The Impact of Outward Foreign Direct Investment on the Upgrading of China's Manufacturing Industry Structure

--Based on Spatial Autoregressive Model

Jiajun Dong and Yang Han(✉)

School of Economics and Management, Harbin Institute of Technology, WeiHai, China
hanyang_andy@163.com

Abstract. At present, under the situation of increasing complexity of domestic and international environment, the upgrading of China's manufacturing industry structure is an important task for China to deepen reform and increase new drivers of economic development. In recent years, the scale of China's outward direct investment has continued to rise, ranking third in the world for many years in a row. In this context, it is of great practical significance to explore the impact of China's outward foreign direct investment on the upgrading of manufacturing industry structure and its mechanism. Based on the panel data of 31 provinces in China during the 11-year period from 2011 to 2021, this paper constructs an evaluation index of the industrial structure upgrading of the manufacturing industry, and uses the spatial econometric model for analysis. The conclusion is drawn that there is a significant spatial autocorrelation in the industrial structure of the manufacturing industry in China, and China's outward foreign direct investment has a significant positive promoting effect on the industrial structure upgrading of the manufacturing industry in China. Therefore, this paper puts forward suggestions on rational use of outward foreign direct investment to promote the upgrading of manufacturing industry structure, and provides detailed policy basis for promoting the transformation and upgrading process of China's manufacturing industry.

Keywords: OFDI · industrial structure upgrading of manufacturing industry · height of manufacturing structure · spatial autoregressive model

1 Introduction

1.1 Background

In the reform documents of "Made in China 2025" and "Industry 4.0", the external environment is becoming more complex, the internal factors are undergoing profound changes, the traditional mode of "introduction-digestion-absorption-re-innovation" is hampered, and the contradiction of China's manufacturing industry being complete but not excellent, large but not strong is increasingly acute. In order to avoid being marginalized in the new wave of science and technology and realize innovation breakthrough, China's manufacturing industry structure urgently needs to be transformed and upgraded.

S. Tehseen et al. (Eds.): ICEDBC 2023, AEBMR 258, pp. 784–797, 2024.
https://doi.org/10.2991/978-94-6463-246-0_96

Historical experience shows that the Outward Foreign Direct Investment (OFDI) has a synergistic relationship with the adjustment of domestic manufacturing industry structure. By the end of 2021, China's OFDI traffic reached $178.82 billion, with a year-on-year growth of 16.3%, ranking among the top three in the world for ten consecutive years. However, the interaction between such a huge OFDI and the upgrading of China's manufacturing industry structure has become a key issue in academic research. This paper will conduct a preliminary discussion on this issue.

1.2 Literature Review

The theory of outward foreign direct investment can be traced back to the monopoly advantage theory of Hymer (1960), which pointed out that the monopoly advantage that the host country enterprise does not have is the necessary condition for the enterprise to make profits from outward foreign direct investment [1]. The "Product life cycle theory" put forward by Vernon (1966) holds that the density characteristics of product factors change regularly in different life stages of products, and then the comparative advantage will shift from one country to another. In the period of product maturity and decline, if developed countries want to maintain foreign market share, they need to make direct investment in countries with the lowest factor cost and carry out resource replacement [2]. Based on the theory of comparative advantage, Kojima (1978) summarized the "marginal industry expansion theory". He believes that outward foreign direct investment should start from marginal industries in which the country is in a comparative disadvantage while the host country is in a comparative advantage, and concentrate resources on domestic advantageous industries to upgrade the industrial structure [3].

Wang Qi (2004) attributed the effect of adjustment and optimization of industrial structure of the investing country brought by OFDI to resource deficiency, transfer of traditional industries, growth promotion of emerging industries, industrial correlation and radiation, and overseas investment income [4]. According to the differences in investment motives, Yin Zhongming and Li Dongkun (2015) divided China's OFDI into resource-seeking, efficiency seeking, market-seeking and strategic resource-seeking types, and different types of OFDI will affect domestic industrial upgrading through different paths [5]. Pan Ying and Liu Guanghui (2010) use co-integration and Granger causality analysis to find that OFDI can promote the upgrading of industrial structure in the long run but cannot be realized in the short run [6]. Wang Ying and Zhou Lei (2013) made use of the panel data of 29 provinces from 2005 to 2011 and adopted the fixed-effect model to draw the conclusion that OFDI has a significant promoting effect on the optimization of China's industrial structure, and its significant intensity is greater than that of FDI [7]. Yang Jianqing and Zhou Zhilin (2013) selected time series data from 1993 to 2011 to design a regression model and found that OFDI can effectively promote the optimization and upgrading of China's industrial structure [8].

Based on the shortcomings of the existing research, this paper collects the panel data of 31 provinces from 2011 to 2021, constructs the evaluation index of the upgrading of the manufacturing industrial structure, and discusses the impact of OFDI on the upgrading of China's manufacturing industrial structure based on the spatial lag model, so as to better realize the synergistic effect of OFDI and the optimization of the manufacturing industrial structure.

2 Evaluation Indicator

This paper will use the height of manufacturing industry structure (HMS) to measure whether the manufacturing industry has achieved transformation and upgrading.

According to Li Xianzhu (2010), the high-end and mid-high-end manufacturing industries were combined into high-end manufacturing industries, namely, they were divided into high-end technology manufacturing industries, mid-end technology manufacturing industries and low-end technology manufacturing industries [9]. Based on the classification method, this paper divided the manufacturing industries into three categories. At the same time, according to the practice of Wei Ping and Yu Yishan (2017), the ratio between the total industrial output value of high-end technology manufacturing industry and the total industrial output value of middle-end technology manufacturing industry is used to represent the height of the structure of manufacturing industry [10], and the calculation formula is as follows:

$$HMS = \frac{Total\ industrial\ output\ value\ of\ high - end\ manufacturing\ industry}{Total\ industrial\ output\ value\ of\ mid - range\ manufacturing\ industry}$$

Since the data of output value and added value are incomplete, the sales revenue is very close to the output value, so the sales revenue data is used to replace the output value to measure the height index of the manufacturing structure.

3 Current Situation

3.1 OFDI in China

From the perspective of local OFDI development, as shown in Figs. 1 and 2, most regions in China have achieved a large growth of OFDI from 2011 to 2021.

When investigating OFDI in different economic regions, it can be found that China's OFDI is mainly concentrated in the eastern region, and the Pearl River Delta, Yangtze

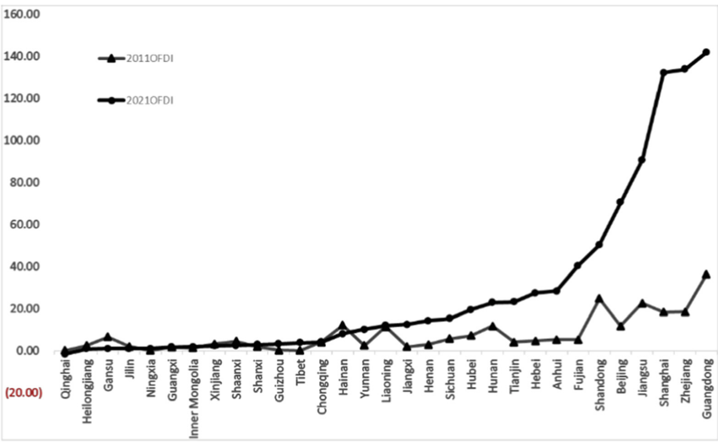
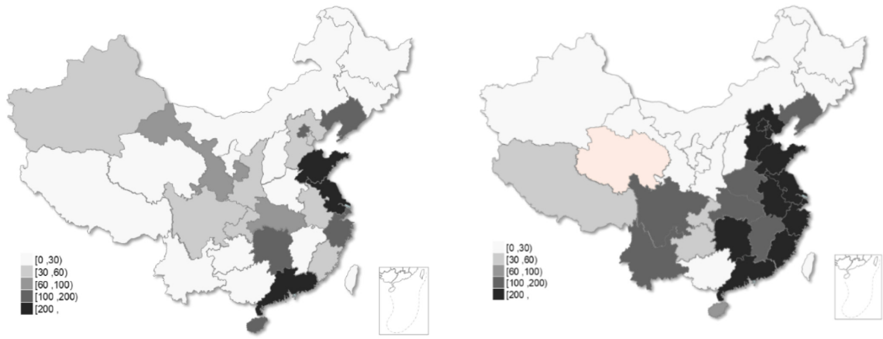


Fig. 1. Comparison of OFDI of 31 provinces in 2011 and 2021



2011OFDI **2021OFDI**

Fig. 2. Comparative geographical maps of OFDI of 31 provinces in 2011 and 2021

River Delta and Beijing-Tianjin-Hebei region are the main forces of China's OFDI. The western region, the central region and the three northeastern provinces are significantly less than the eastern region due to the constraints of economic development level and policy orientation, showing a trend of regional imbalance.

3.2 Manufacturing Structure in China

From the perspective of local manufacturing structure, as shown in Figs. 3 and 4, during the 11 years from 2011 to 2021, the manufacturing structure of most provinces and cities has achieved a high level of growth. From the perspective of different economic regions, the height of the structure of the domestic manufacturing industry also presents a situation that high-end manufacturing industry is more concentrated in the eastern and central regions, while the western region is relatively scarce. Among them, more than 16 provinces and cities in the eastern and central regions will have a height of manufacturing structure greater than 0.5 in 2021.

4 Mechanism Analysis

4.1 Enterprise Level

R&D Resource Feedback

Chinese enterprises invest in technology and knowledge-intensive countries or regions, set up branches or subsidiaries, utilize human and technological R&D resources in these countries or regions, cooperate closely with local enterprises and R&D teams, carry out R&D innovation, and feed back the latest research results to the parent company and other branches. Form R & D resource feedback path.

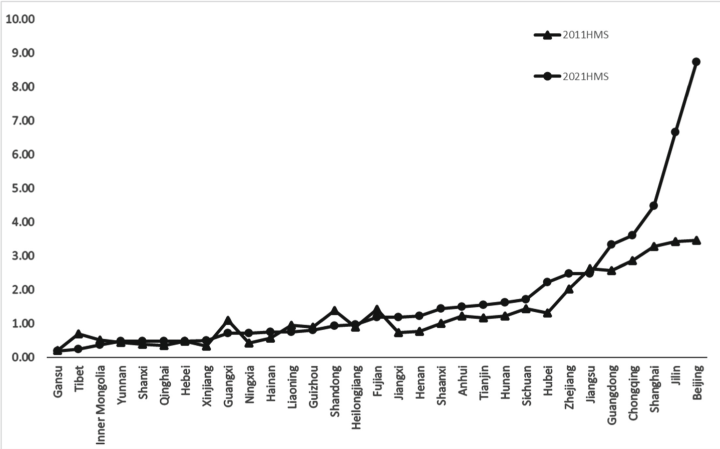


Fig. 3. Comparison of HMS of 31 provinces in 2011 and 2021

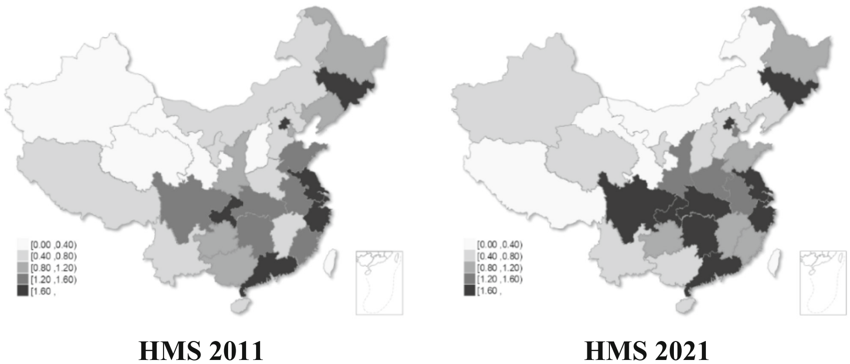


Fig. 4. Comparative geographic map of HMS of 31 provinces in China in 2011 and 2021

Reverse Technology Transmission

The reverse technology transmission mechanism mainly means that Chinese enterprises make direct investment in developed countries or regions through horizontal and vertical cross-border mergers and acquisitions to obtain all asset property rights, so as to realize reverse technology reflux. Enterprises acquire R&D resources, advanced technology, mature management system and existing human resources of the acquired enterprises through cross-border mergers and acquisitions, and return them to the home enterprises through various channels. The home enterprises can accelerate the transfer of reverse technology by rational allocation of R&D personnel.

R&D Cost Allocation

R&d cost allocation mechanism refers to that when enterprises in the home country make outward foreign direct investment such as "greenfield investment" and "transnational merger", they make full use of and combine the location advantage of the host country and the technical support of R&D institutions, enjoy the policy and tax incentives, and peel off the technology R&D that is compatible with the superior resources of the host country, so as to reduce the production and R&D costs of the parent company. The superior resources of the home country will be reallocated to domestic core technology research and development.

Profit Feedback

The profit feedback mechanism means that the parent company reasonably allocates the earned income and uses the high income to introduce advanced equipment, high-end talents or increase the research and development of core projects, so as to convert the profit into the further improvement of the research and development ability and innovation ability, so as to further expand the advantages and profits in the competition.

4.2 Sector Level

Competitive Effect

"Competition effect" means that enterprises with technological and product advantages in OFDI can provide products more in line with market demand and compete in the market at a lower price level, while their competitors in the same sector have to improve their research and development technology level, improve product quality, reduce production costs and other ways to compete in the market, otherwise they will only be eliminated by the market.

Demonstration Effect

"Demonstration effect" means that an enterprise obtains technological innovation under the influence of four mechanisms at the enterprise level of OFDI, so that it has technological and product advantages when competing in the sector. This phenomenon will drive other enterprises in the same sector to try the same way as this enterprise, namely, to make outward foreign direct investment and introduce advanced technology and talents. Furthermore, under the influence of four mechanisms at the enterprise level, technology upgrading and structure optimization can be achieved.

4.3 Industry Level

Sector Association

Sector correlation is mainly based on the close relationship between different sectors in the manufacturing industry. Sector correlation channels are divided into feedforward-related channels and feedback-related channels. Feedforward-related channel refers to the downstream sectors' technology upgrading after OFDI. In order to match the production of its own high-level products, domestic suppliers of upstream sector will be required to provide processed products or intermediate products with higher technical level, thus forcing the upstream sector to strengthen research and development and upgrade technology. The feedback-related channel refers to the technology upgrading of upstream sectors engaged in OFDI, which improves the technical level and quality of intermediate products supplied to downstream sectors, thus improving the technical level of products in downstream sectors.

Sector Diffusion

Sector diffusion refers to the improvement of technological innovation ability of some leading sectors, which stimulates the development of other sectors, optimizes the industrial structure of manufacturing industry, and improves innovation ability. There is not necessarily a correlation between leading sectors and other sectors. Sector diffusion channels mainly include two kinds. First, the rapid development of some leading sectors brought about by technological innovation increases their demand for factors, resources and other processed goods, which will stimulate some emerging sectors to accelerate technological innovation. Second, the rapid development of some leading core sectors will optimize the industrial structure, and even lead to changes and optimization of the system, culture and other aspects, which also provides an environment for innovation and development of other sectors.

5 Empirical Analysis

5.1 Research Design

Theoretical Basis

This paper adopts the spatial econometric model. Spatial econometrics provides a variety of estimation methods for different types of data, each of which has its own advantages and disadvantages.

Space Weight Matrix

Considering the applicability of the spatial measurement model selected in this paper to various spatial weight matrices and the sensitivity of the test results to the weight matrix, this paper selects the economic distance spatial weight matrix to quantize the position of spatial units. It is constructed as follows:

$$W_{ij} = \frac{1}{|Z_i - Z_j|}$$

Spatial Autocorrelation Test

Before applying the spatial measurement method, the data need to be tested for spatial correlation. At present, *Moran'I* and *Geary'C* are commonly used to test spatial autocorrelation, among which *Global Moran'I* is the most commonly used.

5.2 Model Setting

Variable Selection

Table 1 shows the selected variables and Table 2 shows the descriptive statistical analysis results.

Table 1. Variable **Selection**

Variable	Name	Description	source
dependent variable	**HMS**	**the height of manufacturing industry structure**	**China Industrial Economic Statistical Yearbook**
independent variable	**OFDI**	**the OFDI traffic data of 31 provinces in China from 2011 to 2021**	**Statistical Bulletin of China's Outbound Investment.**
control variable	**gdp**	**the GDP level of each province from 2011 to 2021**	**National Statistical Yearbook**
	gov	**the annual government expenditure of the provincial government from 2011 to 2021**	**Statistical yearbook of the provinces**
	open	**the annual export volume of each province from 2011 to 2021**	**National Statistical Yearbook**

Since the GDP, government expenditure and export data of provinces from 2011 to 2021 are too large, in order to avoid the impact on model regression, standardized methods are adopted for processing and standardized indicators are obtained. The standardized formula is as follows:

$$std\_x = \frac{x - \overline{x}}{\sigma}$$

Model Representation

According to the explained variables, explanatory variables and control variables selected in this paper, the measurement equation is set as follows:

$$HMS_{i,t} = \alpha_i + \beta_1 OFDI_{it} + \beta_2 std\_gdp_{it} + \beta_3 gov_{it} + \beta_4 open_{it} + \varepsilon_{it}$$

Table 2. Descriptive statistical analysis results

Variable	Obs.	Mean	Std	Min	Max
HMS	**341**	**1.500689**	**1.414882**	**0.11126**	**8.921445**
OFDI	**341**	**1.47E–11**	**1.00147**	**−0.63668**	**5.468172**
gdp	**341**	**1.47E–11**	**1.00147**	**1.157388**	**4.515564**
gov	**341**	**2.05E–11**	**1.00147**	**1.484064**	**4.407281**
open	**341**	**1.47E–11**	**1.00147**	**0.56778**	**5.184709**

This paper will adopt the spatial econometric model. Common spatial metrology models include spatial autoregressive model *(SAR)*, spatial error model *(SEM)*, and spatial Dubin model *(SDM)*. The model structure is as follows: This paper will carry on the selection of spatial econometric model through empirical analysis.

5.3 Empirical Analysis

Spatial Autocorrelation Test

This paper uses *Global Moran'I* to test the spatial autocorrelation of HMS in 31 provinces across the country, and the test results are shown in Table 3. According to the following table, it can be found that the *Global Moran'I* of HMS of 31 provinces in China is all greater than 0. Except for 2020 and 2021, when the HMS index is significant at the 10% significance level, the rest results are significant at the 5% significance level. Therefore, this paper considers that the HMS of 31 provinces in China has significant positive spatial autocorrelation, and it is necessary to adopt the spatial econometric model for regression analysis.

Model Selection Test

After the spatial autocorrelation is confirmed by the spatial autocorrelation test, it is necessary to further determine which spatial measurement model to choose for regression analysis. LM test, Robust LM test, Hauseman test and LR test are adopted in this paper. The results are shown in Table 4.

According to the test results, in LM test, the test results of spatial effect and spatial error effect are both significant at the 5% significance level, indicating that there are significant spatial effect and spatial error effect in the model. However, after Robust LM test, it was found that only the spatial autoregressive effect was significant at the 5%

Table 3. HMS spatial autocorrelation test results of 31 provinces in China

Variables	I	E(I)	sd(I)	z	p-value*
year = 2011	0.176	−0.033	0.09	2.312	0.021
year = 2012	0.195	−0.033	0.09	2.543	0.011
year = 2013	0.165	−0.033	0.09	2.204	0.028
year = 2014	0.158	−0.033	0.089	2.155	0.031
year = 2015	0.151	−0.033	0.089	2.085	0.037
year = 2016	0.154	−0.033	0.086	2.182	0.029
year = 2017	0.147	−0.033	0.083	2.179	0.029
year = 2018	0.128	−0.033	0.078	2.073	0.038
year = 2019	0.125	−0.033	0.074	2.129	0.033
year = 2020	0.108	−0.033	0.083	1.709	0.087
year = 2021	0.119	−0.033	0.082	1.867	0.062

Table 4. Test results of model selection

Model test	Value	p-value*
LM-Spatial error	**4.216**	**0.040**
LM-Spatial	**7.055**	**0.008**
Robust-LM- Spatial error	**1.754**	**0.185**
Robust-LM-Spatial	**4.593**	**0.032**
Hausman test	**62.24**	**0.000**
LR-BOTH-IND	**4.100**	**0.943**
LR-BOTH-TIME	**634.25**	**0.000**

significance level, and the spatial error effect was not significant, indicating the existence of spatial autoregressive effect in the model, so we selected the spatial autoregressive model *(SAR)*. In Hauseman test, the P-value was significant at the 1% significance level, indicating that the fixed effects model was significantly better than the random effects model. In the LR test, the p value was not significant in the test of individual and mixed effect model, so the individual fixed effect model was selected. When the time and mixed effects model were tested, the P-value was significant at the 1% significance level, so the mixed fixed effects model was selected. To sum up, this paper finally selects the spatial autoregressive model *(SAR)* under the individual fixed effect.

Regression Analysis

Based on the above analysis, this paper adopts the spatial autoregressive model *(SAR)* under the individual fixed effect for spatial econometric analysis. Table 5 shows the regression results of the spatial autoregressive model *(SAR)* under the individual fixed effect.

As can be seen from the Table 5 regression results, the general regression coefficient of OFDI is positive and significant at the significance level close to 1%. Therefore, this paper has reason to believe that OFDI has a positive effect on the industrial structure upgrading of the manufacturing industry in China, but the small regression coefficient indicates that it can only promote the industrial structure upgrading of the manufacturing industry to a small extent. The general regression coefficient of gov is negative and significant at 1% significance level, indicating that too much government intervention

Table 5. Regression results

Variable	Coefficient	Std	Z	p-value*
OFDI	**0.1172962**	**0.0469658**	**2.5**	**0.013**
gdp	**−0.147754**	**0.220274**	**−0.67**	**0.502**
gov	**−0.360859**	**0.1322436**	**−2.73**	**0.006**
open	**−0.383787**	**0.2649797**	**−1.45**	**0.148**

may hinder the upgrading of manufacturing industry structure. However, the regression coefficient of gdp and open is not significant.

Spatial Effect Decomposition

This paper further divides the spatial effects of OFDI, gdp, gov and open on the upgrading of manufacturing industrial structure into direct effect, indirect effect through spatial effect decomposition. Effect breakdown Table 6.

It can be seen from this table that the regression coefficients of both direct and indirect effects of OFDI are positive. The direct effect is significant at the significance level of 5%, while the indirect effect is not. This indicates that OFDI has a significant positive promoting effect on the upgrading of manufacturing industry structure in this region, but there is no evidence to show that OFDI has an impact on the spatial spillover effect in other regions. This paper believes that this may be because OFDI of each region has its own regional characteristics. Therefore, the factors that promote the upgrading of local manufacturing industry structure obtained by OFDI in each region may not be scarce in other surrounding regions or the factors cannot promote the upgrading of manufacturing industry structure in other surrounding regions. The regression coefficients of both direct and indirect effects of gov are negative. The direct effect is significant at 1% significance level, while the indirect effect is not significant. This indicates that gov has a significant positive promoting effect on the upgrading of the manufacturing industry structure in this region, but there is no evidence that gov has an impact on the spatial spillover effect in other regions. This paper argues that it may be because government spending pays more attention to improving people's livelihood in the region, thus favoring low-technology-intensive industries. Both the direct and indirect effects of gdp and open pass the test at the significance level of 5%. Therefore, this paper believes that there is no evidence to show that gdp and open have an impact on the upgrading of manufacturing industrial structure in the region and surrounding areas.

Table 6. Decomposition results of total spatial effects

Spatial effect decomposition	variable	coefficient	Z	p-value*
Direct	**OFDI**	**0.1181**	**2.5**	**0.012**
	gdp	**−0.1711**	**−0.91**	**0.362**
	gov	**−0.3684**	**−3.08**	**0.002**
	open	**−0.3464**	**−1.3**	**0.193**
Indirect	**OFDI**	**0.0181**	**0.89**	**0.373**
	gdp	**−0.0273**	**−0.65**	**0.514**
	gov	**−0.0561**	**−0.96**	**0.336**
	open	**−0.0531**	**−0.64**	**0.525**

6 Conclusions and Policy Recommendations

6.1 Conclusions

Spatial Correlation

According to the spatial correlation test, it can be found that the spatial spillover effect exists in the height of manufacturing industry structure in 31 provinces of China, but the value is not large, indicating that the spatial spillover effect is not obvious. This may be due to the differences in the level of economic development and policy orientation of provinces across the country. However, in the process of development, each region is inevitably affected by the surrounding areas, and there is a behavior of learning from the development model of the surrounding areas.

Significant Positive Promoting Effects

According to the regression results of spatial model, it can be found that OFDI has a significant positive promoting effect on the upgrading of local manufacturing industry structure, but from the numerical perspective, the positive promoting effect is hindered to some extent. At the same time, there is no evidence that the level of economic development and the degree of opening to the outside world have positive or negative effects on the upgrading of manufacturing industry structure. In addition, in terms of spatial total effect decomposition, OFDI has a significant direct effect on the upgrading of local manufacturing industry structure, but has no significant indirect effect on the upgrading of manufacturing industry structure in other surrounding areas. This paper concludes that the reason is that OFDI has local characteristics, and the scarce factors or technical feedback it obtains is adapted to the upgrading of the regional manufacturing industry structure.

6.2 Policy Recommendations.

Encouraging Technology-Seeking OFDI to Expand the Spillover Effect of Technological Resources

Learning and developing high-end technology is an important way to expand the proportion of high-end manufacturing industry. The government should vigorously encourage technology-seeking enterprises to make outward foreign direct investment, and help them create investment in technology and knowledge-intensive countries or regions. Through R & D resource feedback mechanism and reverse technology transmission mechanism, the advanced R & D equipment, technology and mature management system of developed countries and other scarce resources can be reversely returned to the domestic manufacturing industry. Thus, the technological level of domestic manufacturing industry is greatly mentioned. At the same time, transnational exchanges of technology R&D personnel should be encouraged, and high-end technical personnel should be cultivated through personnel flow and technical cooperation to form a growth mechanism.

Formulating Policies to Guide the Use of OFDI to Promote the Upgrading of the Manufacturing Industry Structure

On the basis of this study, in order to promote the upgrading of the industrial structure of the manufacturing industry, this paper suggests that the government should create a good policy environment for the coordinated development of OFDI and the upgrading of the industrial structure of the manufacturing industry. The government should guide the flow of outward foreign direct investment to better realize technology spillover, etc. Then through the transmission mechanism of enterprise level, sector level and industry level, spread layer by layer, and realize the comprehensive upgrade of the industrial structure of manufacturing industry.

References

1. Hymer, S. H. . (1976). The international operations of national firms: a study of direct for-eign investment. Journal of International Management, 8. https://www.mendeley.com/catalogue/8b1de336-0d50-3c15-8c13-37f02ebad44f/
2. Vernon, R. A. . (1966). International investment and international trade in the product cycle. The International Executive, 8(4), 16-16. https://doi.org/10.1002/tie.5060080409
3. Kojima, K. (1978) Direct Foreign Investment: A Japanese Model of Multinational Business Operations. Croom Helm, London. https://doi.org/10.4324/9780203845660
4. Wang Qi. (2004) FDI's Effect and Transmission Mechanism to the Adjustment of Investor Countries. Forum of World Economy and Politics (1):36–41. CNKI: SUN: GJMW.0.2004–05–018. (in Chinese)
5. Yin Zhongming, Li Dongkun. (2015) Analysis on Multi-motivated Chinese Outward Direct Investment and Its Impacts on Domestic Industrial Upgrading. Journal of North University for Nationalities: Philosophy and Social Sciences Edition (1):37–41. CNKI: SUN: XBDR.0.2015–01–006 (in Chinese)
6. Pan Ying, Liu Guanghui. (2010) An empirical study on the relationship between China's foreign direct investment and industrial structure upgrading. Statistics and Decision (2):102–104. CNKI: SUN: TJJC.0.2010–02–036 (in Chinese)
7. Wang Ying, Zhou Lei. (2013) Industrial structure upgrading Effect of China's foreign direct investment: An Empirical study based on provincial panel data. Journal of China University of Geosciences: Social Sciences Edition 13(006):119–124. CNKI: SUN: DDXS.0.2013–06–019 (in Chinese)
8. Yang Jianqing, Zhou Zhilin. (2013) China's Outward Direct Investment on the Upgrading of Domestic Industries: An Empirical Analysis. Economic Geography (4):120–124. CNKI: SUN: JJDL.0.2013–04–019 (in Chinese)
9. Li Xianzhu. (2010) Sino-south Korea trade and its structural changes. International Studies (6):48-52. https://doi.org/10.3969/j.issn.0452-8832.2010.06.009. (in Chinese)
10. Wei Ping, Yu Yishan. (2017) Impact of environmental regulation on industrial structure upgrading of manufacturing industry: A systematic GMM analysis based on provincial dy-namic panel data. Inquiry into Economic Issues 0(9):144–152. CNKI: SUN: JJWS.0.2017–09–019. (in Chinese)