

An Empirical Analysis of the Effect of FDI on the Industrial Structure of Productive Services in Qingdao City

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Abstract—With the advent of economic globalization, knowledge intensive productive services have ushered in new opportunities for development. Qingdao is one of the most economically developed cities in East China, and also a key city for foreign capital inflow. This paper first expounds the current situation of utilizing FDI in Qingdao's productive services. And the influence of FDI on the industrial structure of productive services in Qingdao is analyzed. Then the empirical analysis is used to analyze the above. Finally, it puts forward reasonable suggestions: guiding the direction of foreign investment to promote the upgrading of industrial structure of productive services in Qingdao.

Index Terms—FDI; industrial structure; productive services in Qingdao; empirical analysis

I. INTRODUCTION

Since China's entry into WTO, the economic exchanges between China and developed countries are more frequent. As one of the most economically developed coastal open cities in Shandong Province, Qingdao's growth rate of foreign direct investment is faster and faster. The focus of foreign direct investment is turning from the second industry such as industry, manufacturing, construction industry to service industry. And the productive service industry is the core of the whole service industry. The study of the influence of foreign direct investment on the industrial structure of Qingdao's productive service industry will contribute to the optimization and adjustment of its industrial structure^[1].

II. THE DEVELOPMENT STATUS OF FDI IN PRODUCTIVE SERVICES IN QINGDAO

On the whole, the total amount of foreign investment absorbed by productive services in Qingdao is reflected by the total number of FDI actually utilized. From the relevant statistical results, it is found that the total amount of FDI in Qingdao's productive service industry in 2010 and 2011 kept steady, suddenly rose sharply in 2012, decreased slightly in 2013, and then continued to rise, and the total amount of FDI in 2016 was more than 20 times higher than in 2010^[2]. The rising speed was increased firstly and then reduced to a stable level. In 2010, the rising rate of Qingdao's productive service

industry rose, and the growth rate in 2011 fell again and then stabilized.

From the internal segments of the industry, during the period of 2010 to 2016, the actual amount of FDI used in transportation, warehousing and postal services showed a sustained growth trend and remained stable for a long period of time. The actual amount of FDI used in information transmission, computer services and software industry decreased and then increased. The actual amount of FDI used in finance, leasing and business services decreased firstly and then increased^[3].

III. THE EFFECT OF FDI ON THE INDUSTRIAL STRUCTURE OF PRODUCTIVE SERVICES IN QINGDAO

The FDI of producer services has entered a positive industrial structure effect in Qingdao, and this effect can be realized from two ways, capital and talent.

In 2000, the productive service industry in Qingdao mainly took the traditional productive service industry such as transportation, storage and postal industry as the pillar, which accounted for 91% of the total added value of the productive service industry in Qingdao, while the market share of the modern productive service industry was negligible^[4]. After 2001, with the inflow of FDI in the productive service industry, the growth rate of modern productive service industry, such as computer service, is increasing gradually, and the growth rate is increasing year by year. By the end of 2016, the added value of services with modern production line in Qingdao accounted for more than half of the total value added in services^[5]. It can be seen that direct investment in capital has a significant contribution to upgrading the industrial structure of productive services in Qingdao.

From a talent point of view, the subsidiaries of foreign businessmen in Qingdao need a large number of labor, and they can only invest in the skills training of the local labor force with their advanced technical advantages and rich capital advantages. The labor force that obtained advanced technology through training gradually flowed into the modern productive service industry with higher salary and payment, which led to the optimization and upgrading of the industrial structure^[6].

IV. AN EMPIRICAL ANALYSIS OF THE EFFECT OF FDI ON THE INDUSTRIAL STRUCTURE OF PRODUCTIVE SERVICES IN QINGDAO

A. Variables Selection

By summarizing the relevant literature at home and abroad, and combining the above analysis, the economic variables closely related to the productive service industry in Qingdao can be selected. This paper takes the ratio of the added value of the modern productive service industry to the added value of the productive service in Qingdao as the explained variable, takes the actual use of foreign direct investment in Qingdao as the explaining variable, making an empirical analysis of the impact of FDI on the industrial structure of the productive service in Qingdao.

The ratio of the added value of modern productive service industry to the added value of the productive service industry in Qingdao (H): from the theoretical analysis of the effect of FDI on the productive service industry in Qingdao, it is clear that the effect of FDI on the industrial structure is very obvious. Through consulting related literature, it is found that the ratio of the added value of the modern productive service industry to the added value of the productive service can depict the change of industrial structure very well^[7].

B. Construction of Model

H and FDI are modeled in this paper, and the data variables is logarithmically treated to prevent heteroscedasticity. The variables processed are recorded as $\ln H$, $\ln FDI$ respectively. The model of variables construction after logarithmic processing is as follows:

$$\ln H = C + \alpha \ln FDI + \varepsilon \quad (1)$$

Among them, C is a constant term, and ε is a random error term, and α is a regression coefficient.

C. Data Source

In this paper, statistical data in the years from 1997 to 2016 are selected in time sequence as time series. The variable data are derived from the Chinese business Yearbook, Shandong statistical yearbook, and the Qingdao statistical yearbook. In order to eliminate the impact of price factors and to measure with the unity of measurement units, all the statistics are calculated in accordance with the exchange rate of RMB against US dollars published by the National Bureau of statistics in the same year. The specific values are shown in Table I

TABLE I, YEARLY DATA AND DATA AFTER LOGARITHMIC PROCESSING OF H AND FDI IN QINGDAO IN 1997-2016 (UNIT: BILLION YUAN)

years	H(%)	FDI	LNH	LNFDI
1997	9.79	1.52	2.28	0.42
1998	11.65	1.66	2.46	0.51
1999	12.79	1.79	2.55	0.58
2000	14.28	2.09	2.66	0.74
2001	16.33	2.33	2.79	0.85
2002	18.51	2.45	2.92	0.90
2003	19.64	2.49	2.98	0.91
2004	21.78	2.53	3.08	0.93
2005	23.87	2.65	3.17	0.97
2006	26.11	2.78	3.26	1.02
2007	30.09	2.98	3.40	1.09
2008	33.15	3.22	3.50	1.17
2009	37.22	3.65	3.62	1.29
2010	40.33	3.47	3.70	1.24
2011	41.78	3.37	3.73	1.21
2012	46.32	29.61	3.84	3.39
2013	51.07	45.60	3.93	3.82
2014	55.49	43.09	4.02	3.76
2015	60.11	51.02	4.10	3.93
2016	64.35	61.62	4.16	4.12

Data sources: Chinese business Yearbook, Shandong statistical yearbook, and the Qingdao statistical yearbook.

D. Empirical analysis process

In this paper, firstly, the ADF method is used to check the stationarity of H and FDI data by unit root test. Then Johansen cointegration method is used to test whether the linear combination is a stationary sequence, and EVIEWS8.0 is used as the measurement tool. But cointegration test can only test whether there is a stable linear correlation between the explanatory variables and the explanatory variables, and it cannot determine whether there is a definite causal relationship. Finally, the Grainger causality test method is used to test whether there is a causal relationship between the two. The specific test results are shown in Table 2

TABLE II. THE EMPIRICAL RESULTS OF THE IMPACT OF FDI ON THE INDUSTRIAL STRUCTURE OF PRODUCTIVE SERVICES IN QINGDAO

Unit root test results:						
variable	ADF	1% level	5% level	10% level	Prob.*	conclusion
LNFDI	0.0997	-3.8315	-3.0299	-2.6551	0.9569	Unstable
LNFDI(-1)	-3.8063	-3.8574	-3.0404	-2.6606	0.0111	stable
LNH	-2.7120	-3.8315	-3.0299	-2.6552	0.0903	Unstable
LNH(-1)	-4.7037	-3.8574	-3.0404	-2.6606	0.0018	stable
Cointegration test results:						
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05Critical Value	Prob.**	conclusion	
None*	0.5253	17.1351	14.2646	0.0171	There is a trace Cointegration relationship	
At most 1	0.1111	2.7079	3.8414	0.0999		
The result of Grainger causality test:						

Null hypothesis	lag time	F statistical value	probability	observation level	decision
LNFDI is not a Grainger cause of LNH	2	15.5824	0.0011	0.05	refuse
LNH is not a Grainger cause of LNFDI	2	0.7306	0.5138	0.05	accept

Note: the significant level of cointegration test is 0.05

From the results of unit root test in Table II, it can be found that the ADF values of LNFDI and LNH are all greater than 10% critical value, the probability is greater than 0.1, and there is a unit root. After the first order difference between the two, the ADF value is less than 5% critical value and the probability is less than 0.05, which indicates that LNFDI and LNH are first order unit root cointegration, and it can satisfy the condition of cointegration test. The cointegration test shows that there is a trace co integration relationship between LNFDI and LNH, indicating that there is a long-term and stable linear correlation between the two. The test results show that the optimal lag order is order 2, and the result of Grainger causality test shows that when the lag order is 2, the probability is 0.0011 less than the significant level 0.05, the null hypothesis that LNFDI is not the Grainger reason of LNH is rejected. Therefore, LNFDI is the Grainger reason of LNH, that is, the foreign direct investment is the cause of the change of productive service industry.

Since it has been concluded that there is a real interaction between LNFDI and LNH, and that LNFDI growth is the reason for LNH growth, we can get a long-term equilibrium relationship with the LNFDI as the independent variable and LNH as the dependent variable: $LNH = -1.622 + 0.127 * LNFDI$

The equilibrium expression indicates that the amount of attracting foreign direct investment in productive services in Qingdao increases 1%, it can lead to a 0.127% increase in the ratio of the added value of the modern productive service industry to the added value of the productive service industry in Qingdao, and there is a long-term stable relationship between the two variables.

V. CONCLUSIONS AND SUGGESTIONS

From the above empirical analysis process, it is true that FDI can promote the adjustment of the internal industrial structure of productive services in Qingdao^[8]. From the cointegration expression, it can be seen that the increase of FDI will cause the increase in the proportion of the added value of modern productive service industry to the added value of the productive service industry in Qingdao, and it has a great contribution to the upgrading and optimization of the industrial structure of the productive service industry in Qingdao^{[9] [10]}.

Therefore, the investment direction of foreign investment in Qingdao's productive service industry should be correctly guided to make the imported FDI as the greatest contribution to the optimization and upgrading of industrial structure. The main measures are:

On one hand, Qingdao municipal government should continue to formulate relevant industrial policies to rationally guide foreign investment into the modern productive service industry with relatively weak

development level^[11]. These industries can not only promote the optimization of the industrial structure of the productive service industry in Qingdao, but also promote the further development of related industries through the industrial association effect.

On the other hand, Qingdao municipal government should guide the modern productive service enterprises in Qingdao to make use of the technology spillover of foreign enterprises to improve their production and management level. And the government should also give these enterprises enough preference in terms of capital and human resources to alleviate the strong impact of foreign investment and promote the competitive power of modern productive service industry in Qingdao compared with foreign enterprises. The competitiveness can also increase the proportion of modern productive services in Qingdao, so as to achieve the purpose of upgrading and optimizing the industrial structure of productive services in Qingdao^{[12] [13]}.

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