Research on the Impact of Foreign Direct Investment on the Upgrading of Industrial Structure

Min Jiang¹, Wenjie Ni¹, Shaoqing Ren¹, Zikai Zhao¹, Chaolin Li²,*

¹School of International Economics and Trade, Anhui University of Finance and Economics, Bengbu, Anhui, China
²School of Economics, Anhui University of Finance and Economics, Bengbu, Anhui, China

*952587990@qq.com

Abstract

This paper selects the panel data of 8 provinces and cities in China from 2010 to 2019, calculates the rationalization level of industrial structure with the help of improved labor productivity, and empirically analyzes the impact effect of China's foreign direct investment on industrial upgrading by using panel regression model. The empirical results show that the impact of foreign direct investment on the upgrading of industrial structure is significantly positive, indicating that foreign direct investment can promote the upgrading of industrial structure. At the same time, the level of regional economic development, the level of science and technology and the degree of international trade can affect the upgrading of industrial structure, and all of them can significantly promote it.

Keywords

Foreign Direct Investment; Upgrading of Industrial Structure; Panel Model; Economic Development Level.

1. Introduction

Coordinate and promote the strategic layout of comprehensively building a modern socialist country and comprehensively deepening reform, unwaveringly implement the new development concept of innovation, coordination, green, openness and sharing, speed up the construction of the modern economic system with the theme of promoting high-quality development, and speed up the construction of a new development pattern dominated by the domestic cycle and mutually promoted by the domestic and international cycles. The "new development concept, new development pattern and high-quality development" mentioned in the 14th five year plan is of concern. In order to promote the high-quality development of China's industry, the upgrading of China's industrial structure is imminent. As an important way of industrial structure upgrading, foreign direct investment is worthy of our study. In the spirit of the 18th CPC National Congress, it is pointed out that we should hold high the great banner of socialism with Chinese characteristics, under the guidance of Deng Xiaoping theory, the important thought of Three Represents and the scientific outlook on development, emancipate the mind, reform and opening up, pool strength, overcome difficulties, firmly move forward along the road of socialism with Chinese characteristics, and strive to build a well-off society in an all-round way. Under the conditions of changes in the situation at home and abroad and new opportunities and challenges in China's reform and development, we should adhere to the road of socialism with Chinese characteristics, comprehensively deepen reform, and improve the depth and breadth of reform and opening up. As China's current weakness in foreign direct investment, we should strengthen our deployment in this regard; On the basis of building a well-off society in an all-round way and continuously optimizing the industrial
structure, we should make unremitting efforts to build a well-off society. The 19th National Congress of the Communist Party of China put forward the "two-step" strategy according to the new judgment of socialism with Chinese characteristics entering a new era and the transformed social contradictions. On the basis of time unchanged, it raised the goal and standard of China's modernization. The meeting proposed that "China's economy has changed from the stage of high-speed growth to the stage of high-quality development", and high-quality development means the upgrading of industrial structure. China has become an economic power, but it is not an economic power. Most of China's industries still belong to labor-intensive manufacturing, with weak core competitiveness and unreasonable industrial structure. Faced with this situation, the State Council has launched a series of economic transformation policies, advocating us to develop high-quality industries, green industries and innovative industries. On the premise of deepening reform and opening up and implementing high-quality development, the impact of foreign direct investment on the upgrading of industrial structure is worth exploring.

There are abundant research results on the impact of foreign direct investment on the upgrading of industrial structure. There are three views on the impact of OFDI on China's industrial structure.

One view is that OFDI plays an obvious role in promoting the upgrading of domestic industrial structure. The research results of Feng Chunxiao (2009) show that there is a positive correlation between China's manufacturing OFDI and the optimization of its industrial structure [1]. The research of Janissa (2014) and others shows that China's two-way FDI can promote the upgrading of industrial structure, but IFDI and OFDI have different emphases on the upgrading of industrial structure [2]. Li Dongkun (2016) and others estimated through the spatial Dobbin model that the development of OFDI can not only improve the structural rationalization level of local industries, but also significantly promote the rationalization level of surrounding industrial structures through the spatial spillover effect [3]. The research results of Chen Yuanqing (2019) using panel data model show that China's OFDI can significantly promote the upgrading of domestic industrial structure [4]. Yang Dongxu (2020) and others found that OFDI not only significantly promoted the upgrading of China's industrial structure on the whole, but also had two impact mechanisms of "capacity transfer" and "technological progress" [5]. Zeng Qian (one belt, one road, 2021) and others think that the direct investment and technological progress of the "along the road" along the economic belt in China will have a positive effect on upgrading their industrial structure [6]. Mingrui Jiang (2020) and others believe that the technology spillover of OFDI has a significant impact on the industrial structure, and the degree of impact depends on the absorptive capacity of the home country. The impact of China's OFDI on the industrial structure is generally positive [7]. Wang Mei Ling (2021) and others reached the conclusion that OFDI significantly promoted the upgrading of industrial structure, but the adverse impact was not significant through the results of panel vector autoregressive model [8].

The second view is that the rapid development of OFDI will cause a serious imbalance between domestic material production and non-material production, that is, "industrial hollowing out", which will inhibit the upgrading of domestic industrial structure. Hu Lijun (2013) and others proposed that the economy of some developed coastal areas in China has experienced a real economy dominated by manufacturing industry, and the development has encountered many difficulties from reality to emptiness [9]. The research of Xie Guangya (2018) and others shows that the "industrial hollowing out" effect of OFDI does exist, but it is not the main factor [10]. Yang Lili (2019) and others concluded through PSTR model that when the intensity of OFDI exceeds a certain value, with its enhancement, "industrial hollowing out" becomes more and more significant [11]. The research results of Li Mengxi (2020) and others through the dynamic panel model show that China's OFDI can inhibit the change rate of industrial structure.
adjustment [12]. Lewis Alexander (2018) and others pointed out that foreign direct investment will lead to the hollowing out of some easily transferable industries [13]. The study of Gu Huijie (2018) shows that the overall effect of OFDI in Japan is negative [14]. The research of Ansgar Belke (2020) and others shows that OFDI can promote the "de industrialization" and "industrial hollowing out" of the home country [15].

The third view is that OFDI has a certain threshold effect on the impact of domestic industrial structure, resulting in both promotion and inhibition. The research results of Pan Ying (2010) and others show that OFDI can not promote the upgrading of industrial structure in the short term, but can promote the upgrading of industrial structure in the long term [16]. Li Fengchun (2012) came to the conclusion that the rhythm and irregularity of OFDI will affect its effect on industrial structure by modifying Chenery’s "structural growth" model [17]. Liu Xiangru (2020) and others used the panel smooth transformation model to conclude that the threshold effect and the difference of regional absorption capacity will affect the effect of OFDI on the upgrading of industrial structure [18]. Zhang Zhihua (2021) and others empirically verified the threshold effect of OFDI through the spatial Dobbin model, that is, OFDI has different effects on different levels of financial development [19]. Although there is a lot of relevant literature, some literature views show opposite positions, and do not comprehensively consider the overall impact of foreign direct investment on the upgrading of industrial structure. The selected influencing factors are generally representative and not innovative.

This paper focuses on the impact of foreign direct investment on the development of industrial structure, and analyzes the mechanism of foreign direct investment on the development of industrial structure. Using panel regression model to analyze the empirical study of FDI on the upgrading of industrial structure. Analyzing the existing problems and giving corresponding countermeasures and suggestions has certain reference value and significance for the upgrading of China's industrial structure.

2. Current Situation of Foreign Direct Investment and Industrial Structure

2.1. Current Situation of Foreign Direct Investment

2.1.1. Foreign Direct Investment Generally Shows an Increasing Trend, and the Recent Growth Trend is Gradually Slowing Down

![Figure 1. Non-financial outward investment flow from 2011 to 2020 in China](image)

Over the past decade, the investment volume of China’s foreign direct investment has generally shown an increasing trend. The investment flow has increased from US $74.65 billion in 2011 to US $153.71 billion in 2020, ranking first in the world for the first time, with an increase of US
China has a wide range of regions for foreign direct investment. At the end of 2020, China's foreign direct investment involves a variety of industries, but it is mainly concentrated in leasing and business services, manufacturing, wholesale and retail, and finance. In 2020, for example, the investment in the above industries exceeded US $10 billion, with leasing and business services taking the first place and manufacturing taking the second place. From the analysis of specific data, leasing and commercial services account for 25.2%, manufacturing accounts for 16.8%, wholesale and retail accounts for 15.0%, financial industry accounts for 12.8%. The above four industries account for 69.8% of the total flow. In addition, the construction industry accounts for 5.3%. Transportation / storage and postal industry, real estate industry, power / heat / gas and water production and supply industry and mining industry account for 3.4% - 4.0% respectively, scientific research and technical services accounted for 2.4%, Residential services / repair and other services accounted for 1.4%. Because of the impact of COVID-19, investment flows to agriculture / forestry / animal husbandry / fishery, culture / sports and entertainment, accommodation and catering, education and other areas have dropped considerably.

2.1.4. **Foreign Direct Investment Covers a Wide Range of Locations, But Most of Them are Concentrated in Asia**

China has a wide range of regions for foreign direct investment. At the end of 2020, China's foreign contracted engineering business signed new contracts in 184 countries and regions around the world with a total contract amount of US $255.54 billion and a turnover of US $155.94 billion. Among them, the one area along the "one belt, one road" business accounted for more than 50%. In addition, in 2020, China's foreign contracted project market is relatively concentrated, and the business in Asia and Africa accounts for more than 80%. Due to the different economic development and foreign trade of each region, the situation of foreign direct investment is different. From the perspective of foreign direct investment flows in 2020, 73.1% of the investment is concentrated in Asia, of which Hong Kong, China, is the most active region for Chinese investment, accounting for 79.4% of the investment in Asia, followed by Latin America.
America, accounting for 10.8%, Europe accounts for 8.3%, North America accounts for 4.1%, Africa accounts for 2.8%; Oceania accounts for a minimum of 0.9%.

2.2. Current Situation of Industrial Structure

2.2.1. The Secondary and Tertiary Industries are the Leading Industries, and the Output Value of the Primary Industry is Small

Since the introduction of China's "reform and opening up" policy, the tertiary industry represented by the service industry has developed rapidly and gradually become one of the main pillar industries of China's GDP, while the proportion of the output value of the primary industry has decreased greatly. According to the data of 2019, the proportion of China's primary industry in GDP is only 7.1%, which has not reached 1/3 before the reform and opening up. The proportion of the secondary industry is 39.0%, which has also decreased compared with that before the reform and opening up, but the change is small; The tertiary industry accounted for 53.9%, more than double that before the reform and opening up. China has formed an industrial structure dominated by secondary and tertiary industries and supplemented by primary industries.

2.2.2. The Employment of the Tertiary Industry has Shifted, and the Number of People in the Tertiary Industry is Large

In recent years, the rapid development of China's tertiary industry is inseparable from the transfer of a large number of working population. The tertiary industry represented by service industry provides new jobs different from traditional industry and agriculture. The development of the tertiary industry has increased the selectivity of the working population in choosing careers. A large number of young and middle-aged workers go out to work and give up farming, resulting in the decline of the number of employed people in the primary industry year after year. In contrast, the number of employed people in the tertiary industry shows an increasing trend (see Figure 2.2). In 2010, the number of employed people in China's primary industry was 279.31 million. The number of employed people in the secondary industry is 218.42 million. The number of employed people in the tertiary industry is 263.32 million. By 2019, the number of employed people in China's primary industry has dropped to 194.45 million. The number of employed people in the secondary industry also decreased slightly, to 213.05 million. The number of employed people in the tertiary industry increased to 367.21 million.

Figure 2. Number of employees in three industries
2.2.3. Fixed Investment in Various Industries Fluctuated, and the Construction Industry Decreased Significantly

Due to the market prospect of the industry, the change of residents' consumption preference, the influence of national policies and other factors, the fixed investment in various industries generally fluctuated compared with the previous year. Compared with the previous year, fixed investment in agriculture, forestry, animal husbandry, fishery, manufacturing, real estate, transportation and storage, water conservancy, environment and public, health and social work increased slightly, but the range was very small, between 0-10%. Mining, finance, leasing and business services, scientific research and technical services, education, sports and entertainment showed moderate growth, ranging from 10% to 25%. The construction industry, wholesale and retail industry, accommodation and catering industry, residents' repair, repair and other service industries, public management, social security and social organization industries showed a decline, of which the accommodation and catering industry had the smallest decline of 1.2%, and the construction industry had the largest decline of 83.8%.

2.2.4. The Output Value of the Three Industries has Increased, and the Manufacturing Industry is the Highest

With the development of economy, China's GDP has increased year by year. In terms of industries, the output value of the three industries has increased to a certain extent. Among them, the added value of the output value of the primary industry is small, and the added value of the output value of the secondary industry and the tertiary industry is large. Specifically, the industry with the highest added value of output value is manufacturing, which has been maintained at about 20 trillion in recent five years. Followed by the wholesale and retail industry, financial industry and real estate industry, maintained at between 5-10 trillion; The industries with the least added value of output value are water conservancy, environment and public facilities management, sports and entertainment, with an added value of less than 1 trillion yuan. However, on the whole, the output value of various industries shows an increasing trend, and China’s GDP also shows an upward trend with the growth of the output value of various industries.

3. Mechanism of Foreign Direct Investment on Industrial Structure Upgrading

3.1. Optimize Resource Allocation and Make Full Use of Resources

The country's natural resources, such as oil, iron ore and coal, are limited and non renewable within a certain period of time. Rational allocation of resources is an important way to improve resource utilization. Foreign direct investment can restructure the resources of some domestic industries with excess capacity and transfer the excess capacity abroad, so as to improve the marginal rate of return of corresponding industries. At the same time, foreign direct investment has promoted the development of enterprises, increased employment, reduced the unemployed population, improved the utilization rate of labor resources in the home country, and adjusted the allocation of production factors in the industrial structure to a certain extent. In other words, foreign direct investment can increase the output and utilization of production factors by adjusting the allocation of resources, thus affecting the upgrading of industrial structure.

3.2. Increase Competitive Pressure and Upgrade Market Structure

When an enterprise adopts the overseas investment strategy, its information, products, systems and other aspects will change, so as to enhance its competitiveness in the domestic market and bring more competitive pressure to other enterprises. In order to maintain their original market share, other enterprises will enhance their competitiveness by developing new
technologies and reducing product prices. Superior products will eliminate inferior products, so as to improve the product quality in the market, but the price will maintain the original price level or even decline. The enhancement of competitive pressure promotes the upgrading and transformation of market structure, so as to further promote the upgrading and transformation of industrial structure. Foreign direct investment also promotes the openness of enterprises in the home country, so as to promote the upgrading of industrial structure.

3.3. Promote Technology Transfer and Improve Technology Level

Foreign direct investment can also affect the upgrading of the industrial structure of the home country through technology transmission. Generally speaking, foreign direct investment mainly drives the upgrading of the industrial structure of the home country through the reverse technology spillover of domestic enterprises in transnational operations (COE and Helpman, 1993; Branstetter, 2006) [20], especially technology seeking enterprises. After enterprises carry out foreign direct investment strategy, the cooperation between home country investment enterprises and host country enterprises is bound to involve the advanced technology of products. The home country can absorb and learn the core technology of its products and innovate, so as to improve the product technology level of its own enterprises, so as to promote the technological upgrading of its enterprises and the optimization of its industrial structure.

4. Empirical Analysis of Foreign Direct Investment on Industrial Structure Upgrading

4.1. Model Building

Based on the research of Yangligao [21] (2019), combined with theoretical mechanism analysis and data availability, this paper constructs the following panel regression model:

$$\ln IND_{it} = \beta_0 + \beta_1 \ln OFDI_{it} + \beta_2 \ln X + \mu_{it}$$  \hspace{1cm} (1)

Where, IND represents the industrial upgrading index and is the explanatory variable of this paper; OFDI stands for foreign direct investment and is the main explanatory variable of this paper; X represents a series of control variables and µ is a random error term. i and t represent provinces and years respectively.

Based on data availability and model simplification, this paper adds import and export trade volume, regional per capita GDP and scientific and technological level as control variables. The complete model is as follows:

$$\ln IND_{it} = \beta_0 + \beta_1 \ln OFDI_{it} + \beta_2 \ln VOL_{it} + \beta_3 \ln AGDP_{it} + \beta_4 \ln TEL_{it} + \mu_{it} + \epsilon_{it}$$  \hspace{1cm} (2)

4.2. Variable Selection and Data Source

According to the representativeness and availability of data, the sample of this paper selects the variable data of 8 provinces and cities in Xinjiang Province, Anhui Province, Heilongjiang Province, Sichuan Province, Guangxi Province, Guangdong Province, Beijing and Qinghai Province from 2010 to 2019. Relevant data are from EPS database, China Statistical Yearbook and statistical yearbooks of provinces and cities. Among them, the industrial structure upgrading index (IND) is represented by the adjusted labor productivity based on the research of Li Fengchun [17] (2012). The explanatory variable is foreign direct investment (OFDI), which is measured by the flow of non-financial foreign direct investment. The control variables are based on references and theoretical research, and the volume of import and export trade (VOL),
In this paper, the mixed regression model, fixed effect model, random effect model and double fixed effect model are used for regression analysis of formula (2). From the regression results, it can be seen that the results of foreign direct investment in the three models except the mixed regression model are significantly positive, indicating that they can significantly promote the upgrading of industrial structure. The results in the mixed regression model are not significant. Based on the experience of a large number of references, the reasons are as follows: there are few control variables and less data, which does not mean that they are irrelevant. Due to the simplification of model data, there is no too much explanation here, and the processing method can add data and control variables. Regional per capita GDP is significantly positive (1% significant level) in the four models, indicating that it has a strong correlation to promote the
upgrading of industrial structure. The total volume of import and export trade is significantly negative in the mixed regression model, significantly positive in the fixed effect model and double fixed effect model, and not significant in the random effect model. The intersection term of foreign direct investment and import and export trade volume is further added for regression test. The results show that the intersection of foreign direct investment and import and export trade volume is significantly positive, that is, import and export trade volume has a positive role in promoting the upgrading of industrial structure. The level of science and technology is significantly positive in the mixed regression model, and significantly negative in the fixed effect model, random effect model and double fixed effect model. The intersection term of foreign direct investment and the level of science and technology are further added for regression test. The results show that the intersection of foreign direct investment and science and technology level is significantly positive, so science and technology level can positively promote the upgrading of industrial structure. The reasons for the different regression results of total import and export trade and scientific and technological level in the four models are the same as above, that is, there are few data. At the same time, the Hausmann test result P < 0.01 rejected the original hypothesis, that is, the fixed effect model is better than the mixed regression effect model and random effect model.

5. Conclusions and Suggestions

5.1. Conclusion

Through the analysis of the empirical results, the following conclusions are drawn:
(1) Foreign direct investment has a significant positive impact on the upgrading of industrial structure. After reaching a certain foreign direct investment flow, it will significantly promote the upgrading of the industrial structure of the home country, but its impact is affected by many other factors. Although there are certain risks, foreign direct investment is still an important way to upgrade China's industrial structure, and we need to pay more attention.
(2) Different levels of economic development have different effects on the upgrading of industrial structure. As an important external factor, the level of economic development affects the flow of foreign direct investment, thus affecting the process of industrial structure upgrading. Different levels of economic development in different regions will bring different effects of industrial structure upgrading. The higher the level of regional economic development, the higher the flow of foreign direct investment, the higher the degree of industrial structure upgrading and the faster the transformation speed.
(3) Different levels of science and technology have different effects on the upgrading of industrial structure. The level of science and technology will also affect the impact of foreign direct investment on the upgrading of industrial structure. Different levels of science and technology in various regions will lead to different corporate strategies of enterprises, which will affect the flow of regional foreign direct investment and further affect the degree of upgrading of industrial structure in the home country. In this paper, the regional science and technology input flow is used to replace the science and technology level, but other factors affecting the science and technology level are not considered, which has a certain distortion. However, further regression of the cross-multiplication term shows that the impact mechanism of science and technology level on the upgrading of industrial structure is positive and significant, that is, the higher the science and technology level is, the higher the upgrading degree of industrial structure is.
(4) Different levels of foreign trade have different effects on the upgrading of industrial structure. The degree of trade with foreign countries also affects the impact of foreign direct investment on the upgrading of industrial structure. Different foreign trade levels in various regions will affect the flow of regional foreign direct investment, thus affecting the progress of
industrial structure upgrading in various regions. The higher the degree of regional trade is, the higher the degree of industrial structure upgrading.

5.2. Suggestions

After analysis, the following countermeasures and suggestions are put forward:

(1) Promote policies. For the unbalanced process of industrial upgrading structure caused by the unbalanced investment in various industries and regions, the state should implement corresponding policies to narrow the gap and strive to achieve the balance of industrial upgrading. We can implement differentiated foreign investment and economic development policies according to different industries and regions, and strive to realize the balance of national industrial structure upgrading as soon as possible. For the unpopular industries with less foreign investment, the state should also appropriately introduce policies to promote investment, so as to introduce foreign advanced technology and management system, so as to balance the upgrading level of industrial structure of various industries in China.

(2) Increase technology transmission. Although China has made some breakthroughs and achievements in various "sophisticated" core fields, its innovation ability still needs to be improved. In the process of foreign direct investment of Chinese enterprises, Chinese enterprises should pay more attention to foreign high-tech industries, strengthen the intensity and depth of investment, strive to improve the spillover effect of technology and increase the transmission effect of technology, so as to promote the development of China's high-tech industries and the upgrading of industrial structure. In addition, we should strengthen the breadth and depth of cooperation between Chinese and foreign enterprises, actively explore the R & D and innovation of technology with foreign countries, transmit advanced technology back to our home country, and strive to improve the effectiveness of technology transmission through foreign direct investment. Our home country should increase investment in scientific research, develop and innovate local high-tech industries, and realize the upgrading of industrial structure.

(3) Strengthen foreign trade. According to the results of empirical analysis, it can be seen that there is a significant correlation between import and export trade volume and China's industrial upgrading. One belt, one road and other policies should be adopted to strengthen foreign trade. We should further enhance the degree of opening up to the outside world, persist in deepening reform and opening up, vigorously promote the construction of Sino foreign cooperative enterprises, and encourage enterprises to develop overseas cooperation, develop overseas trade areas, and increase import and export volume.

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