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The impact of two-way FDI on the upgrading of China's industrial structure: Based on the research in Chongqing

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ABSTRACT

The improvement in the economic environment and the implementation of the "bring in and go global" strategy have had an impact on China's economic development and the optimization of its economic structure. The decline of Chongqing's traditional pillar industries has made the promotion of economic structure upgrading a key to economic development. The purpose of this paper is to study the role of two-way foreign direct investment (FDI) in industrial structure upgrading. This paper is designed to study the effect of outward foreign direct investment (OFDI) and inward foreign direct investment (IFDI) on the industrial structure upgrading from both theoretical and empirical perspectives. This study selects data from Chongqing from 1987 to 2022 and uses Stata 17.0 software for empirical analysis, based on Chenery's "standard structure" industrial change model. The research findings show that OFDI and IFDI have a significant positive impact on the intensification and servicification of Chongqing's industrial structure and are significant at the 0.01 level. OFDI and IFDI have a significant positive impact on the rationalization of Chongqing's industrial structure and are significant at the 0.05 level. This means that two-way FDI has a positive effect on the optimization of industrial structure. The practical implication of this study is that it provides a realistic basis for Chongqing to fully leverage the advantages of international direct investment and promote the optimization and upgrading of the industrial structure, which also has enlightening significance for China's economic structure reform.

Contribution/ Originality: This study investigates the impact of two-way FDI on the upgrading of industrial structure, contributing to guiding Chongqing in leading the upgrade of the industrial structure in the central and western regions of China. It complements the attention of this topic to the inland areas of China.

1. INTRODUCTION

China has entered a critical moment of economic development, and structural transformation is the lifeline for developing countries to achieve development (Khan, 2020). China's industrial development structure has improved in recent years, but the imbalance and unsustainability of economic development in various industries in China are still sharp. These two characteristics will become fundamental obstacles to the transformation of China's economic growth mode (Wang, Chen, Liao, & Zhang, 2020). Meanwhile, China is both the second largest recipient and provider of FDI globally. According to the official reports "Statistical Bulletin of China's Inward Foreign Direct" and "Statistical Bulletin of China's Outward Foreign Direct", in 2022, China's actual use of IFDI was $189.13 billion, an increase of 4.5% year-on-year; China's OFDI was $163.12 billion, a decrease of 8.8% from the previous year. In the future, the level of coordinated development of the two will continue to improve, better docking the domestic and international markets (Zheng, Zhuo, & Deng, 2022). Therefore, paying attention to and studying the

role of China's two-way FDI in industrial structure upgrading has enlightening significance for China's economic structure reform.

Chongqing is a typical example of China's unsustainable investment-driven economic growth. Since 2002, Chongqing's economy has maintained a growth rate of more than 10%; however, the growth rate slowed to 9.3% in 2017 and further dropped to 6.5% in 2018, lower than the national average (Lin, 2021), due to the decline in manufacturing and construction industries, and the lack of capacity and human capital required for transformation from manufacturing. The decline of traditional pillar industries requires Chongqing to adjust its industrial structure continuously and regard promoting economic structure enhancement as the key to economic development. OFDI and IFDI in Chongqing have shown a good development trend. Foreign trade and foreign direct investment constitute an integral component of Chongqing's economic framework. They significantly influence the industrial structure by facilitating the inter-sectoral transfer of capital and technology, thereby playing a pivotal role in the city's economic dynamics. In 2019, Chinese policy further reinforced Chongqing's exemplary status in the three major national strategies of Western Development, the Belt and Road Initiative and the Yangtze River Economic Belt. Therefore, empirical research taking Chongqing as an example, plays a significant role in regional development and the overall pattern of the country's opening up.

Setting against the backdrop of China's "bring in" and "go global" policies, this paper studies the impact of OFDI and IFDI on the enhancement of China's industrial structure. The main exploration of this research is how China should seize opportunities to solve the key issue of optimizing and upgrading the current industrial structure in the context of economic globalization. The paper uses Chenery's "Standard Structure" model to conduct an empirical study on the impact of bidirectional FDI on the enhancement of Chongqing's industrial structure. It compares the impact of OFDI and IFDI on the intensification, rationalization, and servicification of the industrial structure, to further study the impact of OFDI and IFDI on different dimensions of the industrial structure. This paper takes OFDI and IFDI as the main explanatory variables, with the degree of industrial structure upgrading as the dependent variable.

Based on a review of existing literature, this paper summarizes and analyzes theories on the impact of OFDI and IFDI on the upgrading of local industrial structures. Although many scholars have focused on this research question, there has yet to be a consensus at the theoretical and empirical levels. Most scholars believe that two-way FDI promotes the upgrading of the industrial structure. However, some scholars have found that two-way FDI has a negative impact on the industrial structure. Based on empirical results, this paper further supports the impact of OFDI and IFDI on the upgrading of China's industrial structure. The practical significance of this paper lies in its empirical examination, which reveals the impact of two-way FDI on the upgrading of Chongqing's industrial structure. This provides a realistic basis for China to explore the dual identity of host and investing countries, and to actively implement the "bring in" and "go global" strategy. This also provides a practical basis for China as a whole and its regions to leverage their advantages in FDI, promoting the optimization of industrial structures.

Upon reviewing existing literature, it is observed that studies on China's FDI and industrial structure upgrading are predominantly based on prosperous coastal regions such as the Yangtze River Delta and the Pearl River Delta. The applicability of these studies may be limited in the context of China's inland regions. This empirical study takes Chongqing as an example. Chongqing is one of the important central cities that the State Council approved. It is located at the junction of the "Belt and Road" and the Yangtze River Economic Belt and plays a leading and demonstrative role in China's "Western Development" strategy. Therefore, research based on Chongqing has unique and significant guiding significance for regional development and the overall pattern of opening up. To some extent, this complements the attention of this topic to China's inland regions, becoming a potential innovative point of this paper.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Two-Way FDI and Industrial Structure Upgrading

According to the IMF (The International Monetary Fund), FDI is characterized as a "cross-border investment" made by an investor who is "resident in one economy" but exercises control or exerts a significant degree of influence over the management of an enterprise that is "resident in another economy". It can be divided into two aspects based on the direction of investment. Outward foreign direct investment is scrutinized from the vantage point of the investing country, signifying the flow of capital from a home country to a foreign entity. Conversely, inward foreign direct investment is examined from the perspective of the host country, indicating the influx of foreign capital into the domestic economy. For ease of distinction and understanding, this study uses FDI to represent international direct investment, OFDI to represent outward foreign direct investment, and IFDI to represent inward foreign direct investment.

The theory of industrial structure has a long history, and William Petty first proposed it. He believed that the differences in national income and economic development levels among countries are attributed to differences in industrial structure. Industrial structure upgrading is an essential path for countries and regions to achieve technological progress and industrialization (Lin, 2021). This process involves the transfer of production factors from low-productivity industries to high-productivity industries, thereby promoting the development of other industries (Wang, 2023) such as the transition from labour-intensive growth to capital and knowledge technology-intensive growth. It is mainly manifested as the transition from the primary industry to the secondary and tertiary industries. This paper refers to the methods of Jing (2005); Gan, Zheng, and Yu (2011) and Wu (2008) using dimensions such as the intensification, rationalization, and servicification of the industrial structure to measure the dynamic changes in China's industrial structure. The specific indicators will be detailed in the fourth section.

2.2. The Impact of OFDI on the Upgrading of Industrial Structure

Foreign scholars began studying OFDI in developed countries earlier. Developed countries, relying on their technological and capital expansion advantages, started their development of foreign investment earlier than developing countries. As developing countries are becoming increasingly pivotal in the landscape of international investment, later scholars found that the early OFDI theories revolving around developed countries lacked explanatory power for developing countries. Some scholars have proposed new OFDI theories with developing countries as the research object.

Kojima (1978) proposed the "marginal industry expansion theory" in his study of Japan's actual industrial development situation. This theory emphasizes that the transfer of domestically developed lagging industries through foreign investment can release factor space for domestic industrial upgrading.

Dunning (1993) proposed the theory of strategic asset acquisition motivation for investment, arguing that the process of OFDI can not only utilize advantages but also build new competitive advantages for itself. Through global OFDI, the investing country acquires "strategic assets", thereby forming new competitive advantages, which play a more important strategic role in promoting the optimization of the mother country's industrial structure.

Caves (1974) conducted a comprehensive analysis of the externalities of IFDI technology spillover. He summarized that the realization process of the IFDI technology spillover effect is achieved through the competitive effect, demonstration effect, and imitation effect among enterprises. Tolentino (1993) proposed that developing countries can obtain advanced technology by investing in developed countries, thereby improving the technological innovation ability of the investing country's industrial development. Because the direction of technology spillover is opposite to the direction of international direct investment, scholars summarize the technology spillover effect of OFDI on the home country as the "reverse technology spillover theory".

Mathews (2006) took the multinational companies of many developing countries in the Asia-Pacific region as the research object and proposed the linkage-leverage-learning (LLL) framework for OFDI in southern countries. This empirical study found that emerging economies can participate in the globalization process, expand OFDI, enhance external "linkage", and adjust the industrial structure through the impact mechanisms of "leverage" and "economy learning".

However, a small number of scholars advocate that OFDI has a negative impact on the upgrading of the domestic industry. "Industrial hollowing out" emphasizes that large-scale OFDI will cause a shortage of capital for the development of the home country's industry, leading to the decline of the domestic industry's development, that is, the problem of industrial development hollowing out, which is not conducive to industrial optimization and upgrading. Cowling and Tomlinson (2003) focused on one of Japan's core manufacturing industries, the machinery industry. They found that the industry's foreign investment greatly impacted the home country's employment absorption capacity and investment creation level, leading to a decline in output and the decline of the core industry.

Through the analysis of existing literature, several theories provide a theoretical foundation for studying the impact of China's OFDI on industrial structure. These include the Strategic Asset Acquisition Motivation for Investment (Dunning, 1993) the Reverse Technology Spillover Theory (Caves, 1974; Tolentino, 1993) and the LLL Framework (Mathews, 2006). Furthermore, referring to the methods of Jing (2005); Gan et al. (2011) and Wu (2008) this paper uses intensification, rationalization, and servicification to measure the dynamic changes in China's industrial structure. Based on the mainstream theories, the following hypotheses are proposed:

H_1: OFDI has a positive impact on the intensification of the industrial structure.

H_2: OFDI has a positive impact on the rationalization of the industrial structure.

H_3: OFDI has a positive impact on the servicification of the industrial structure.

2.3. The Impact of IFDI on the Upgrading of Industrial Structure

Classic theories about the impact of IFDI on industrial structure are mostly based on the real-world observation of developing countries introducing international direct investment in the 20th century, analyzing the mechanism of the impact of developing countries' introduction of international direct investment on local industrial structure.

In 1968, Chenery analyzed the relationship between developing countries' use of foreign capital and economic growth. Generally speaking, every country has a "savings gap" and a "foreign exchange gap" in the early stages of development. Therefore, IFDI can fill the "savings gap" and "foreign exchange gap", promote the development of emerging industries, and increase national economic income. On this basis, James and Hirschman (1961) emphasized that developing countries have a "technology gap". These theories all believe that the gaps in developing countries cannot be filled in the short term by their development. By attracting foreign investment, they can fill the gap in advanced technology and high-level management talents and promote domestic industrial development.

Akamatsu (1962) through the post-World War II economic development and industrial structure upgrading process of East Asian countries, proposed the "Flying Geese Paradigm". Introducing high-quality IFDI drives the development of its related industries. It influences the adjustment and upgrading of the host country's industrial structure through ways such as improving the technological level of the industry (Korhonen, 1994).

Blomstrom and Wolff (1989) proposed the "technology spillover effect". Some market-seeking IFDI expands the original product market of developing countries. These IFDI form competition with the host country's original industry with advanced production technology and distribution channels, etc. IFDI "forces" the host country's enterprises to improve production technology and reduce production costs through the technology spillover effect, thereby improving the competitiveness of the host country's enterprises in the long term and promoting industrial structure upgrading. In addition, Blomstrom and Wolff (1989) tested the impact of Mexico's IFDI on its economic

development and industrial structure upgrading. The research conclusion shows that IFDI contributes to the intensification of the manufacturing industry structure.

A small number of Chinese scholars hold the opposite view, believing that IFDI "hinders" the upgrading of China's industrial structure. For example, Liu (2006) shows that IFDI has caused China's secondary industry to expand excessively, exacerbating the imbalance in the development of the industrial structure.

Several theories provide a theoretical basis for studying the impact of China's IFDI on industrial structure. These include the Gap Theory (Chenery & Strout, 1968; James & Hirschman, 1961) the Flying Geese Paradigm (Akamatsu, 1962; Korhonen, 1994) and the Technology Spillover Effect (Blomstrom & Wolff, 1989). Based on the mainstream theories, the following hypotheses are proposed:

H_4: IFDI has a positive impact on the intensification of the industrial structure.

H_5: IFDI has a positive impact on the rationalization of the industrial structure.

H_6: IFDI has a positive impact on the servicification of the industrial structure.

3. DATA AND EMPIRICAL STRATEGY

3.1. Econometric Model and Method

This paper adopts a quantitative method and uses Chenery's "Standard Structure" model of industrial change for empirical analysis to deeply explore the effects of Chongqing's two-way FDI on the upgrading of the industrial structure. The basic model is set as follows:

$$Upgrade_t = \alpha_0 + \alpha_1 FDI_{t-1} + \alpha_2 Open_t + \alpha_3 Indu_t + \varepsilon_t \quad (1)$$

In the model, the dependent variable upgrade represents the level of regional industrial structure development. The explanatory variables FDI represent OFDI or IFDI, respectively. Open and Indu are the control variables. The coefficients of each variable are represented by β, and ε is the random disturbance term. Here, t represents the data for the t-th year in Chongqing.

This paper aims to discuss the impact of two-way FDI on the enhancement of industrial structures, which refers to the overall improvement of industrial quality and efficiency. It not only includes the rationalization between industries, including the rational distribution of the three industries in the national economy, but also includes the technological intensification and servicification within the industry. This paper intends to measure the industrial structure upgrade in Chongqing from three dimensions: the intensification, the rationalization and the servicification of the industrial structure. Therefore, three additional indicators are introduced into the original model for comprehensive measurement: the hierarchy coefficient of the industrial structure (W), the Theil index (TL), and the ratio of the output value of the tertiary industry to the secondary industry (TS). FDI has a certain lag in its effect, so this paper studies FDI with a lag of one period. In addition, in order to reduce the negative impact of heteroscedasticity on the estimation results of the model, this paper adopts the method of Sun and Wang (2013) to take the logarithm of all non-ratio variables.

3.2. Sample Selection and Source

This paper selected data from Chongqing for the years 1987-2020 and conducted an empirical analysis. Firstly, the development of Chongqing plays a guiding role in China's development. Chongqing is one of the important central cities approved by the State Council, the economic centre of the upper reaches of the Yangtze River, an international comprehensive transportation hub, and a gateway to foreign openness. In 1983, Chongqing became the first city in the country to implement comprehensive economic system reform and separate planning. Secondly, the development of Chongqing plays a guiding role in the development of relatively underdeveloped areas in central and western China. It is the only municipality directly under the Central Government in central and western China, playing a leading and exemplary role in China's "Western Development" strategy.

Overall, research based on Chongqing has unique and important guiding significance in the national regional development and foreign opening pattern. It is located at the junction of the "Belt and Road" and the Yangtze River Economic Belt. The development of Chongqing will further stimulate China's opening potential, which is expected to change the global trade pattern and bring rare opportunities to the western part of China and even the countries and regions along the 'Belt and Road'.

The data comes from the Chongqing Statistical Yearbook from 2000 to 2023. Under the guidance of the open-door policy in 1979, China made significant reforms to its original foreign trade system, promoting the development of Chongqing's foreign economic trade. Considering that the statistics of Chongqing's import and export value started in 1987, the selected years for the data are from 1987 to 2022.

3.3. Variables

3.3.1. Dependent Variables

3.3.1.1. Intensification of Industrial Structure

Referring to the method of Jing (2005) this paper uses the hierarchy coefficient of the industrial structure to measure the intensification of Industrial Structure. This formula assigns weights according to the level of the three industries and then sums up the weighted proportions of the output value of the three industries.

$$W = \sum_{i=3}^{3} y_i \times i \quad (2)$$

"y_i" represents the output value proportion of the i-th industry. The larger the W, the larger the structural hierarchy coefficient of the region, indicating a higher level of industrial structure intensification.

3.3.1.2. Rationalization of Industrial Structure

The rationalization of the industrial structure refers to the quality of coordinated and rational development between industries, realizing the process of rational distribution of production factors among industries. It not only reflects the degree of coordinated development between industries but also indirectly reflects the distribution and utilization efficiency of resources. Gan et al. (2011) pointed out that the Theil index (TL) is also a good indicator for measuring the rationalization of the industrial structure. The TI was first proposed in 1967 to measure the income gap between individuals or regions using the concept of entropy. The calculation formula is as follows:

$$TL = \sum_{i=1}^{n} \left(\frac{Y_i}{Y}\right) ln\left(\frac{Y_i}{L_i} / \frac{Y}{L}\right) \quad (3)$$

In this context, "Y_i" represents the output value of the i-th industry, and "L_i" represents the number of employees in the i-th industry. The TL takes into account the relative weights of different industries in its calculation. In a balanced state, TL=0. However, in the actual economic operation process, economic imbalance is rather a norm. The larger the TL value, the greater the deviation of the industrial structure from the balanced state; The smaller the TL value, the smaller the deviation of the industrial structure from the balanced state.

3.3.1.3. Servicification of Industrial Structure

This paper refers to Wu (2008). It uses the ratio of the output value of the tertiary industry to the secondary industry (TS) as a measure of the intensification of the industrial structure.

$$TS = \frac{Y_3}{Y_2} \quad (4)$$

In this context, "Y_2" and "Y_3" represents the output value of the secondary industry and tertiary industry. This indicator can reflect whether the industrial structure of Chongqing is developing in the direction of "servicification". If the SI value is rising, it means that the economy is advancing towards servicification.

3.3.2. Independent Variables

3.3.2.1. OFDI

This paper uses the flow of OFDI to measure the changes in Chongqing's OFDI. This refers to the economic activities centred on the control of the operation and management rights of foreign (territorial) enterprises by investors within China, which is reflected in one economy achieving its long-term interest goals by investing in another economy.

3.3.2.2. IFDI

This paper uses the Realized FDI Value to measure the degree of change in Chongqing's IFDI. This refers to foreign investors investing in China by setting up foreign-invested enterprises and partnership enterprises, jointly exploring resources with Chinese investors, and setting up branches.

3.3.3. Control Variable

3.3.3.1. Open

The policy of economic openness has had a profound impact on the economic development of our country. The level of openness affects the regional industrial structure through its impact on trade outcomes. This paper measures the level of openness by the ratio of the total amount of imports and exports in the region to the GDP.

3.3.3.2. Indu

The process and level of industrialization directly affect the technical resources and industrial structure of the region. This paper measures the level of industrialization by the proportion of the total value of industrial production in each region to the GDP.

4. ANALYSIS OF THE FDI AND INDUSTRIAL STRUCTURE IN CHONGQING

4.1. Overview of Two-Way FDI in Chongqing

Chongqing has conformed to the trend of economic globalization, fully integrated into the national development and opening strategies. China's ability to lead and drive openness in the western region has significantly increased, making new contributions to promoting the formation of a land-sea internal and external linkage, as well as a two-way mutual aid opening pattern from east to west. Chongqing's FDI has achieved rapid development, providing new momentum for the development of Chongqing's economy and the transformation and upgrading of the industrial structure.

From 1987 to 2017, Chongqing's OFDI increased from 5.72 million USD to 1,530.18 million USD, showing a continuous upward trend. However, starting in 2017, Chongqing's OFDI declined, reaching a periodic trough of 737.99 million USD in 2019. The reason for this may be related to China's policies. In 2017, the Chinese government tightened its foreign investment policies, regulating the foreign investment behaviour of Chinese enterprises, aiming to effectively promote the healthy and orderly development of OFDI. It can continuously optimize the structure of foreign investment, and push the real economy, innovation field, and high-tech industries towards the world stage. It can be seen that after 2019, Chongqing's OFDI has rebounded, reaching 1,062.70 million USD in 2022.

From 1985 to 2011, Chongqing's IFDI increased from 4.27 million USD to 5,825.75 million USD, showing a continuous upward trend. However, after 2011, Chongqing's IFDI overall showed a downward trend, dropping to 1,857.44 million USD in 2022.

The possible reason is that around 2011, the production costs of Chinese enterprises rose, and labour shortages and wage levels increased. These factors led to a decrease in China's attractiveness to FDI. Subsequently, the

reasons for the decline in Chongqing's IFDI are relatively complex. Possible reasons are that the international investment environment is not optimistic, and the flow of IFDI globally has declined. In addition, the adjustment of the global supply chain and industrial chain, under the influence of geopolitics and the game of great powers, and the new rules of international investment may weaken China's attractiveness to FDI.

Statistics on the use of foreign capital in Chongqing in 2022 found that Chongqing's actual use of foreign capital is concentrated in "Manufacturing", "Leasing and Business Services", "Wholesale and Retail Trades" and "Information Transmission, Computer Services and Software", accounting for 24.8%, 22.7%, 21.9%, and 14.2% of the actual use of foreign capital, respectively.

It can be seen that Chongqing's actual use of foreign capital is concentrated in the tertiary industry, accounting for as much as 74.4%. This indicates that the industry structure of Chongqing's actual use of IFDI is constantly being optimized and upgraded.

4.2. Overview of Chongqing's Industrial Structure

Table 1 shows the previous study of OFDI and IFD, Table 2 shows the structure of output value and employment of the three industries in Chongqing since 1987. Y_1, Y_2, and Y_3 represent the proportion of output value of the three industries, respectively, and X_1, X_2, and X_3 represent the proportion of employment structure of the three industries, respectively.

From the perspective of industrial structure, the proportion of output value of the primary industry is small, and the trend is continuously declining, decreasing from 30% to 7%. The proportion of the secondary industry changes slightly, showing a trend of fluctuating around 45% and then decreasing. The tertiary industry develops rapidly, with the fastest growth, increasing from 26% in 1987 to 53% in 2022. As indicated in the Table 2, there is a consistent shift in the total output value of Chongqing from the primary sector towards the secondary and tertiary sectors, with a particularly notable increase in the tertiary sector. This is in line with the basic law presented in the process of economic development. From the perspective of employment structure, the proportion of employment in the primary industry has significantly decreased, from 50% to 24%. The reasons for this include not only the decline in the proportion of output value of the primary industry, but also factors such as the improvement of agricultural technology.

The employment of the secondary industry is relatively stable, and the trend of change is similar to the change in the proportion of output value. The tertiary industry's absorption of employment is continuously rising, reaching 51% in 2022, with a faster development speed, absorbing more surplus labour released by the primary industry.

Table 1. Summary of literature review.

Definition and theories	Study
OFDI&IFD	FDI (The international monetary fund)
Industrial structure upgrading	Intensification of the industrial structure (Jing, 2005)
	Rationalization of the industrial structure (Gan et al., 2011)
	Servicification of the industrial structure (Wu, 2008)
The impact of OFDI on the upgrading of industrial structure	Marginal industry expansion theory (Kojima, 1978)
	Strategic asset acquisition motivation for investment (Dunning, 1993)
	Reverse technology spillover theory (Caves, 1974; Tolentino, 1993)
	LLL framework (Mathews, 2006)
	Industrial hollowing out theory (Cowling & Tomlinson, 2003)
The impact of IFDI on the upgrading of industrial structure	Gap theory(Chenery & Strout, 1968; James & Hirschman, 1961)
	Flying Geese Paradigm (Akamatsu, 1962; Korhonen, 1994)
	Technology spillover effect (Blomstrom & Wolff, 1989)
	Over-expansion of the secondary industry (Liu, 2006)

Table 2. Output value and employment of the three industries in Chongqing since 1987.

Year	Y_1	Y_2	Y_3	X_1	X_2	X_3
1987	30	44	26	71	17	12
1988	29	45	26	70	17	13
1989	27	45	28	70	17	13
1990	31	41	28	70	17	13
1991	29	41	30	70	17	13
1992	25	42	32	67	17	16
1993	23	45	32	66	17	17
1994	23	45	31	61	17	21
1995	23	44	33	60	18	22
1996	22	43	35	58	19	23
1997	20	43	37	58	18	24
1998	19	42	39	57	18	25
1999	17	42	41	56	17	26
2000	15	43	42	55	17	27
2001	14	43	43	54	18	28
2002	14	43	43	52	18	30
2003	13	45	43	50	19	32
2004	14	46	41	48	19	33
2005	13	45	42	47	19	34
2006	10	48	42	46	20	35
2007	10	47	43	45	20	35
2008	9	45	46	44	21	36
2009	9	45	46	42	22	36
2010	8	45	47	39	23	38
2011	8	45	47	36	25	40
2012	8	46	47	33	26	41
2013	7	46	47	31	28	41
2014	7	46	47	28	28	43
2015	7	45	48	27	29	45
2016	7	43	50	25	29	46
2017	6	42	52	24	28	48
2018	6	41	53	23	27	50
2019	7	40	54	23	26	51
2020	7	40	53	23	25	52
2021	7	40	53	22	26	52
2022	7	40	53	24	25	51

Intuitively, it can be seen that Chongqing's industrial structure is continuously optimized and upgraded, moving from the secondary industry to the tertiary industry. However, the upgrade speed is still relatively slow. Compared with the industrial hierarchy coefficient calculated from the employment structure, the output value coefficient is higher. This indicates that although the output value of the second and third industries in our country has risen, their ability to absorb employment is still weak. However, from 1987 to 2022, the gap between the two values has been narrowing, indicating a trend of increasing ability to absorb employment.

As shown in Table 3 the rationalization level of Chongqing's industrial structure has been fluctuating between 0.3 and 0.4 from 1987 to 2006. However, Chongqing's TL value has maintained a clear downward trend, from 0.362 in 2006 to 0.120 in 2022. It indicates that the deviation of the industrial structure from the balanced state is decreasing, and the degree of rationalization of the industrial structure is increasing. Overall, Chongqing focuses on the coordinated development of industries and continuously optimizes its industrial structure. Compared to other provinces in China, the proportion of the secondary industry in Chongqing is relatively high. This may be because Chongqing is one of China's important old industrial bases. The impact of COVID-19 on Chongqing's industrial development was relatively low.

Table 3. Chongqing's TL from 1987 to 2022.

Year	TL	Year	TL	Year	TL
1987	0.348	1999	0.352	2011	0.236
1988	0.363	2000	0.366	2012	0.206
1989	0.400	2001	0.362	2013	0.181
1990	0.335	2002	0.343	2014	0.168
1991	0.348	2003	0.340	2015	0.149
1992	0.373	2004	0.309	2016	0.127
1993	0.385	2005	0.299	2017	0.127
1994	0.330	2006	0.362	2018	0.122
1995	0.295	2007	0.340	2019	0.113
1996	0.297	2008	0.318	2020	0.108
1997	0.314	2009	0.308	2021	0.106
1998	0.334	2010	0.276	2022	0.120

However, looking at the data from 1987 to 2022, the proportion of the tertiary industry has significantly increased, showing a trend of coordinated industrial development. Chongqing insists on making economic structural adjustments as the key to transformational development, vigorously developing high-tech industries and the tertiary industry. Among them, Chongqing's financial industry has achieved rapid growth. From 2010 to 2022, Chongqing's financial industry achieved rapid growth, with the financial industry's share of GDP rising from 6.68% in 2010 to 8.55% in 2022. This may have brought Chongqing a strong ability for coordinated development between industries, and the level of rationalization of the industrial structure continues to grow.

Considering the great impact of the information technology revolution on the industrial structure of major industrialized countries, there has been a trend towards "economic servitization". This is one of the important features in the upgrade of modern industrial structures. A salient feature of the "economic servitization" process is that the growth rate of the tertiary sector outpaces that of the secondary sector (Wu, 2008). From the data, it can be seen that the industrial development of Chongqing from 1987 to 2022 conforms to this fact.

Table 4 shows that from 1987 to 2001, the TS value of Chongqing showed an upward trend, rising from 0.587 to 1.005. However, from 2001 to 2014, the level of servitization development in Chongqing was slow, and the development process was somewhat tortuous. From 2014 to 2019, the level of servitization of Chongqing's industrial structure rose from 1.012 to 1.348 in 2015. Among them, the service industries such as wholesale and retail, finance and information technology services maintained rapid growth, playing a pivotal role in fostering the intensification of Chongqing's industrial structure.

Table 4. Chongqing's TS from 1987 to 2022.

Year	TS	Year	TS	Year	TS
1987	0.587	1999	0.975	2011	1.049
1988	0.584	2000	0.990	2012	1.019
1989	0.633	2001	1.005	2013	1.018
1990	0.676	2002	1.005	2014	1.012
1991	0.719	2003	0.961	2015	1.077
1992	0.769	2004	0.895	2016	1.162
1993	0.714	2005	0.920	2017	1.222
1994	0.692	2006	0.879	2018	1.286
1995	0.743	2007	0.923	2019	1.348
1996	0.806	2008	1.015	2020	1.331
1997	0.849	2009	1.012	2021	1.332
1998	0.927	2010	1.046	2022	1.319

However, the TS value showed a slight downward trend from 2019 to 2022. The relatively slow development of the tertiary industry may be due to the impact of COVID-19. For example, in 2022, the added value of larger transportation, warehousing, and postal services decreased by 0.9%. In response to this, the Chongqing government has fully implemented economic measures to enable the service economy to overcome the impact of local epidemic outbreaks, frequent extreme weather, and other unexpected factors, overall presenting a stable recovery trend in the tertiary industry.

5. EMPIRICAL FINDINGS

As can be observed from Table 5 the value interval of W is between [1.954, 2.471], with a standard deviation of 0.166. The value interval of TL is between [0.106, 0.400], with a standard deviation of 0.0970. The value interval of TS is between [0.584, 0.788], with a standard deviation of 0.215. This suggests that these three indicators are relatively stable in their development overall. The value interval of LnOFDI is between [6.349, 11.94], with a standard deviation of 1.605. The value interval of LnIFDI is between [5.805, 13.28], with a standard deviation of 1.964. As these two indicators share the same unit, the descriptive statistical results indicate that the development of IFDI is more pronounced in terms of quantity compared to OFDI.

Table 5. Descriptive statistics.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Min	p25	p50	p75	Max	Mean	SD
W	1.954	2.113	2.298	2.399	2.471	2.269	0.166
TL	0.106	0.175	0.312	0.348	0.400	0.274	0.097
TS	0.584	0.788	0.983	1.048	1.348	0.958	0.215
LnOFDI	6.349	8.065	9.311	11.27	11.94	9.591	1.605
LnIFDI	5.805	10.13	10.78	12.47	13.28	10.85	1.964
Open	0.0530	0.0810	0.104	0.236	0.401	0.149	0.095
Indu	0.278	0.352	0.366	0.379	0.408	0.358	0.037

The mean of the data being greater than the standard deviation indicates that the overall data is relatively stable. The Variance Inflation Factor (VIF) was tested, and the results were all less than 10. The average VIF is 2.21. This estimate suggests that there is no multicollinearity, indicating that the variable selection is reasonable.

As shown in the Table 6 the regression results of models 1 and 2 indicate that for every unit increase in the explanatory variable OFDI, the W index increases by an average of 0.115 units.

Table 6. Regression statistics.

Variables	-1	-2	-3	-4	-5	-6
	W	W	TL	TL	TS	TS
LnOFDI	0.115***		-0.012**		0.097***	
	(10.36)		(-2.13)		(8.79)	
Indu	-0.547*	-1.500***	1.033***	1.132***	-3.217***	-4.004***
	(-1.70)	(-5.07)	(6.30)	(7.46)	(-10.09)	(-16.67)
Open	-0.547***	-0.002	-0.515***	-0.569***	-0.571***	-0.157
	(-3.13)	(-0.02)	(-5.78)	(-8.03)	(-3.30)	(-1.40)
LnIFDI		0.064***		-0.007**		0.058***
		(10.49)		(-2.23)		(11.61)
Constant	1.446***	2.111***	0.097	0.029	1.269***	1.791***
	(8.25)	(15.83)	(1.08)	(0.43)	(7.30)	(16.56)
Observations	36	36	36	36	36	36
R-squared	0.902	0.904	0.926	0.927	0.943	0.963

Note: t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

For every unit increase in the explanatory variable IFDI, the W index increases by an average of 0.064 units. The coefficients of the industrial structure upgrading effect of OFDI and IFDI are significantly positive at the 1% significance level. This empirical result indicates that two-way FDI has a significant promoting effect on the intensification of Chongqing's industrial structure. Hypotheses H1 and H4 of this paper are verified.

Table 7. Ordered logit statistics.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	W	W	TL	TL	TS	TS
LnOFDI	9.075***		-0.668*		4.408***	
	(1.806)		(0.399)		(0.834)	
Indu	-112.763***	-157.698***	80.772***	86.334***	-205.032***	-286.907***
	(27.259)	(32.979)	(19.055)	(19.456)	(40.161)	(52.735)
Open	-0.708	22.667***	-29.281***	-31.532***	-15.129**	-1.040
	(9.574)	(8.356)	(9.811)	(9.708)	(6.800)	(5.692)
LnIFDI		4.845***		-0.476**		3.462***
		(1.063)		(0.206)		(0.617)
N	36.000	36.000	36.000	36.000	36.000	36.000
r2_p	0.515	0.459	0.260	0.270	0.452	0.506

Note: t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1.

As the Table 7 presents, regression results of models 3 and 4 show that for every unit increase in the explanatory variable OFDI, the TL index decreases by an average of 0.012 units. For every unit increase in the explanatory variable IFDI, the TL index decreases by an average of 0.007 units. The coefficients of the industrial structure rationalization effect of two-way FDI are negative at the 5% significance level. Considering that the smaller the TL value, the smaller the deviation of the industrial structure from the equilibrium state, this empirical result indicates that OFDI and IFDI have a significant promoting effect on the rationalization of Chongqing's industrial structure. Hypotheses H2 and H5 of this paper are verified.

The regression results of models 5 and 6 indicate that for every unit increase in the explanatory variable OFDI, the TS index increases by an average of 0.097 units. For every unit increase in the explanatory variable IFDI, the TS index increases by an average of 0.058 units. The coefficients of the industrial structure servitization effect of two-way FDI are significantly positive at the 1% significance level. This empirical result indicates that two-way FDI has a significant promoting effect on the servitization upgrade of Chongqing's industrial structure. Hypotheses H3 and H6 of this paper are verified. This may be because two-way FDI has a positive promoting effect on the development of modern service industries such as finance in Chongqing, which provides momentum for the development of the servitization of Chongqing's economic structure.

Overall, the industrial structure upgrading effect of OFDI is significantly larger than that of IFDI. Comparing absolute quantities, the growth of IFDI far exceeds OFDI. However, OFDI has a greater marginal effect on the enhancement of industrial structure. This may be due to the rapid development of labour-intensive and technology-intensive industries in Chongqing. Empirical research that there is a close connection between OFDI and industrial structure adjustment, and this effect is more pronounced in labour-intensive and technology-intensive industries.

The OLS regression results in this chapter indicate that actively carrying out FDI can promote the upgrading of Chongqing's industrial structure. Moreover, OFDI has shown a more prominent role in this process. This suggests that encouraging and facilitating both inward and outward foreign direct investments could be a strategic approach for further industrial development in Chongqing.

5.1. Robustness Check and Further Analysis

To ensure the reliability of the regression results, this paper intends to further test the results using the ordered logit method. The table reports the results of the robustness test, and the relatively consistent empirical results illustrate the robustness of the conclusion. Both OFDI and IFDI have a positive impact on the W and TS, being significant at the 0.01 level. OFDI and IFDI have a negative impact on TL, significant at the 0.1 and 0.05 levels respectively.

Compared to the results of the OLS regression, only the significance level of the negative impact of OFDI on TL has slightly decreased, but it remains statistically significant. It may be because the data type is more in line with the linear regression model. Overall, the consistency between the ordered logit and OLS results indicates that the empirical results of this study are robust. It means that OFDI and IFDI promote the intensification, rationalization, and servitization of Chongqing's industrial structure.

It can be seen that OFDI has promoted the intensification, rationalization, and servitization of Chongqing's industrial structure. This may be related to the long-term effect of OFDI on the industrial structure. This result is in line with expectations and the viewpoint of the "reverse technology spillover theory".

At the same time, IFDI also0 Among them, China's OFDI's long-term contribution to the development of the industrial structure is more significant than IFDI. This may be because, in the early stage of attracting investment, IFDI's promotion of the industrial structure is not significant in the short term. Zou and Han (2013) proposed that in the early stage of attracting investment, multinational companies invest in low-added-value manufacturing industries in China, making full use of local natural resources and labour to process and produce finished products directly. This may promote China's economic development, but it does not promote the optimization of China's industrial structure. However, as the domestic investment threshold increases, the development model of IFDI gradually changes from "quantity" type to "quality" type. This shows China's IFDI's promotion effect on the development of the industrial structure, which shows an upward trend (Jia, Han, & Zou, 2014).

In the context of economic transformation, promoting the development of the industrial structure is a key point for the high-quality development of China's economy. This paper reviews and sorts out relevant literature, and analyzes the mechanism of two-way FDI development to affect the industrial structure. In addition, this paper incorporates Chongqing's two-way FDI and industrial structure into the "standard structure" model at the same time, verifying the impact of FDI on the upgrading of the industrial structure. This provides insights for the economic transformation of China especially the central and western regions of China.

There is the theory of "industrial hollowing out" and empirical research on IFDI exacerbating the imbalance of China's industrial structure development by promoting the development of the secondary industry. The research results of these scholars showed strong opposition. They show that this research topic has not reached a consensus.

Therefore, this paper empirically analyzes the impact of OFDI and IFDI on the enhancement of Chongqing's industrial structure. The data analysis is performed using STATA 17.0. The main findings of the study are as follows: Both OFDI and IFDI have a significant positive impact on the enhancement of industrial structure, and both are significant at the 0.01 level. Both OFDI and IFDI have a significant positive impact on the rationalization of industrial structure, and both are significant at the 0.05 level. Both OFDI and IFDI have a significant positive impact on the servitization of industrial structure, and both are significant at the 0.01 level. That is, two-way FDI has promoted the enhancement of industrial structure.

6. LIMITATION AND RECOMMENDATIONS

First, the quantitative indicator of FDI is flow, which only represents its quantity change. The quality of FDI has not been taken into consideration, which may lead to the neglect of the structure of FDI. Second, many factors influence the development of economic structure. The selection of control variables was based on previous studies.

However, different scholars have different views on control variables, which makes it difficult to avoid errors in this study.

First, we should fully recognize the important role of FDI in Chongqing and other central and western regions. With the gradual deepening of reform and opening up, China has become an important player in FDI, simultaneously assuming the dual identity of host country and investing country. In this context, while China values and guides the two-way FDI of the entire country, it should also strengthen the promoting effect of FDI in the industrial structure in the less developed central and western regions. Second, we should pay attention to quantity and quality. Encouraging enterprises in new energy and high-tech industries to carry out OFDI actively is important. This can be achieved by transferring domestic overcapacity and opening up international markets. According to the "reverse technology spillover theory", high-quality OFDI can promote domestic, independent innovation and technological progress and promote long-term economic development. Besides, introducing more technology-type IFDI can optimize the industrial structure through the "technology spillover effect" and improve the domestic independent innovation capability. This can fully play the supporting role of high-quality elements in the transformation of high-end industries. Third, the government should continue to strengthen macro-service functions and carry out legislative work related to FDI. This can provide effective policy support and a legal environment for enterprises to "go global" and "bring in". Especially for places in the central and western regions of China where the level of economic development is low, the government should strengthen infrastructure construction, strengthen technical guidance and policy preferences, establish regional assistance industrial development mechanisms, and improve the overall economic environment of the region.

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REFERENCES

Akamatsu, K. (1962). A historical pattern of economic growth in developing countries. *Developing Economies*, *1*(s1), 3–25. https://doi.org/10.1111/j.1746-1049.1962.tb00811.x

Blomstrom, M., & Wolff, E. N. (1989). Multinational corporations and productivity convergence in Mexico. Retrieved from NBER Working Paper Series. No. 3141:

Caves, R. E. (1974). Multinational firms, competition, and productivity in host-country markets. *Economica*, *41*(162), 176–193. https://doi.org/10.2307/2553765

Chenery, H. B., & Strout, A. M. (1968). Foreign assistance and economic development: Reply. *The American Economic Review*, *58*(4), 912–916.

Cowling, K., & Tomlinson, P. R. (2003). The problem of regional hollowing out in Japan: Lessons for regional industrial policy. *Urban and Regional Prosperity in a Globalised Economy*, *7*, 33-58. https://doi.org/10.4337/9781781951217.00014

Dunning, J. H. (1993). *Multinational enterprises and the global economy*. Wokingham: Addison-Wesley.

Gan, C., Zheng, R., & Yu, D. (2011). The impact of China's industrial structure change on economic growth and fluctuation. *Economic Research*, *46*(05), 4-16.

James, E., & Hirschman, A. O. (1961). The strategy of economic development. *Revue Economique*, *12*(3), 514-515.

Jia, N., Han, Y., & Zou, J. (2014). The upgrading effect of china's bidirectional fdi on industrial structure: Theoretical mechanism and empirical test. *International Trade*, *10*(11), 109-120.

Jing, X. (2005). Industrial structure upgrading and economic growth - an empirical analysis of the Yangtze river delta region. *Journal of Nantong University (Social Science Edition)*, *10*(3), 51-55.

Khan, M. A. (2020). Cross sectoral linkages to explain structural transformation in Nepal. *Structural Change and Economic Dynamics*, *52*, 221-235. https://doi.org/10.1016/j.strueco.2019.11.005

Kojima, K. (1978). *Direct foreign investment: A Japanese model of multinational business operations*. London: Croom Helm.

Korhonen, P. (1994). The theory of the flying geese pattern of development and its interpretations. *Journal of Peace Research*, *31*(1), 93-108. https://doi.org/10.1177/0022343394031001008

Lin, J. Y. (2021). Catch-up industrial policy and economic transition in China. *World Economy*, *44*(3), 602–632. https://doi.org/10.1111/twec.13046

Liu, Y. (2006). Foreign direct investment and empirical analysis of China's industrial structure evolution. *Finance and Trade Economics*, *10*(5), 50-56.

Mathews, J. (2006). Dragon multinationals: New players in 21st century globalization. *Asia Pacific Journal of Management*, *23*(1), 5–27.

Sun, X., & Wang, Y. (2013). Does the structure of foreign trade drive the upgrade of industrial structure? - an empirical test based on semi-logarithmic model and structural effect. *World Economic Research*, *5*(1), 15-21.

Tolentino, P. E. (1993). *Technological accumulation and third world multinationals*. London: Routledge.

Wang, H. (2023). Industrial structure upgrading and technological capability in China–based on the perspective of industrial structure depth. *Asian Journal of Technology Innovation*, 1-21. https://doi.org/10.1080/19761597.2023.2249519

Wang, S.-L., Chen, F.-W., Liao, B., & Zhang, C. (2020). Foreign trade, FDI and the upgrading of regional industrial structure in China: Based on spatial econometric model. *Sustainability*, *12*(3), 815. https://doi.org/10.3390/su12030815

Wu, J. (2008). *Choice of China's growth model*. Shanghai: Far East Publishing House.

Zheng, C., Zhuo, C., & Deng, F. (2022). Coordination of IFDI and OFDI, government innovation support, and China's industrial green transformation. *Environmental Science and Pollution Research*, *29*(54), 82199-82217. https://doi.org/10.1007/s11356-022-21499-x

Zou, J., & Han, Y. (2013). Investment transformation, FDI quality and regional economic growth: An empirical analysis based on panel data in the Pearl River Delta. *International trade Easy Problem*, *10*(7), 147-157.