increases to 27.72% in 2006.
2. It is easily to find that the intermediate input rate and the intermediate demand rate are both high by analyzing the input-output table, which proves that producer services play a key role in the national economy development. However, it shows producer services does few affect on driving the national economy, the same to other sections in the economy system. Generally speaking, the producer services grow fast these years, but still not mature.
5. Reference


## Appendix

### Table 1 Intermediate Input Rate of Beijing

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<td>0.3412</td>
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### Table 2 Intermediate use Rate of Beijing

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### Table 3 Influence coefficient of Beijing

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<td>1.217</td>
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1 Data Source: Chinese yearbook 2007
Table 4 Induction coefficient of Beijing\(^2\)

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\(^2\) Data Source: Chinese yearbook 2007