The Global Value Chain Position of China's Service Industry

Empirical Analysis Based on Industry Heterogeneity

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Abstract. With the development of new technology, especially the wide application of modern information technology, the internal transformation and upgrading of the industry has been promoted, and new changes and trends have emerged in the international division of labor. The service industry is playing an increasingly important role in the division of labor in the global value chain. Based on the value-added data of the service industry in the TIVA database from 2005 to 2018, this paper uses fixed effect and random effect models to carry out regression analysis on traditional service industry, modern service industry and information technology-based service industry respectively. To analyze the impact of the transformation of the service industry driven by the progress of information technology on the division of labor in the global value chain of my country's service industry. The results show that: the traditional service industry has an inhibitory effect on the rise of the global value chain status; the modern service industry and the information technology-based service industry have a promoting effect. The application of information technology has improved the operational efficiency of China's service industry and won a better position for China in the global division of labor.

Keywords: Service industry value chain · Fixed effect · Random effects · Industry heterogeneity

1 Introduction

Since the 1990s, the international division of labor has undergone significant changes. And the global value chain division model has changed the allocation structure of product production. The accelerated reconstruction of global value chain is deeply affecting the development of service field. At the key node of the transformation from "industrial economy" to "service economy", the research on the measurement of the global value chain of service industry and value-added trade has attracted close attention of scholars.

Scholars use the trade value-added database, learn from the global value chain status index and export decomposition method to calculate the relevant indicators of service value-added, and make a comparative analysis at the national level [2, 4, 5] and the industrial level [1, 7]. Using the global value chain status index of Koopman et al. [3],

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this paper introduces the perspective of industry heterogeneity, and empirically studies the heterogeneous impact of each sub industry of the service industry on China's global value chain division status at the industrial level, which has certain practical significance for the optimization of China's service industry structure and the promotion of China's global value chain status.

2 Theoretical Analysis and Research Hypothesis

Based on the existing literature, combined with the service industry types divided according to the technological gradient in TIVA database, and considering the integration of data, this paper divides China's service industry into three categories: traditional service industry, modern service industry and information technology-based service industry. Traditional service industries mainly include: power, natural gas, water supply, sewage, waste and remediation services, wholesale and retail, automobile repair, transportation and storage, accommodation and catering services; Modern service industry mainly includes: real estate activities, services of other business departments, education, art, entertainment, recreation and other service activities; The information technology-based service industry mainly includes: information and communication, financial and insurance activities, human health and social work.

The traditional service industry currently referred to generally has two meanings: one is that the demand of this industry has existed widely before industrialization, and the other is that its mode of production has a certain tradition. Traditional service industries are mostly labor-intensive industries, with relatively little added value in the production process. They are at the low end of the value chain division of labor, lack of professionals and unreasonable resource allocation. Therefore, it is proposed:

Hypothesis 1: The traditional service industry has an inhibitory effect on improving the division of labor status of China's service industry in the global value chain.

With the development of economy and technology and the structural optimization of service industry, the traditional production mode has turned to the modern production mode by means of new business mode and service management mode. The development of modern service industry, especially the vigorous promotion of educational activities, has transformed China's huge population resources into high-quality labor force. China's modern service industry has many comparative advantages in technology, manpower and market, and can create more added value. Therefore, it is proposed:

Hypothesis 2: The modern service industry can promote the division of labor status in China's service industry's global value chain.

Information technology-based service industry, that is, high-end service industry, is the final direction of my country's service industry structure upgrade. With the advent of the big data era, the Internet has become an important tool for providing services [8]. The use of information technology has improved the production process of the service department to a certain extent [6], showing a high-end phenomenon of the service

industry dominated by knowledge technology intensive service industry. It has the characteristics of high technical content and high added value, and can promote China's modernization. Therefore, it is proposed:

Hypothesis 3: The information technology-based service industry can also promote the division of labor status in the global value chain of China's service industry.

3 Model Setting and Variable Description

3.1 Model Setting

In order to deeply analyze the heterogeneity of different types of service industry in China on GVC division of labor, this paper establishes the following model:

$$GVC\_Position_{it} = \alpha_0 + \alpha_1 ser_{it} + \alpha_2 X_{it} + v_t + v_i + \varepsilon_{it} \quad (1)$$

In the above formula, *GVC_Position* is the status index of a country in the division of labor in the global value chain, *ser* is the development degree of the service industry, which is the core explanatory variable of this paper, it is expressed by the proportion of the added value of the service industry in the total output value, i refers to different industries of the service industry, t refers to the year, X is the collection of control variables, v_t is the year specific effect, v_i is the industry specific effect, and ε_{it} is the random disturbance term. The explained variables and control variables are mainly described below.

3.2 Variable Description

3.2.1 Explained Variable

In the existing literature, the commonly used measurement indicators are the measurement indicators of global value chain division system and global value chain status index proposed by Koopman et al. [3]. This paper also selects this index to reflect the position of a country or an industry in the global value chain division system, and to a certain extent, it can also reflect the international competitiveness of a country or an industry. The calculation formula is as follows:

$$GVC\_Position_{ir} = \ln(1 + \frac{IV_{ir}}{E}) - \ln(1 + \frac{FV_{ir}}{E}) \quad (2)$$

$GVC\_Position_{ir}$ refers to the division of labor position of country r industry i in the global value chain. IV_{ir} refers to the indirect value-added export of industry i of country r, that is, the intermediate trade volume of an industry of the country exported to other countries. FV_{ir} represents the value of foreign imported intermediate goods included in the final product export of industry i of country r, E_{ir} represents the export volume of industry i of country r calculated by added value. Among them, the higher the value of $GVC\_Position_{ir}$, the higher the position of the industry in the division of global value chain.

3.2.2 Control Variable

In the model used in this paper, the set X of control variables is:

$$X_{it} = \beta_1 edu_{it} + \beta_2 K/L_{it} + \beta_3 OFDI_{it} + \beta_4 FDI_{it} + \beta_5 output_{it} + \beta_6 cap_{it} \quad (3)$$

edu_{it} indicates the level of education, the education level is expressed by the percentage of employed persons with college degree or above in urban units; K/L_{it} indicates the factor endowment structure, which is measured by the ratio of total fixed assets to employed persons; $OFDI_{it}$ indicates outward foreign direct investment; FDI_{it} means foreign direct investment; $output_{it}$ indicates the scale of the industry, measured by the total output of the industry; cap_{it} is the per capital output of the industry, which is measured by the ratio of the total output of each industry to the number of employees.

3.2.3 Data Sources

Using the value-added data from 2005 to 2018, this paper calculates the global value chain status index of China's service industry and the development degree of the core explanatory variable service industry. The added value data and total output data are from the TIVA database recently released by the organization for economic cooperation and development (OECD) and the World Trade Organization (WTO). The data on the proportion of personnel above junior college in all employed persons are from the statistical yearbook of China's population and employment; The data of foreign direct investment, foreign direct investment, total fixed assets formation and employment of urban units are from China Statistical Yearbook.

Among them, the foreign direct investment data of the financial industry in 2005 is missing, but the foreign investment data belongs to the key data of this paper. Therefore, grey prediction is used to solve this problem. In this paper, GM (1, 1) model is selected to predict the data in 2005, and a posteriori test is carried out. The accuracy of the model is good, so as to carry out the next analysis.

4 Empirical Analysis

According to the segmentation of service industry, this paper will conduct regression analysis on traditional service industry, modern service industry and information technology-based service industry respectively to analyze the impact of internal heterogeneity of service industry on the division of labor in China's service industry global value chain. According to the Hausman test results, modern service industry and traditional service industry reject the original hypothesis and choose the fixed effect model; The information technology-based service industry does not reject the original hypothesis and adopts the random effect model. The regression results are shown in Tables 1, 2 and 3.

Without the introduction of control variables, the regression result of the development level of the traditional service industry is −0.218. After gradually adding the control variable, the regression result is still negative, and the regression results basically pass

Table 1. Regression results of the impact of traditional service industry development level on service industry value chain position.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lnser	−0.218 (−1.59)	−0.099 (−2.07)	−0.131*** (−20.85)	−0.128*** (−18.97)	−0.127*** (−14.40)	−0.079* (−2.99)	−0.032 (−0.70)
lnedu		0.038*** (7.31)	−0.028*** (−9.62)	−0.027*** (−9.02)	−0.027*** (−8.45)	−0.036*** (−6.75)	−0.043*** (−6.46)
lnK/L			0.039*** (11.74)	0.040*** (11.26)	0.040*** (10.12)	0.032** (4.48)	0.030** (3.43)
lnOFDI				−0.001 (−0.63)	−0.001 (−0.60)	−0.003 (−1.68)	−0.003** (−3.30)
lnFDI					0.000 (0.72)	0.000 (0.29)	0.000 (0.34)
lnoutput						0.013* (2.55)	0.033* (2.50)
lncap							−0.020 (−1.82)
cons	0.276** (5.27)	0.132** (5.32)	0.191*** (32.01)	0.198*** (16.95)	0.197*** (18.43)	0.071 (1.49)	−0.039 (−0.38)
R^2	0.134	0.515	0.778	0.778	0.779	0.789	0.802
Year	Y	Y	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y	Y	Y

Table 2. Regression results of the impact of modern service industry development level on service industry value chain position.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lnser	0.287*** (10.55)	0.187* (3.17)	0.021 (0.25)	0.023 (0.26)	0.033 (0.64)	0.001 (0.01)	0.030 (0.42)
lnedu		0.066** (5.71)	−0.002 (−0.06)	−0.002 (−0.08)	−0.008 (−0.30)	−0.021 (−1.19)	−0.028 (−1.33)
lnK/L			0.019*** (6.17)	0.019** (4.57)	0.013* (2.80)	0.003 (0.75)	0.010 (1.33)
lnOFDI				0.000 (0.14)	−0.000 (−0.11)	−0.002 (−1.73)	−0.003 (−1.18)
lnFDI					0.002 (1.97)	0.001 (1.23)	0.002 (1.14)

(*continued*)

Table 2. (*continued*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
lnoutput						0.019*** (6.31)	0.023** (3.42)
lncap							−0.017 (−0.84)
cons	0.055** (4.22)	−0.147** (−3.29)	0.131 (1.00)	0.128 (0.88)	0.143 (1.20)	0.027 (0.40)	0.095 (0.74)
R^2	0.269	0.364	0.593	0.593	0.632	0.701	0.711
Year	Y	Y	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y	Y	Y

Table 3. Regression results of the impact of information technology-based service industry development level on service industry value chain position.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lnser	0.039** (2.24)	0.005 (0.49)	0.093*** (7.70)	0.102*** (8.65)	0.086** (2.45)	0.005 (0.11)	0.004 (0.08)
lnedu		0.025** (2.24)	0.012 (1.63)	0.011** (2.26)	0.011*** (2.78)	0.018*** (3.51)	0.016*** (4.01)
lnK/L			0.011*** (6.73)	0.011*** (4.91)	0.012*** (6.76)	0.006* (1.95)	0.006** (2.17)
lnOFDI				−0.001 (−0.49)	−0.003 (−1.09)	−0.005*** (−3.23)	−0.002*** (−5.24)
lnFDI					0.002 (0.83)	0.000 (1.40)	0.001* (1.66)
lnoutput						0.021** (2.55)	0.024*** (3.34)
lncap							−0.013*** (−3.39)
cons	0.176*** (22.34)	0.093* (1.94)	0.090*** (3.20)	0.096*** (4.66)	0.114*** (2.68)	−0.114 (−1.32)	−0.099 (−1.58)

the significance test. It shows that in recent years, the development of China's traditional service industry cannot improve the division of labor status in the value chain of China's service industry, but plays a significant inhibitory role. China's traditional service industry has developed in an extensive way for a long time, with unreasonable structure and low value-added rate. Therefore, the industrial development level within the traditional service industry cannot play a driving role in the division of labor in the value chain of China's overall service industry, so as to confirm hypothesis 1.

In contrast, China's modern service industry and high-end service industry combined with information technology, when no control variables are added, the regression coefficients of high-end service industry and modern service industry are positive, 0.039 and 0.287, respectively, and both pass the significance test. After gradually adding the control variables from columns (2) to (7), although the development degree coefficient of the service industry has changed, it still shows a significant role in promoting, indicating that improving the development level of China's high-end service industry and modern service industry has a positive impact on improving the division of labor position of China's service industry in the global value chain. Compared with the modern service industry, the promotion effect of high-end service industry is more obvious. It can be seen that the application of information technology has played a significant role in promoting the development of China's service industry. The empirical results show that vigorously developing high-end service industry and modern service industry is an important way to improve the value chain of China's service industry, so as to confirm hypothesis 2 and 3.

Among them, the industry scale indicators are significantly positive. Whether it is traditional service industry or modern and high-end service industry, the estimated coefficient of factor endowment K/L is relatively stable and significantly positive, indicating that improving the resource allocation ratio of capital and labor can effectively improve the division status of China's service sector. Most of the indicators representing human capital show a negative correlation, mainly because traditional industries are more labor-intensive industries, there is less demand for high-tech talents, and the absorption capacity of advanced technology is not strong. The investment of human resources cannot promote the division of labor status of traditional service industries.

Through the above analysis, it can be seen that modern service industry and high-end service industry can promote the position of China's service industry in the global value chain, and the promotion effect of high-end service industry is more obvious, while traditional service industry cannot promote because of its own limitations. It can be seen that the application of information technology not only improves the operation mechanism of China's service industry, but also has a higher technical service industry for China to earn a better position in the international division of labor.

5 Research Conclusions and Policy Recommendations

5.1 Model Setting

The main conclusions of this paper are as follows:

Due to the limitations of its own structure, resource allocation and value-added creation, traditional service industry has a significant negative effect on the division of labor in the global value chain of China's service industry.
Modern service industry has high added value and reasonable resource labor ratio, which has a significant positive effect on the division of labor status of China's service industry in the global value chain.

The information technology-based service industry has a significant positive effect on the division of labor in the global value chain of China's service industry. And its promotion effect is greater than that of modern service industry. It can be seen that the integration of information technology with other high-tech and service industries will help China gain a favorable position in international competition.

5.2 Policy Recommendations

Combined with the actual situation and external experience of the country, promote the transformation and upgrading of the traditional service industry, combine the digital fields such as information technology with the traditional service industry, and improve the innovation and science and technology of the traditional service industry, so as to promote the upgrading of the industry.

On the basis of retaining the original advantages of modern service industry, introduce emerging technologies, improve the human resource allocation of modern service industry, improve operation efficiency, provide more policy support and create a perfect market environment.

Enhance the adaptability between high-end service industry and high-tech industries such as information technology, improve talent training plan, increase investment guidance for high value-added service industry, form a trend of social attention and capital agglomeration, realize the transformation and upgrading of traditional service industry, and form a good trend of rapid development and scale expansion of modern service industry and high-end service industry.

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