

# Outward Foreign Direct Investment and Transformation and Upgrading of China's Manufacturing Industry

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**Abstract:** Since the the reform and opening-up, China has rapid development in outward foreign direct investment and manufacturing industry, but the transformation and upgrading of manufacturing industry remain unsolved. Based on the above background, the research on outward foreign direct investment and transformation and upgrading of china's manufacturing industry is proposed. It's proved by complete sample test that the outward foreign direct investment can promote the transformation and upgrading of china's manufacturing industry; it's proved by areas separated test that the promotion of outward foreign direct investment to transformation and upgrading of china's manufacturing industry is different according to areas, and more obvious in developed area.

**Keywords:** Outward foreign direct investment; Manufacturing industry; Transformation; Upgrading

## 1. Introduction

Since the reform and opening up, China's manufacturing industry has developed rapidly and its overall strength has been continuously enhanced, ranking first in the world's manufacturing industry. The rapid development of manufacturing is based on low-cost competition, high energy consumption, and high capital investment. In recent years, China's labor costs have risen steadily, resource and environmental constraints have intensified, and China's manufacturing industry is facing the squeeze of manufacturing in other countries. Especially after the financial crisis in 2008, the world entered the restructuring period of the industrial chain and value chain. Developed countries strengthened their emphasis on the development of the real economy. Through the "re-industrialization" strategy and the designation of international trade rules, they attracted high-end manufacturing to return and promote. The integration of the service value chain and the manufacturing value chain continues to strengthen the competitive advantage. The domestic economic development has entered a new normal, and the economic development mode is shifting from the extensive growth of scale and speed to the intensive growth of quality efficiency. The economic structure is moving from incremental capacity expansion to adjustment of stocks and optimization of coexistence. change. At present, China's low-cost advantage is gradually losing. Developing countries actively participate in the global industrial division of labor, using low-cost labor advantages and resource costs, and rapidly developing low-end manufacturing industries, which has an impact on "Made

in China." Therefore, the transformation and upgrading of China's manufacturing industry is a top priority<sup>[1]</sup>. As the cross-border flow of factor of production, the foreign direct investment directly affects the country's resource allocation, which in turn affects the industrial structure of a country. The experience of developed countries shows that outward foreign direct investment (OFDI) is crucial to the adjustment and optimization of domestic industrial structure<sup>[2]</sup>. With the continuous development of China's economy and the continuous deepening of the "going out" strategy, the development of OFDI is also very rapid. After investigation and research, it is found that China's OFDI flows and stocks have grown rapidly in recent years, with growth rates of more than 40%. How has such a large-scale OFDI affected the transformation and upgrading of China's manufacturing? This problem is the main research issue of this paper<sup>[3]</sup>.

Most of the traditional OFDI theory is based on the integration of experience in developed countries, such as marginal industrial expansion theory, product life cycle theory, etc., and most of these theoretical views are affirmative. In recent years, OFDI in developing countries has gradually developed, which has provided more rich experience for OFDI theory, and the theory is more extensive and mature. American scholars believe that the development of OFDI in developing countries can bring benefits to the adjustment of industrial structure in the country, and that domestic technology can be strengthened and innovated; At the same time, British scholars believe that the industrial upgrading of a country is the result of the accumulation of OFDI experience<sup>[4]</sup>. Therefore, this paper studies the impact of OFDI on the trans-

formation and upgrading of China's manufacturing industry.

## 2. Model Construction and Selection of Sample data

### 2.1. Model construction

The problem studied in this paper is the impact of OFDI on the transformation and upgrading of China's manufacturing industry, but the transformation and upgrading of manufacturing industry also includes many factors, such as import and export trade, foreign direct investment, technological innovation, financial marketization level, human capital, and household consumption levels, etc., these factors are the control variables of the model [5]. The model (1) is as follows:

$$ah_{it+} = \alpha + \beta ofdi_{it} + \gamma_1 fdi_{it} + \gamma_2 open_{it} + \gamma_3 pat_{it} + \gamma_4 hum_{it} + \gamma_5 fin_{it} + \gamma_6 Incons_{it} + \lambda_i + \mu_t + v_{it} \quad (1)$$

In the model (1),  $i$ ,  $t$ ,  $\lambda_i$ ,  $\mu_t$ , and  $v_{it}$ , represent different cross-sectional areas, the  $t$  th year, individual fixation effects in different regions, time fixed effect, and random error term respectively.

### 2.2. Selection of sample data

This paper will select data from 2007 to 2017 in 30 provinces of China as sample data, and remove Tibet in China's provinces and cities, because its data is incomplete, and the final result will have a greater impact. The economic development between China's provinces and cities is very uneven. Therefore, the effects of OFDI on the transformation and upgrading of manufacturing industries are also very different. This paper divides China's provinces and cities into two regions, namely the eastern and central and western regions. The eastern regions include Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, and Guangdong. The remaining provinces and cities are included in the central and western regions [6]. The data used in this paper are based on 2011.

Explained variables. The goal of upgrading the manufacturing industry is to achieve a high degree of manufacturing structure, which is the evolution of manufacturing from a low value-added form to a high value-added form, from a low-tech level to a high-tech level. That is to say, the industrial upgrading of the manufacturing industry is characterized by the continuous increase of the proportion of high value-added manufacturing industry, and its goal is to achieve a high degree of manufacturing industry structure. Some scholars divide manufacturing into three categories, namely high-end manufacturing, mid-end manufacturing and low-end manufacturing [7]. Among the 30 provinces and cities in China, the value of mid-end manufacturing and high-end manufacturing in most provinces far exceeds the output value of low-end

manufacturing. Therefore, the key to the transformation and upgrading of manufacturing industry is to increase the proportion of high-end manufacturing in the manufacturing industry. This paper measures the change in the level of manufacturing industry structure by the ratio of the output value of high-end manufacturing and mid-end manufacturing. The calculation data of this paper comes from the "China Industrial Economics Statistical Annual" and the statistical annual of various regions. The specific situation of the ratio of output value of high-end manufacturing and mid-end manufacturing from 2007 to 2017 is shown in Figure 1:

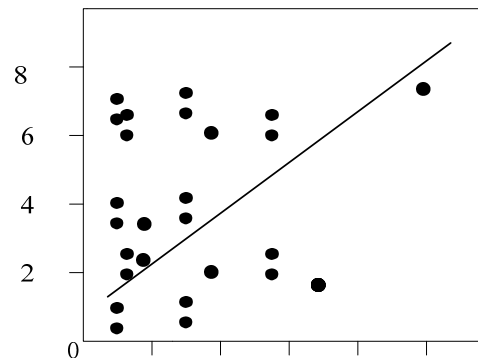


Figure 1. Scatter diagram of OFDI and transformation and upgrading of manufacturing

Core explanatory variables. OFDI is expressed by the proportion of outward foreign direct investment flows and fixed asset investment in the current year. The data sources are the China Statistical Annual and the China Outward Foreign Direct Investment Statistics Bulletin. It can be seen from Figure 1 that as the proportion of outward foreign direct investment flows to fixed assets investment increases, the ratio of high and medium-end manufacturing output increases gradually, and the two are positively correlated.

Control variables. This paper regards the factors involved in the transformation and upgrading of manufacturing industry as control variables [8]. It mainly includes the following items: foreign direct investment (fdi), which is expressed by the proportion of actual foreign direct investment and fixed asset investment in the current year; Open to the outside world (open), expressed as the proportion of total imports and exports to GDP; Technical innovation (pat), selecting thousands of people to have a patent authorization quantity metric; Human capital (hum), using the method of years of education, with reference to the calculation methods of other literatures, the primary, middle, high school, college and above education years are in turn according to 6 years, 9 years, 12 years and 16 years, and then multiplied by the proportion of the employment level of each education level, the sum is the level of human capital; The level of financial mar-

ketization (fin) is measured by the ratio of the loan balance of financial institutions and the total liabilities of state-owned enterprises according to the research methods of other literatures. The larger the ratio, in the case of a certain total debt of state-owned enterprises. The stronger the ability of the financial institutions to provide loans for non-state-owned enterprises, the higher the lev-

el of marketization of financial institutions; The consumer consumption level (cons), which is expressed by the natural logarithm of the CPI conversion<sup>[9]</sup>. The above data are all from the Statistical Annual. The description and descriptive statistics of each control variable are shown in Table 1.

Table 1. Description and descriptive statistics of control variables

Control variables	Meaning of variables	Sample	Mean value	Standard deviation
fdi	Proportion of foreign direct investment in fixed assets investment	300	0.048	0.047
empfdi	Proportion of employment of the three-asset industry in urban employment	300	0.056	0.066
open	Proportion of total import and export volume in GDP	300	0.345	0.341
pat	Number of patent licenses owned by thousands of people	300	0.460	0.561
hum	Weighted summation of employment share of each education level	300	9.075	1.623
fin	Ratio of the loan balance of a financial institution to the total debt of state-owned enterprises	300	2.048	1.003
incons	Natural logarithm of household consumption level	300	-0.423	0.534

### 3. Data Processing

The data processing is mainly to perform collinearity test on the data. If the test result is between 1.05 and 4.73, it indicates that there is no serious multicollinearity between the variables. This paper uses the metrology analysis software to test the collinearity of the data by using the panel data analysis method<sup>[10]</sup>.

#### 3.1. Complete sample test

In order to ensure the stability of the estimation results, the model should be tested for stability. The test is divided into two aspects: on the one hand, the explanatory variables are replaced. The main process is: changing the foreign direct investment into the employment ratio of the foreign-funded enterprises, and changing the consumption level of the residents to the adult GDP.

Before the test, the complete sample should be tested for stability, the detailed results are shown in table 2. The model (1) in Table 2 is the estimated result of the complete sample fixed effect, model (2) is the estimation result using the least squares method. The regression results are shown in Table 2. In Table 2, we can see that among the control variables, the three control variables of foreign direct investment, technological innovation and human capital have a significant positive correlation with the transformation and upgrading of the manufacturing industry. The above results show that manufacturing transformation innovation can be implemented through technology spillovers and capital supply. Of course, upgrading human capital and technological innovation is also the key to the transformation and upgrading of manufacturing. The coefficients of the other two control variables are not obvious.

Table 2. Regression result of complete sample test for stability

Model	(1)	(2)	(3)	(4)
fdi	6.423***(0.865)	7.435***(1.353)		
empfdi			5.243***(1.345)	5.465***(1.634)
open	0.118(0.234)	0.364(0.354)	0.294(0.234)	0.274(0.356)
Pat	0.383***(0.053)	0.376***(0.067)	0.230***(0.063)	0.234***(0.368)
hum	0.278*(0.023)	0.243*(0.153)	0.268***(0.075)	0.559***(0.354)
Fin	-0.074(0.045)	-0.058(0.052)	-0.004(0.038)	-0.001(0.015)
incons	-0.088(0.082)	-0.064(0.193)		
Constant term	-0.160(0.784)	-1.280(1.749)	-0.778(0.758)	-3.645(1.798)
Observed value	300	260	300	260

The model (3) in Table 2 is the estimated result after replacing the explanatory variables. It can be seen from Table 2 that after the explanatory variables are replaced, the regression results of other control variables have only a small change in the coefficient and the significance, and there is no significant difference from the original regression results<sup>[11]</sup>. The other hand is the dynamic panel model. The industrial restructuring of the manufactur-

ing industry has a certain continuity. The industrial transformation and upgrading of each period may be affected by other periods. Due to the existence of this situation, the first-order lag term of the explanatory variable is introduced into the model, and the system method is used for calculation. The results in model (4) show that there is a first-order autocorrelation of random perturbation terms, and there is no second-order autocorrelation. The

test results show that the selection of variables is valid. The results of the above tests show that the empirical results of this paper are reliable, and OFDI plays a significant role in promoting the transformation and upgrading of China's manufacturing industry [12].

### 3.2. Areas separated test

This paper divides 30 provinces and cities into two regions, so this paper tests each of these two regions separately [13]. The specific regression results are shown in Table 3:

Table 3. Regression result of areas separated test

Model	(5)	(6)	(7)	(8)
fdi	5.473*(2.865)	14.435**(6.353)	-2.974(8.364)	3.67(1.738)
emfdi	6.435**(2.353)	7.435**(1.353)	5.243***(1.345)	5.465***(1.634)
open	-0.428(0.423)	0.176(0.603)	1.353(0.431)	0.274(0.356)
Pat	0.386***(0.193)	0.835***(0.487)	0.230***(0.063)	0.745***(0.175)
hum	0.538*(0.193)	0.943*(0.193)	0.278***(0.675)	0.589***(0.254)
Fin	-0.094(0.435)	-0.158(0.065)	-0.054(0.135)	-0.651(0.425)
incons	-0.148(0.352)	-0.044(0.793)	-0.968(0.456)	-0.175(0.345)
Constant term	-1.160(0.344)	-1.290(1.949)	-0.978(0.658)	-3.745(1.658)
Observed value	150	130	150	130

## 4. Results

Based on the provincial and municipal data from 2007 to 2017, this paper studies the impact of OFDI on the transformation and upgrading of manufacturing industry. The conclusions are as follows: It's proved by complete sample test that the OFDI can promote the transformation and upgrading of china's manufacturing industry; it's proved by areas separated test that the promotion of OFDI to transformation and upgrading of china's manufacturing industry is different according to areas, and more obvious in developed area [14].

## 5. Conclusion

This paper establishes a model to study the impact of OFDI on the transformation and upgrading of China's manufacturing industry [15]. It's proved by complete sample test that the OFDI can promote the transformation and upgrading of china's manufacturing industry; it's proved by areas separated test that the promotion of OFDI to transformation and upgrading of china's manufacturing industry is different according to areas, and more obvious in developed area.

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