

EMPIRICAL RESEARCH ON THE EFFECTS OF MANUFACTURING OFDI ON THE UPGRADING OF CHINESE MANUFACTURING STRUCTURE

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ABSTRACT

Since our country puts forward "Going out" strategy, OFDI gets fast growth, but manufacturing as a pillar industry in China is facing with the plight of the upgrading, the purpose of this paper is to examine the effects of OFDI on the upgrading of Chinese manufacturing structure. Firstly, on the basis of existing research, we explain the role mechanisms of different types of OFDI on manufacturing structure. Then in empirical part, we use Chenery model and conduct analysis by the data of two layers: that is, inter upgrading, intra upgrading. The results show that, for the two levels, we should develop vertical OFDI to developed country ,and develop horizontal OFDI to developing country. However, the positive influence on inter upgrading more obvious.

Keywords: Vertical OFDI; Horizontal OFDI; Manufacturing; Structure upgrading; Empirical analysis

INTRODUCTION

In the trend of economic globalization drive, in recent years, foreign direct investment in the China (Outward Foreign Direct Investment, hereinafter referred to as OFDI) development, academic research focus from to attract foreign investment to the OFDI field and focus on the influence of OFDI on the industrial structure of the home country effect on. At the same time, with the gradual loss of manufacturing cost advantage and the trend of re industrialization in developed countries, China's manufacturing industry is in a dilemma of overcapacity and urgent transformation and upgrading.

The research on OFDI has a long history, and scholars at home and abroad have carried out a great deal of research on OFDI. Since 1960, scholars at home and abroad have begun to study the relationship between OFDI and industrial structure adjustment. There have been a series of classic studies, such as monopoly advantage theory^[17], life cycle theory^[11], marginal industry

transfer theory and comparative advantage theory. The empirical research, Dierk and Mechthild (2008) using the method of quantitative analysis, foreign direct investment between the United States and Germany the two industrialized countries, the results of the study show that foreign direct investment in the United States in the long term to promote domestic investment, Germany exists only in the short term, in the long run, instead of foreign direct investment ^[15] Germany's domestic investment.

In recent years, domestic scholars have begun to study the relationship between the two from different angles. In theory, Jiang Xiaojuan and Du Ling ^[1] (2002) OFDI on industrial structure adjustment of home country is divided into three levels, one is the adjustment of the structure of the enterprise, with the new production mode transformation of the original home enterprises, two is the adjustment of the industrial structure is the internal, home enterprises transfer to the original industry upstream or the downstream sector, three is the transfer of industrial structure between the home country, is the original enterprise of [30] to the new industrial transfer. Huo Xin^[2](2014) industry, the study of China's OFDI industry structure adjustment effect, research shows that foreign direct investment and technology intensive and labor-intensive industries, the impact of industrial structure is particularly evident. Zhang Bin and Saen [3] (2015) believe that industrial upgrading includes inter industry upgrading and intra industry upgrading, and the impact of China's participation in international division of labor on industrial upgrading.

Empirically, Huo Xin [2] (2014) in 2008 - 2012 in China industry, relevant data, effect of industrial structure adjustment of China's foreign direct investment by using grey correlation theory demonstration. The results show that the foreign direct investment in technology intensive and labor-intensive industries has a particular impact on the optimization of industrial structure. Guo Cheng ([4] 2016) by modifying Chenery standard model, selection of industrial structure coefficient and Hoffman coefficient, an empirical study of Chinese technology seeking OFDI impact on the upgrading of the industrial structure.

In the study of manufacturing industry as a research object, Wong and Chan[18] (2003) thinks OFDI will bring more international capital transfer, and China OFDI can promote the structural optimization of manufacturing and other related industries. Tuan and Ng[13] (2004) takes Hongkong as an example to study the impact of Hongkong OFDI on the local manufacturing structure. The results show that after China's accession to the WTO, OFDI changed the manufacturing industry agglomeration and optimized the manufacturing structure. Zheng Lei [5] (2012) studied the impact of China's investment in ASEAN on China's industrial structure. The results show that China's investment in ASEAN's transportation and postal industry, finance and manufacturing industry has a significant role in promoting the upgrading of domestic industrial structure. Zhang Yunda [6] (2015) to construct ciannelli standards amended model, our country

of OFDI in developing countries and developed countries of the two directions, the calculation of China's manufacturing industrial structure rationalization index. Liu and mohair (2016) European manufacturing OFDI on the added value of exports by two perspectives from the effects of scale and structure, that should make foreign investment strategy according to different industries in the manufacturing sector and the different types of OFDI, so as to adjust the industrial structure [7].

The above literature provides valuable reference for our research, but there are also some limitations: (1) the existing literature for the general study of effect of OFDI on China industrial structure adjustment, or will OFDI on different motivation effects on China industrial structure adjustment, combine OFDI with Chinese manufacturing little literature. (2) from an empirical point of view, the existing literature mostly constructs indicators such as rationalization and upgrading of industrial upgrading, total factor productivity and other indicators, and generally measures the impact of OFDI on industrial upgrading.

In view of this, this paper attempts to analyze the mechanism of industrial upgrading caused by different types of OFDI, and provide theoretical support for the empirical research. Empirical research is made from two levels: upgrading of manufacturing industry and upgrading of industries.

ANALYSIS OF THEORY AND MECHANISM

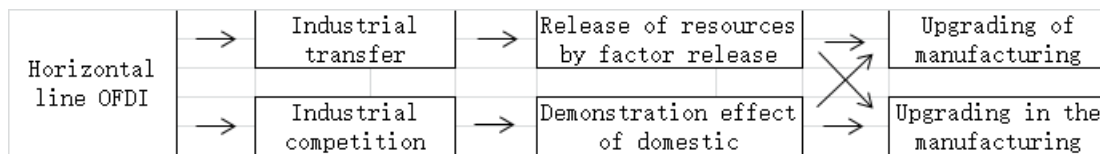
OFDI affects the upgrading of the industrial structure through industrial transfer, industrial association and industrial competition. Considering the type of industrial upgrading, considering the research results of Emst (2001), Humphrey and Schmitz (2001), we can upgrade manufacturing industry into two categories: [14] upgrading and upgrading within industry. Based on the related theories of OFDI built by predecessors, the influence mechanism of horizontal OFDI and vertical OFDI on the upgrading of China's manufacturing industry and intra industry structure is explained in detail.

1. The influence of the horizontal OFDI on the upgrading of the manufacturing structure

OFDI is divided into two types: horizontal and vertical. Antras and Yeaple[12] defines horizontal OFDI as the home country, and all the value chain links of the final product will be allocated to the host country's investment. On the one hand, have a comparative disadvantage or overcapacity industries on the domestic level, put them in the OFDI way to go abroad, the domestic factors of production to be released, due to capital outflows and production factors of idle equipment, land and labor in the domestic cross industry flow, when the flow of capital and technology intensive industries, upgrade the structure of the domestic industry, the success of the optimization of

industrial structure. At the same time, by investing and building factories abroad, we can get reverse technology spillover from host countries. Multinational companies will send advanced technology and management level to China to promote domestic R & D level and value chain upgrading and upgrade industries. On the other hand, Chinese enterprises will create new competition in host country's production, operation and sale, and host country's local businesses. In order to cater for local consumption demand, multinational companies will constantly update products and promote their own research and development level.

It Chinese manufacturing, Chinese manufacturing enterprises looking for cheap labor countries and regions in the foreign market, the use of local labor is cheaper and the unique local abundant resources, will be put into production, can effectively reduce the production cost, to maintain the comparative advantages of domestic enterprises. Through such a way, the labor intensive industries in the mother country will be transferred to the host country. The proportion of the capital intensive industry and capital technology intensive industry in the home country is increasing, and the Chinese manufacturing industry structure has been upgraded inside the industry. For example, the manufacturing industry China will need to get a lot of natural resources through industrial transfer reduces the production of excessive dependence on resources into the domestic manufacturing industry, while intensifying industry restructuring and the development of emerging industries, not only conducive to the improvement of the environment, but also can satisfy the domestic manufacturing resources for development needs, may alleviate the energy shortage the bottleneck of economic development brought by the establishment of resources supply relations of long-term stability in the host country.



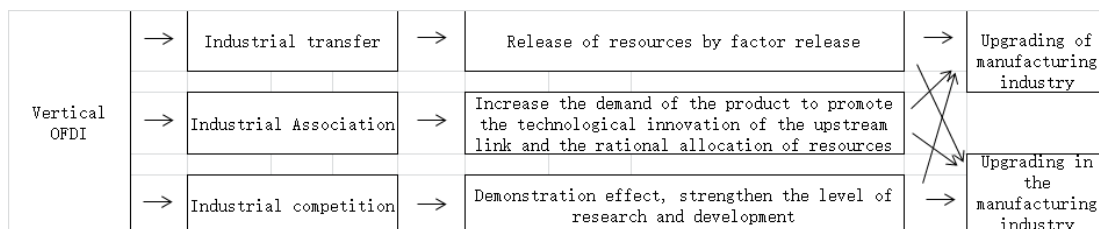
2. The effect of vertical OFDI on the upgrading of manufacturing structure

Antras and Yeaple[14] defines vertical OFDI as an investment by the mother country to lay out the part value chain of the product to the host country. Helpman[16] thinks that the difference between horizontal OFDI and vertical OFDI lies in the difference of their service market. The level OFDI serves the host country's market, while vertical OFDI produces in the host country but serves the market outside the host country.

In order to improve the Chinese manufacturing industry in the global value chain, through the transfer of industries, Chinese manufacturing enterprises will focus on the process of acquiring resources, non core parts production, processing and marketing of customer service link link

assembly layout abroad, focus on the domestic production of core parts and provides research and development, finance, legal, and other high-end design link as the representative of the "headquarters", but also conducive to the "headquarters service" factors of production release and access to resources, the global production organization mode will promote the domestic industry upgrading. Multinational companies to enter the host country, the reason for improving the competitiveness of their products, will the supplier to the host country or the upstream upstream link request for more technology, upstream suppliers or on the part of the overall production efficiency, multinational corporations and host countries downstream production processes to reduce production costs, improve product competitiveness, expand backward linkages, and promote the development of the host country the upstream and downstream industries and enhance the value chain.

On the other hand, if only the primary intermediate goods and the processing and assembly links are left at home, it will lead to the "industry hollowing" in the mother country, and the industrial upgrading will be lack of power. Liu Mao and seagull [7] (2016) found that Chinese manufacturing multinational companies tend to high-end production layout in China, resource acquisition, assembly and other aspects of the layout of the low-end in other countries, Chinese did not appear vertical OFDI caused by the "headquarters service hollow" phenomenon. Thus, the vertical OFDI in China's manufacturing industry is conducive to the development of China's "headquarters economy" and the optimization of the domestic manufacturing structure.



EMPIRICAL ANALYSIS

1. Model setting and data description

Model setting: Through the above mechanism analysis, we can see the close relationship between OFDI and industrial structure. We need further empirical analysis to identify the actual impact of China's large-scale implementation of "going global" strategy on upgrading industrial structure. American economist Hollis ciannelli by observing the economic development in the process of long-term manufacturing industry internal changes, and analyze the statistical data in 1960 to 1980 of the 9 developing countries, established the regression equation established multinational model, found manufacturing development is affected greatly by the per capita

GNP, demand scale and investment rate, construct a the economic development of the "standard structure", which provides a theoretical basis for different countries or regions according to the economic development goals of industrial structural transfer policy. Meanwhile, according to Lv Mingyuan and Li Yanchao (2011)'s research on whether this standard mode is applicable to China, they think that the evolution of China's industrial structure is consistent with the rule [8] reflected in the "standard mode". This paper will China manufacturing industry as the research object, on the basis of Chenery standard model, research on the influence of OFDI on manufacturing industry structure upgrade. Following the standard model's form:

$$\Gamma = \delta + \beta_1 \ln Y + \beta_2 (\ln Y)^2 + \phi_1 \ln N + \phi_2 (\ln N)^2 + \sum_{i=1}^{\infty} \xi_i \cdot T + \varepsilon \cdot K$$

Among them, it represents the development level of industrial structure, represents the gross national product per capita, represents the total number of population, indicates the trend of time, and indicates the flow of resources and production factors. According to the actual situation of Chinese manufacturing, modification of Chenery standard model to do the following:

- (1) to measure the development level of industrial structure again, measure the development level of the industrial structure from two aspects of the upgrading of the manufacturing industry and the upgrading of the industry.
- (2) the resource K variable is expressed as OFDI.
- (3) due to the short time span of OFDI data in China in 2003, ignoring the influence of population change factors and replacing HC with human capital measurement index.

So the modified model can be expressed as:

$$CJ_t = \beta_0 + \beta_1 GDP_t + \beta_2 GDP_t^2 + \beta_3 NHOFDI_t + \beta_4 NVOFDI_t + \beta_5 SHOFDI_t + \beta_6 SVOFDI_t + \beta_7 HC_t + \mu$$

$$CN_t = \beta_0 + \beta_1 GDP_t + \beta_2 GDP_t^2 + \beta_3 NHOFDI_t + \beta_4 NVOFDI_t + \beta_5 SHOFDI_t + \beta_6 SVOFDI_t + \beta_7 HC_t + \mu$$

The subscript of each variable expresses the time, indicating the upgrading index of the manufacturing industry in the last year, indicating the upgrading index of the manufacturing industry in the last year.

2. Variable description

- (1) the upgrading of the manufacturing industry.

This article uses CJ to express the upgrading of the manufacturing industry. According to the definition of inter industry upgrading, that is, the proportion of total output in manufacturing

sector which belongs to labor intensive industries is decreasing, and the proportion of total output in capital and technology intensive industries is rising. This article from Zhang Bin (2015) research methods, the inter industry upgrade CN expressed as manufacturing capital and capital technology intensive industry output proportion, but because of "China Industrial Economy Yearbook" began only released industrial sales output value from 2012, in order to maintain consistency, according to the "interpretation" statistical yearbook of Jiangsu Province in 2012 in the index, 2012-2014 total industrial output value of the industrial sales value divided by the sales rate of industrial products was calculated.

(2) upgrading of manufacturing industry

This article uses CN to express the upgrading in the manufacturing industry. Within the industry to upgrade the performance of certain industry by low processing to the high degree of processing, low technology level to high technical level, from low added value to high value-added transformation [9]. China in the process of foreign direct investment, the non core production country, such as resource acquisition, assembly and other value-added small link transferred abroad, R & D, production, marketing and other core value added greatly to remain in the country, thus forming a "headquarters service economy", resulting in the industry to improve the technical level. Enhance the added value of the value chain, enhance the status of. This article from Zhang Yunhe Wang Xin (2013) research methods, CN manufacturing main business income for the ratio of investment in research and development of new products accounted for the share of total income that the greater the value of product development, said the greater the proportion of [10] for manufacturing annual main business income. In view of the availability of the data, the share of the new product R & D investment in the business income of the manufacturing owner camp of the provinces is obtained by simple calculation. The formula is: To express the national investment in new product R & D in the manufacturing industry in the year, and to express the income of the whole country in the year.

(3) the level of economic development Y

The size of a country's gross domestic product can be used to measure its economic development level. In order to avoid highly multicollinearity, this paper uses the growth rate of GDP in various regions to measure the level of economic development. The data came from the annual statistical yearbook of China.

(4) foreign direct investment OFDI

Along the gradient of vertical type and horizontal type (SVOFDI) OFDI (SHOFDI): the growth rate of the stock stock representing Chinese for vertical and horizontal type OFDI to the rate of

growth in the developing world, can be used to test China to developing vertical and horizontal type OFDI of China manufacturing industry upgrading and industry upgrade; inverse gradient vertical type and horizontal type (NVOFDI) OFDI (NHOFDI): the growth rate of the stock stock representing Chinese vertical type and horizontal type OFDI to the growth rate of developed countries, can be used to test China to developed countries for vertical and horizontal type OFDI to upgrade the impact between the industry upgrading and China of manufacturing industry.

This paper selects China from 2003 to 2014 years in Britain, United States, Canada, Germany, France, Italy, Japan, Australia, Spain, Poland, Singapore, New Zealand, Holland, Sweden, Belgium, the 15 developed countries and Pakistan, Kazakhstan, Malaysia, Turkey, Mongolia, Thailand, India, Indonesia, Russia, Mexico and the Cayman Islands, South Africa, Iran, British Virgin Islands, Nigeria, the 15 developing countries, foreign direct investment as the research sample.

According to Yan Bing's research, the proportion of output value is mostly determined by the OFDI stock. Therefore, this paper selects the OFDI stock of manufacturing industry in China from 2003 to 2014 as explanatory variable to join the model. Similarly, in view of the availability of data, according to the "Chinese foreign direct investment statistics bulletin" the Chinese of 30 samples of OFDI stock and foreign investment enterprises "Chinese list" (hereinafter referred to as the "directory") of the enterprise data, put forward the method of calculating, estimate the Chinese manufacturing industry to sample in OFDI the stock and stock data of different types of OFDI. "Directory" is included in the host country, domestic investors, foreign investment enterprises (Institutions), business scope and other information, because the business scope of the enterprise can be judged based on overseas enterprises (Institutions) belongs to the industry, according to the definition of vertical type and horizontal type OFDI, the foreign direct investment enterprises as vertical and horizontal type. According to the "business scope and the host country information list" overseas institutions, statistics of overseas enterprises Chinese manufacturing set in a sample of 30 countries (Institutions) the total number of enterprises and the number of vertical and horizontal type. After obtaining the number of enterprises, the overall, horizontal and vertical OFDI stock of the manufacturing industry is calculated based on the following method. The specific calculation formula is: Among them, K represents the type of enterprise. It represents the K class OFDI stock of China's host country j in t . It represents the total number of OFDI enterprises in the host country of China in the year of t . It represents the total stock of J in China in the first year of t .

(5) human capital HC

Human capital can measure the cost of labor in the region. This paper uses the average wage

growth rate of manufacturing workers to represent the annual increase of human capital in China's manufacturing industry. The data came from the annual statistical yearbook of China's industrial economy.

3. Data description

Since China began implementing the strategy of "going out" in 2003, the data in 2003 and before were not enough. In order not to affect the final result, we selected OFDI data from 30 countries in China in 2004-2014 years as the research sample, with a sample capacity of 11. The original data are from the Yearbook of China Statistical Yearbook, the China Industrial Economic Statistics Yearbook, the China Foreign Direct Investment Statistics Bulletin, the China high tech industry yearbook and the list of China's foreign investment enterprises. Among them, nominal variables, such as gross regional product, industrial gross output value, OFDI stock and average wage of manufacturing workers, are reduced to the actual value after the corresponding price index is reduced. At the same time, based on manufacturing industry classification method Xie Jianguo, wood processing and products industry, furniture manufacturing, papermaking, printing industry and its products and entertainment products manufacturing industry, non-metallic mineral products industry, ferrous and non-ferrous metal smelting and rolling processing industry, metal products industry and the chemical industry belongs to capital intensive oil; processing, coking and nuclear fuel processing, general and special equipment manufacturing, transportation equipment manufacturing, electrical, machinery and equipment manufacturing, communications equipment, computers and other electronic equipment manufacturing, instrumentation manufacturing, cultural and office machinery manufacturing industry and other manufacturing industries to capital and technology intensive. [18], because some industries did not separate statistics before 2012, for the sake of unification, this article eliminated the industry that did not separate statistics before 2012, and identified 21 manufacturing industries as the analysis objects. The descriptive analysis of the main variables in the model is shown in Table 1.

Table 1: descriptive statistics of the main variables

| variable | Company | Sample size | mean value | standard deviation | minimum value | Maximum value |
|----------|---------|-------------|------------|--------------------|---------------|---------------|
| CJ | % | 11 | 0.811301 | 0.030542 | 0.721821 | 0.830812 |
| CN | % | 11 | 0.005110 | 0.000144 | 0.004880 | 0.005333 |
| GDP | % | 11 | 0.117858 | 0.036409 | 0.060652 | 0.175068 |
| GDP^2 | % | 11 | 0.015096 | 0.008045 | 0.003679 | 0.030649 |
| HC | % | 11 | 0.102800 | 0.015833 | 0.082478 | 0.126877 |
| NHOFDI | % | 11 | 0.361404 | 0.360904 | -0.209626 | 0.985671 |
| NVOFDI | % | 11 | 0.387525 | 0.223273 | -0.015136 | 0.679092 |
| SHOFDI | % | 11 | 0.538660 | 0.379402 | 0.057137 | 1.462160 |
| SVOFDI | % | 11 | 0.339915 | 0.227983 | -0.011007 | 0.821918 |

To exclude the possibility of multiple collinearity, the correlation coefficient of explanatory variables is examined. The results are shown in Table 2. From table 2, we can see that in addition to the high correlation coefficient between the first item and the two item of the gross national product growth rate, the absolute values of the correlation coefficients between the other explanatory variables are all below 0.7, indicating that there is no significant linear relationship between the explanatory variables.

Table 2: explains variable correlation coefficient

| | GDP | GDP^2 | HC | NHOFDI | NVOFDI | SHOFDI | SVOFDI |
|--------|----------|----------|-----------|-----------|-----------|----------|----------|
| GDP | 1.000000 | | | | | | |
| GDP^2 | 0.989903 | 1.000000 | | | | | |
| HC | 0.477463 | 0.461284 | 1.000000 | | | | |
| NHOFDI | 0.000277 | 0.087974 | -0.153607 | 1.000000 | | | |
| NVOFDI | 0.155470 | 0.246014 | 0.189721 | -0.578861 | 1.000000 | | |
| SHOFDI | 0.245663 | 0.257928 | -0.287191 | 0.068258 | -0.361320 | 1.000000 | |
| SVOFDI | 0.328836 | 0.442150 | -0.111163 | 0.516246 | 0.649616 | 0.292706 | 1.000000 |

2. Empirical test

(1) Test of stability of time series variables

In order to avoid possible spurious regression in time series, Dickey and Fuller put forward DF test to check the stationarity of time series in 1976. But in order to guarantee the white noise characteristics of random interference items in DF test, they extended DF test and formed ADF test. Therefore, this paper uses the ADF test to verify the stability of the time series variables, and the results are shown in Table 3.

Table 3: ADF test results

| Variable name | Test type | ADF test value | Critical value 1% | Critical value 10% | conclusion |
|---------------|-----------|----------------|-------------------|--------------------|------------|
| CJ | (1,0,0) | -3.304992** | -4.297073 | -2.747676 | stable |
| CN | (1,0,0) | -5.534108*** | -4.420595 | -2.771129 | stable |
| GDP | (1,1,0) | -3.747372* | -5.521860 | -3.515047 | stable |
| GDP^2 | (1,1,0) | -4.539297** | -5.521860 | -3.515047 | stable |
| HC | (1,0,0) | -4.096349** | -4.420595 | -2.771129 | stable |
| NHOFDI | (1,0,0) | -3.141506* | -4.297073 | -2.747676 | stable |
| NVOFDI | (1,0,0) | -4.330833*** | -4.297073 | -2.747676 | stable |
| SHOFDI | (1,0,0) | -6.928566*** | -4.297073 | -2.747676 | stable |
| SVOFDI | (1,0,0) | -2.978322* | -4.420595 | -2.771129 | stable |

Note: (1) test type is (C, T, P) format, where C represents intercept term, C=1 represents intercepting term, C=0 represents no intercept term, T represents trend item, T=1 indicates trend item, T=0 indicates no trend item, P represents lag order. (2) ***, **, *, respectively, indicated that they were tested at a significant level of 1%, 5% and 10%.

From table 3, we can see that all horizontal sequences of variables are stationary sequences, which satisfy the prerequisites for cointegration test. Therefore, we can further test the cointegration relationship among variables.

(2) Cointegration test

In order to ensure that all variables in the model have stable equilibrium relationship in the long run, we use EG two step method to do cointegration regression for each equation, that is, to test the stationarity of the regression residuals, and the results are shown in Table 4.

Table 4: cointegration test results

| Variable name | Test type | ADF test value | Critical value 1% | Critical value 5% | Critical value 10% | conclusion |
|---------------|-----------|----------------|-------------------|-------------------|--------------------|------------|
| CJ | (0,0,0) | -2.918939* | -4.420595 | -3.259808 | -2.771129 | stable |
| CN | (1,0,0) | -2.869846* | -4.297073 | -3.212696 | -2.747676 | stable |

Note: ***, **, *, respectively, were tested at a significant level of 1%, 5% and 10%.

The results of cointegration test show that in the 5% significant level, the residual sequence of

the cointegration equation has no unit root and is a stationary sequence. Therefore, there is a long-term stable relationship between CJ, CN and various explanatory variables. It is guaranteed that no "pseudo regression" occurs when the time series is regressed.

(3) Analysis of measurement results

This paper uses e-views9.0 software to test the impact of different types of OFDI on the industrial structure upgrading of China's manufacturing industry.

The test results of the impact of the 1. inter industry upgrading are shown in Table 4.

Table 4: impact of inter industry upgrading

| variable | coefficient | T statistical value | The value of P |
|--------------------|--------------|---------------------|----------------|
| GDP | -7.062052** | -3.721888 | 0.0338 |
| GDP^2 | 32.58339** | 3.723789 | 0.0337 |
| HC | -2.039217*** | -4.888684 | 0.0164 |
| NHOFDI | -0.084104** | -4.694537 | 0.0183 |
| NVOFDI | 0.123258* | 2.630720 | 0.0783 |
| SHOFDI | 0.009048 | 0.457617 | 0.6783 |
| SVOFDI | -0.149808* | -2.529187 | 0.0855 |
| R-squared | 0.940363 | F-statistic | 6.757716 |
| Adjusted R-squared | 0.801209 | Prob(F-statistic) | 0.072265 |

Note: ***, **, *, respectively, were tested at a significant level of 1%, 5% and 10%.

The regression results show that between 2004 and 2014, the 94% of the changes in CJ can be explained by the changes of these 7 explanatory variables.

The first item of GDP has a negative impact on CJ, and the two term has a positive effect on the CJ coefficient. The impact of gross domestic product on the upgrading of manufacturing industry presents an upward parabolic shape, that is, gross domestic product has a negative impact on the upgrading of manufacturing industry, and the critical value has the smallest negative impact on manufacturing industry upgrading. According to the value judgment, the fitting degree of the model is better.

The human capital HC has a negative impact on the CJ coefficient and is significant. Human capital is the average wage of workers in the manufacturing industry upgrading has a significant negative impact, the reason may be China along with the economic development level is rising, the labor cost advantage has gradually disappeared, compared to some countries in Southeast

Asia, China's labor remuneration is high, which is China's implementation of a cause of industrial transfer through foreign direct investment. Therefore, it has no significant impact on the inter industry upgrading.

The coefficient of NHOFDI is negative and is tested by 5% significant levels. It shows that the horizontal OFDI to the developed countries has a significant negative impact on the upgrading of China's manufacturing industry. The coefficient of NVOFDI is positive, and by 10% significant level test, it shows that vertical OFDI has a significant positive impact on China's manufacturing industry upgrading. It shows that Chinese manufacturing enterprises should transfer the non core links in the value chain to the developed countries, and keep the core links of technology development in China, so as to achieve headquarters economy and allocate resources rationally, so as to promote the upgrading of domestic manufacturing industry structure. It is difficult for China to transfer its own industry to the developed countries because the labor cost and raw material cost in developed countries are all higher than those in China. Therefore, most of the transfer to the developed countries is capital and technology intensive industries. If they are distributed abroad, they will produce "industry hollowing" phenomenon, which is extremely unfavorable for the development of inter industry structure.

The coefficient symbol of SHOFDI is positive, which shows that the horizontal OFDI has a positive impact on the upgrading of China's manufacturing industry, but the impact is not significant. The coefficient sign of SVOFDI is negative, and by 10% significant level test, it shows that vertical OFDI to developing countries has a significant negative impact on China's manufacturing industry upgrading. It shows that the production, operation and sales of Chinese manufacturing enterprises in developing countries are more conducive to the upgrading of China's manufacturing industry. China should transfer the industry which has excess capacity of steel and building materials to developing countries, not only to achieve the transfer of domestic excess capacity, but also to release domestic production factors and make it invest in a more advantageous industry. But this positive effect is not significant, probably because in developing countries, the establishment of enterprises (Institutions) have reverse technology spillover effect makes the local enterprises, local enterprises to improve their production process, and China enterprises compete, Chinese makes enterprise products overcapacity phenomenon of pile up in excess of requirement.

The test results of the impact on the upgrading of the 2. industry are shown in Table 5.

Table 5: the impact of upgrading in the industry

| variable | coefficient | T statistical value | The value of P |
|--------------------|--------------|---------------------|----------------|
| GDP | -0.048990*** | -7.309007 | 0.0053 |
| GDP^2 | 0.221827*** | 7.176713 | 0.0056 |
| HC | -0.001453 | -0.986232 | 0.3967 |
| NHOFDI | -0.000177* | -2.802053 | 0.0677 |
| NVOFDI | 0.000411* | 2.483781 | 0.0890 |
| SHOFDI | 2.82E-05 | 0.403085 | 0.7139 |
| SVOFDI | -0.001399*** | -6.683955 | 0.0068 |
| R-squared | 0.966473 | F-statistic | 12.35442 |
| Adjusted R-squared | 0.888244 | Prob(F-statistic) | 0.031702 |

Note: ***, **, *, respectively, were tested at a significant level of 1%, 5% and 10%.

The regression results show that between 2004 and 2014, the 95.8% of the changes in CN can be explained by the changes of these 7 explanatory variables.

The first term of GDP has a negative influence on the CN coefficient, and the two term has a positive effect on the coefficient of CN. The impact of gross domestic product on the upgrading of manufacturing industry generally presents an upward parabolic shape, that is, gross domestic product has a negative impact on the upgrading of manufacturing industry, and the critical value has the smallest negative impact on it. According to the value judgment, the fitting degree of the model is better.

Human capital has a negative impact on the CN coefficient and is not significant.

The average wage level of manufacturing industry has no significant impact on the upgrading of the industry. The reason is that the wage level of domestic wage is not up to the demand of high-tech talents, and a large number of talents choose overseas development, which makes part of the domestic talent drain.

The coefficient sign of NHOFDI is negative, and by 10% significant test, it shows that horizontal OFDI to developed countries has a significant negative impact on China's manufacturing industry upgrading. The coefficient of NVOFDI is positive, and by 10% significant test, it shows that vertical OFDI has a significant positive impact on the upgrading of China's manufacturing industry. It shows that the vertical transfer of OFDI to the developed countries is more conducive to the upgrading of China's manufacturing industry. China will not have technical advantages such as industry, equipment manufacturing industry vertical OFDI in developed countries, so as

to learn from developed countries advanced technology, will not appear in their "industrial hollowing out" phenomenon; at the same time will have a comparative advantage industries, such as transportation and communications equipment manufacturing industry to the vertical OFDI will be in the form of non core parts to developed countries, production factors make the continued development of the core processes, promote to enhance the value chain.

The coefficient of SHOFDI is positive, which indicates that horizontal OFDI has a positive impact on the upgrading of China's manufacturing industry, but the impact is not significant. The coefficient of SVOFDI is negative and is tested by 1%. It shows that the vertical OFDI to the developing countries has a significant negative impact on the upgrading of China's manufacturing industry. It shows that the way of horizontal transfer to OFDI in developing countries is more conducive to the upgrading of China's manufacturing industry. China's manufacturing industry should lay out the production, operation and marketing of a certain industry in developing countries, rather than lay a specific link in foreign countries, so that it can neither absorb advanced technological processes nor make some domestic talents lose.

CONCLUSION AND ENLIGHTENMENT

In this paper, China OFDI rapid development as the background, combined with the domestic manufacturing industry structure increasingly prominent problem pressure upgrading, expounds the path of different types of OFDI affect the industrial upgrading of manufacturing industry, analysis of industrial transfer, industrial relationship and industrial competition of these three effects in which the influence of. At the same time ciannelli standards structure model based on the modified empirical model the impact of different types of OFDI on the upgrading of manufacturing industry and industry structure, and select the China during 2004-2014 time series data, test the influence of different types of OFDI manufacturing industry upgrading of intra industry structure of China, the main conclusions are as follows:

First, China's manufacturing industry OFDI can promote the upgrading of the manufacturing structure. The empirical results show that OFDI has positive and positive effects on the upgrading of manufacturing industry and intra industry, and OFDI has a positive effect on the upgrading of manufacturing industry as a whole, which is consistent with the results of mechanism analysis in this paper.

Second, the main driving force of domestic technological progress is still independent R & D innovation. The regression coefficient of each type of OFDI to intra industry upgrading is relatively small, which indicates that OFDI invested abroad has little contribution to the upstream value chain of manufacturing value chain, and the promotion of domestic industry technology neck is still insufficient. The technological progress of manufacturing industry still

needs to increase investment in scientific research and innovation at home, and can not rely on OFDI completely.

Third, our country should adopt different types of OFDI in the host country of different nature. When investing in developed countries, China's manufacturing industry should adopt a vertical OFDI. When investing in developing countries, China's manufacturing industry should adopt a horizontal OFDI approach.

REFERENCES

- [1], Jiang Xiaojuan, Du Ling. Foreign investment theory and its significance for reference, [J]. Economic Research on Chinese 2002,73:32-44.[5] Feng Zhengqiang, Zhang Yan. Foreign direct investment and industrial structure adjustment of the relationship between China empirical research [J]. Economic Research Journal, 2011,22:147-148.
- [2] Huo Xin. Study on China OFDI industry structure adjustment effect -- An Empirical Analysis Based on Grey Theory [J]. international economic and trade research, 2014,09:24-32.
- [3] Zhang Bin, sang Bai Kun. The influence and upgrading path of China's manufacturing industry participating in the international division of labor on Upgrading -- Based on the perspective of vertical specialization of exports, [J]. industrial economic research, 2015,05:12-20.
- [4] Guo Cheng. Chinese technology for [D]. OFDI industry upgrading effect of Zhejiang University, 2016.
- [5] Zheng Lei. Foreign direct investment and industrial structure upgrading - based on the industry data of China's direct investment in ASEAN, [J]. economic problems, 2012,02:47-50.
- [6] Zhang Yunda. Study on the influence of the Zhejiang University [D]. OFDI manufacturing industry on industrial structure optimization China, 2015.
- [7] Liu Haiyun, the European manufacturing industry. Especially the increase in the value of the OFDI effect of [J]. Chinese industrial economy to export, 2016,07:91-108.
- [8] Lv Mingyuan, Li Yanchao. Applicability of the international standard mode of industrial structure: Empirical Analysis of China's experience from 1952 to 2008 -- and an explanation of "industrial structure deviation" [J]. economic longitude and latitude, 2011, (06): 52-56.
- [9] Zhang Bin, sang Bai Kun. The influence and upgrading path of China's manufacturing industry participating in the international division of labor on Upgrading -- Based on the perspective of vertical specialization of exports, [J]. industrial economic research, 2015,05:12-20.
- [10] Zhang Yun, Wang Xin. ODI and the empirical study on the relationship between industrial structure upgrading of China's manufacturing industry -- [J]. technology economy based on ODI classification perspective, 2013,01:44-50.

- [11] (day) Xiao Dao Qing, foreign trade theory (Zhou Baolian translation), Tianjin, Nankai University press, 1987:10-120
- [12] Antràs P, Yeaple S R. Chapter 2 – Multinational Firms and the Structure of International Trade *. Handbook of International Economics, 2014, 4:55-130.
- [13] Chyau Tuan, Linda F.Y. Ng. Manufacturing agglomeration as incentives to Asian FDI in China after WTO. Journal of Asian Economics . 2004 (4)
- [14] Ernst D. Global Production Networks and Industrial Upgrading - A Knowledge-Centered Approach. General Information, 2001.
- [15] Herzer D, Schrooten M. Outward FDI and domestic investment in two industrialized countries. Economics Letters, 2008, 99(1):139-143.
- [16] Helpman E. Trade, FDI, and the Organization of Firms[J]. Journal of Economic Literature, 2006, 44(3):589-630.
- [17] R. Vernon, International Investment and International trade in the product cycle, Quarterly Journal of Economics, 1966, (3) : 80
- [18] Wong, J., Chan, S. China's Outward direct investment: Expanding Worldwide. China: An International Journal . 2003