

Foreign Direct Investment and Industry Income Gap

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Abstract. Since the reform and opening-up, FDI has played an important role in people's daily life. In the early years, FDI went mostly to manufacturing. However, FDI absorption by the service industry has increased significantly in recent years. In this context, from the perspective of industries, it is very valuable to study the impact of the scale of FDI absorption on the income gap of different industries in China. This paper first analyzes the scale of foreign investment absorption in different industries in China and introduces the changing trend of the scale of FDI absorption in manufacturing and service industries at different times. Moreover, the average salary level of different industries in China has also been analyzed to understand the changing trend of the income gap in different industries. Finally, through the method of empirical study, using China's 18 industries in 2005-2020 panel data as samples, this article explores the relationship between absorbed FDI and average wages in different Chinese industries. It demonstrates that the inflow of FDI can polarize the income level between industries. Some explanations have also been given in terms of the empirical results.

Keywords: China; FDI scale; Industry income gap; Fixed effect model; Technology spillover effect.

1. Introduction

FDI plays an important role in the economic development of China. In terms of foreign investment absorption, even in the context of global investment turbulence caused by the COVID-19 pandemic, China remained the world's second-largest recipient of foreign investment in 2021, with the annual use of foreign investment reaching 1.1 trillion yuan, ranking firmly behind the United States. Moreover, in terms of the growth rate, the scale of foreign investment increased by 14.9% in 2021, and nearly 50,000 new foreign-funded enterprises were founded, with the number increasing by 3.5%. Under a favorable environment for FDI, China simultaneously improves the scale and quality of foreign investment.

At the same time, the distribution of FDI and the income among different industries keeps varying. In terms of industrial distribution, FDI gradually transfers from manufacturing to service. In 2020, the FDI utilized in the service industry achieved \$107.2 billion, which is 74% of the total in 2020, which is only 23% in 2004. In another way, the income gap between different industries also expands year by year. The average salary in the service industry rose from 15,359 yuan in 2003 to 107,305 yuan in 2020. The amount above the average manufacturing wage rose from 2,417 yuan in 2003 to 27,231 yuan in 2020.

Due to the profit-driven characteristic of FDI, along with the increasing opening scale, the widening income gap is often reflected in the income gap between skilled and non-skilled industries. For example, the average salary of information transportation, software and computer industry, financial industry has been high for a long time, while the average salary of retail and wholesale industry, food and accommodation industry is low. This trend of polarization is undoubtedly not conducive to the economy and harms social stability.

Therefore, with the increasing FDI in the service sector and the widening income gap between different industries, the paper cannot help but wonder whether FDI has played a positive role in the increasing income gap. Therefore, the paper takes 18 industries in China as the research object to analyze the impact of FDI absorption in different industries on industry average wages from 2005 to 2020.

It should also be noticed that FDI has different impacts on different industries in different countries, which leads to the complexity of the research. For example, the differences between developing

countries and developed countries, manufacturing industries and service industries, technology-intensive industries and non-technology-intensive industries all lead to widely divergent results.

2. Literature Review

At present, scholars have formed a relatively mature theoretical system in studying this issue. The earliest theory was raised by the classical economist MacDougall [1]. He believed that capital flows could increase the welfare of both the outflow country and the host country, but he made no explanation of how the benefits will be distributed between the two countries.

Kuznets (1966) found an inverted-U-curve correlation between FDI and income gap, which meant that in a short term FDI does enlarge the income gap between host countries [2]. The reason lies in the fact that the initial inflow of FDI in different industries is selective and therefore, industries could benefit more if they absorb FDI more. However, in a long run, this effect will diminish and not widen the income distribution gap in the host country. Kuznets's theory is a core representative of the Modernization Hypothesis. Besides, Figini P & Goerg H (1999) found an inverted-U relationship between wage inequality and multinationals in the study of Ireland [3]. Hefeng & Xu Guilin (2009) also verified the existence of the Modernization Hypothesis in China [4].

However, some scholars contended that FDI has a positive influence on the income gap. Through the panel data analysis of 119 developing countries, Basu P & Guariglia A (2007) concluded that while foreign direct investment promoted the economic development of the host country, it had a negative influence on the income gap [5]. He explained that it was because the influx of foreign capital boosted the development of industrial sectors while diminishing the revenue of traditional departments. In China, Sun Churen, etc. (2008), Xuan Ye, Zhao Shudong (2005), Xu Lan, etc. (2011) respectively took the East, Midwest, Jiangsu Province, and Yangtze River Delta as research objects, and found that foreign investment had a positive impact on regional income gap [6-8].

Some scholars believe that FDI does not have a significant impact on the income gap, while the relevant factors in the host country play a greater and more important role. Aitken B, Harrison A and Lipsey R.E. (1996) discovered in the study of Venezuela, the United States, and Mexico that in Venezuela and Mexico FDI enlarged the income gap, while in America FDI narrowed the income gap [9]. They explained that the opposite result is due to different economic development levels in three countries. Figini P & Goerg H (2011) found that the effect of FDI differs according to the level of development [10]. They concluded that for OECD (developed) countries, wage inequality decreased with FDI inward stock, and for non-OECD (developing) countries, it presented a nonlinear stock, with such effect diminishing with further increase in FDI.

3. Analysis of the Chinese FDI Absorption Scale and the Income Gap

To better introduce the current condition of different industries in China, this section will mainly introduce three aspects: the scale of FDI in different industries, the income gap between industries, and the possible transmission channels of foreign direct investment to the income gap between industries.

3.1 The Scale of FDI Utilized by Industries

Because of the limitation of the statistics available, our range of study is from 2004 to 2020. It's not hard to see from the graphs below that FDI gradually transitioned from the manufacturing industry to the service industry. Based on the trend of the actual utilized FDI scale and the project number in China's three major industries, it can be seen that the main flow of FDI is transitioning from the secondary industry to the tertiary industry. The tertiary industry exceeded the secondary industry in terms of the scale of FDI utilization in 2011 and the number of FDI projects in 2008. In 2020, FDI utilized by the tertiary industry amounted to US \$10,720,008, and the number of projects was 33,437, far exceeding that of the secondary industry.

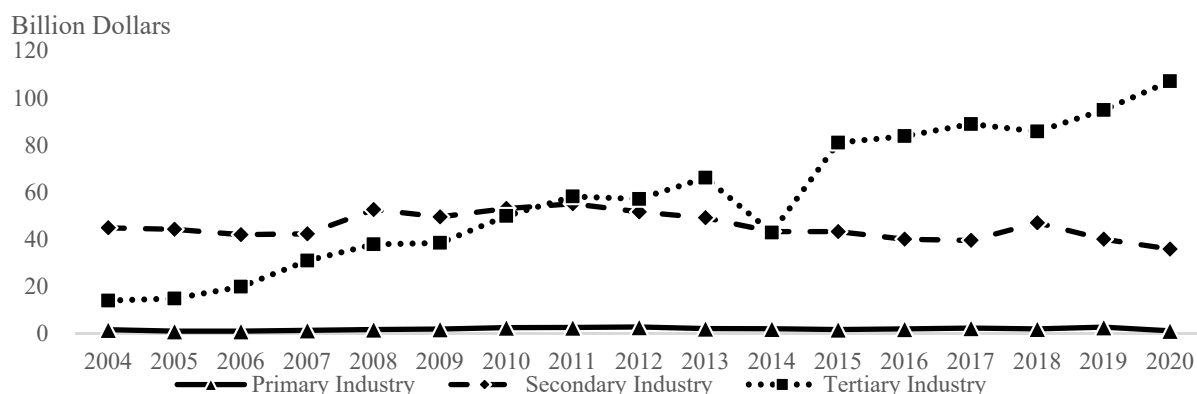


Fig.1 The actual utilized FDI in China's three major industries
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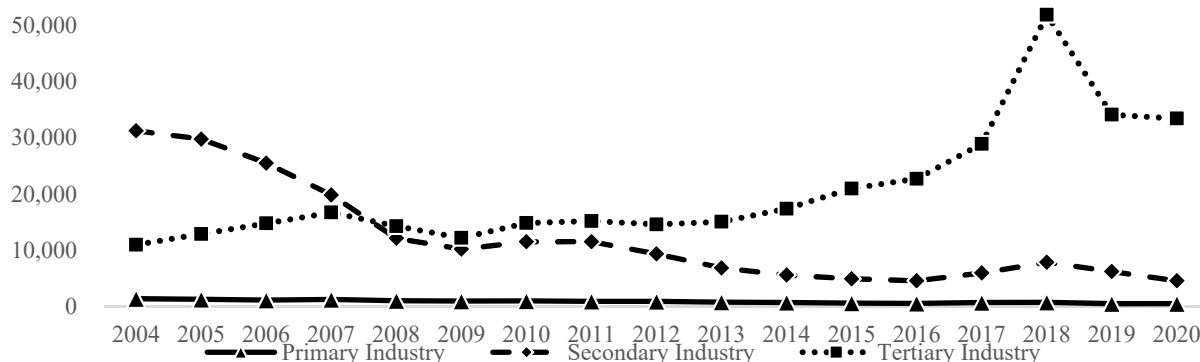


Fig.2 The number of FDI projects utilized by China's three major industries
Photo credit: Original

From the graph below, the secondary industry decreased from 74.10% in 2004 to 24.89% in 2020, while the tertiary industry increased from 23.18% in 2004 to 74.25% in 2020. A similar trend can be seen in the proportion of FDI project quantities. The secondary industry decreased from 71.57% in 2004 to 11.91% in 2020, while the tertiary industry increased from 25.20% in 2004 to 86.69% in 2020. Therefore, the overall trend looks the same, with the proportion in the tertiary industry increasing.

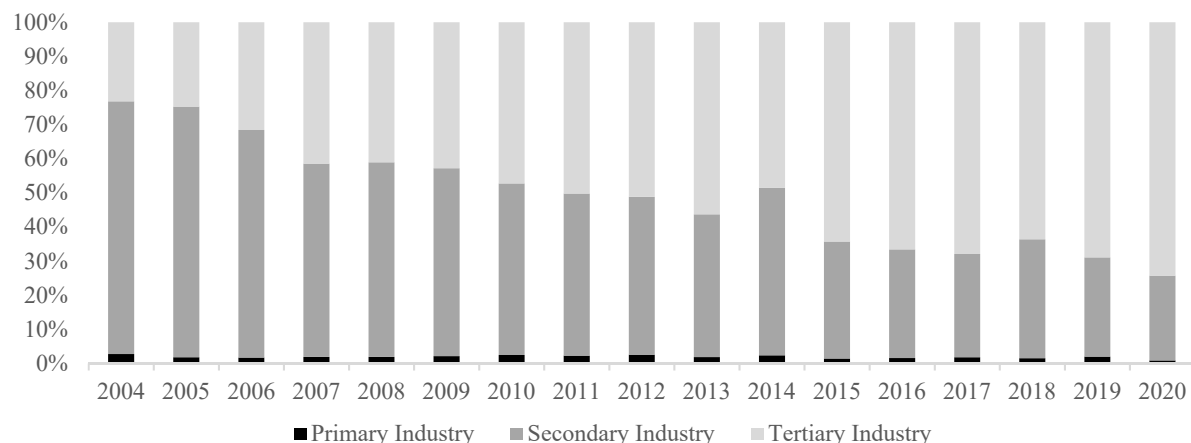


Fig.3 The proportion of actual utilized FDI in China's three major industries
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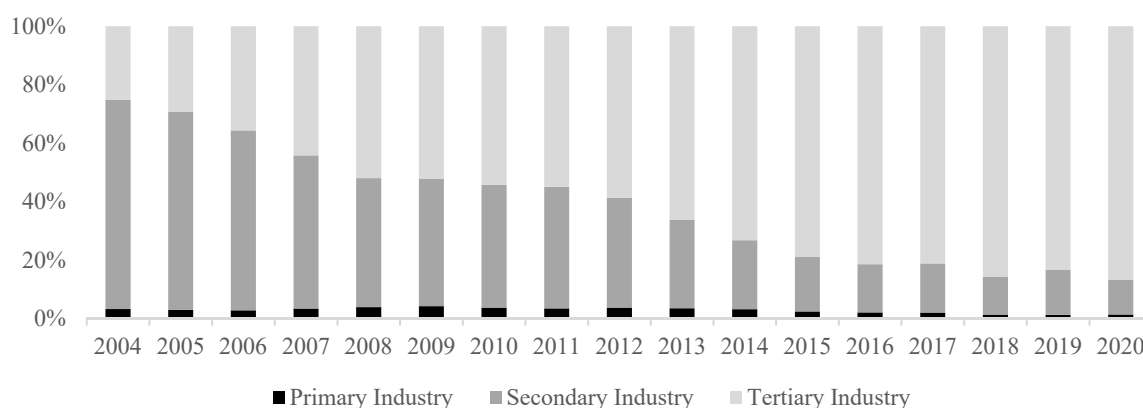


Fig.4 The proportion of FDI projects utilized by China's three major industries
Photo credit: Original

From the perspective of sub-industries, it can be seen that the distribution of FDI in different sub-industries by accumulating the actual amount of FDI used in the past 17 years. Among them, the manufacturing industry used the largest amount of accumulated FDI, amounting to US\$ 715 billion, while public administration and social organizations used the least amount, amounting to US \$55.43 million. The top three industries include manufacturing, real estate, leasing, and business services, accounting for 40%, 18%, and 10% respectively, accounting for 68% in total, which is more than two-thirds of the total. This indicates the uneven distribution of FDI in different industries.

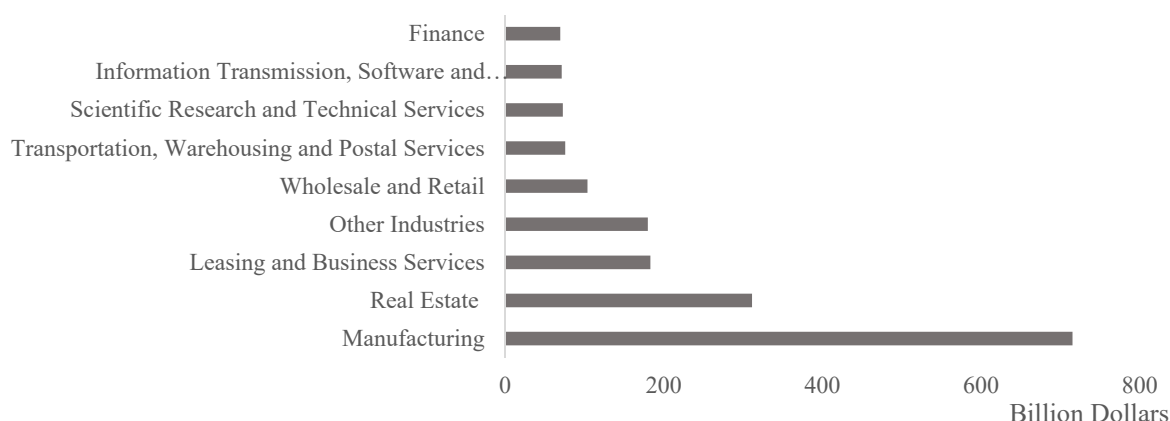


Fig.5 The amount of FDI utilized by subdivided industries from 2004 to 2020
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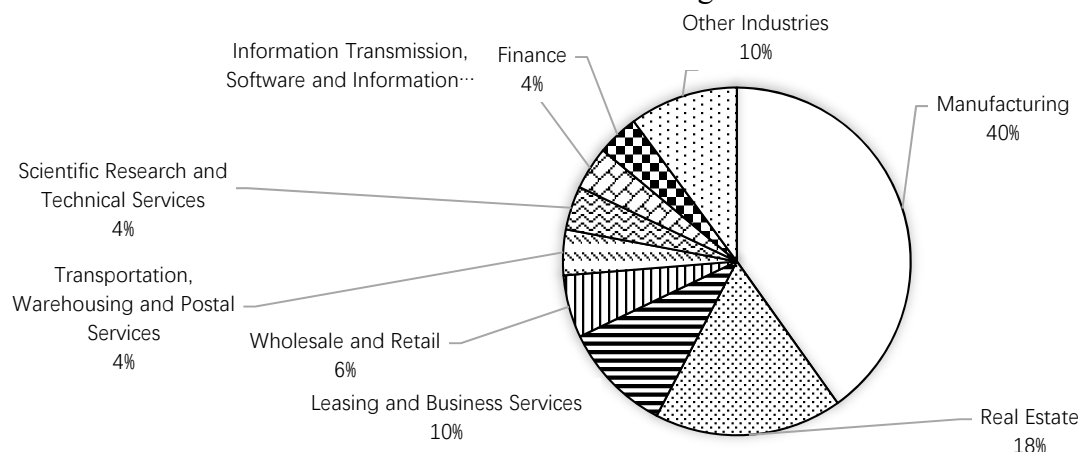


Fig.6 The proportion of FDI utilized by subdivided industries from 2004 to 2020
Photo credit: Original

3.2 The Income Gap between Industries

This section will analyze and introduce the changing trend of the income gap between industries over the years, and make a comparative analysis of the income gap between the three major industries.

The graph below shows China's annual average income from 2003 to 2020, along with the highest and lowest values of different industries in the corresponding years. It can be seen that the overall average salary showed a steady upward trend, increasing from 13,969 yuan in 2003 to 97,379 yuan in 2020. At the same time, from the perspective of the maximum value of the average wage in the industry, the vertical distance between the highest value and the lowest value showed a trend of increasing year by year. In 2003, the extreme value difference was 24013 yuan, and in 2020, the extreme value difference was 129,044 yuan.

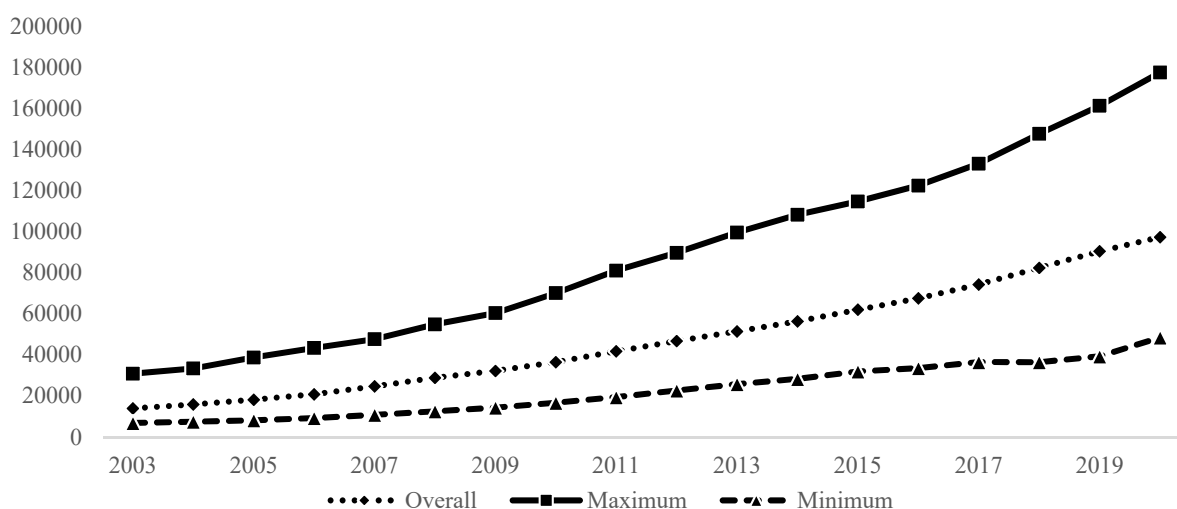


Fig.7 The varying trend of average salary from 2003 to 2020

Photo credit: Original

At the same time, the extreme value ratio, the coefficient of variation and the Theil index can also be used as relative indicators to measure the income gap between different subindustries. Among them, the extreme value ratio is the ratio of the maximum value and the minimum value, this measurement method is easily affected by the extreme value, the smaller the ratio, the smaller the difference. The coefficient of variation refers to the ratio of standard deviation and average value, which eliminates the influence of the natural increase of average wage. The smaller the ratio, the smaller the difference. Theil index is calculated by the equation below:

$$Theil = \sum_{i=1}^n \left\{ \left(\frac{x_i}{x} \right) \ln \left[\frac{x_i/x}{p_i/p} \right] \right\} \quad (1)$$

Where x is the average income of the industry, x is the sum of the average income of all industries; p_i is the number of employed people in the industry, and p is the total number of employed people in all industries. It further takes into account the number of jobs in different industries at the end of the year, and the smaller the ratio, the smaller the difference.

The chart below shows the fluctuations of three relative indicators from 2003 to 2020. The extreme value ratio fluctuated from 4.49 to 3.66. The coefficient of variation is relatively stable, keeping at about 0.33. Theil index dropped from 0.65 to 0.45. The moving trend of the three relative indicators is not the same, indicating that after the number of people in different industries is taken into account, the income gap of different industries tends to narrow, which may be caused to a certain extent by the increase in the number of people employed in high-income industries, therefore the income gap of different industries is mitigated in the calculation of the Theil index.

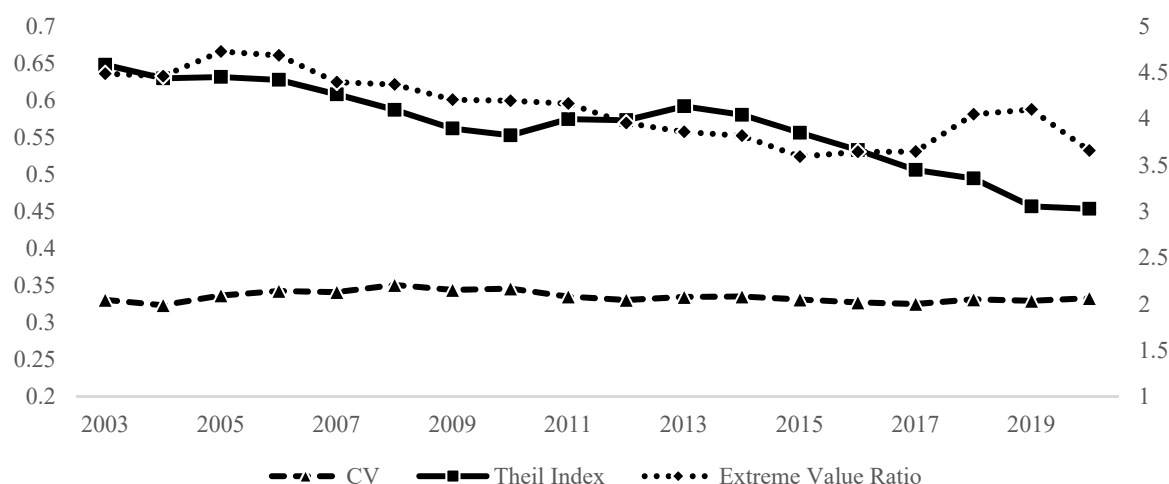


Fig.8 Relative measurement index of income gap from 2003 to 2020

Photo credit: Original

The following table reflects the average income of the three industries from 2003 to 2020, from which it can be found that the average salary of the three industries shows an upward trend with each year, among which the average salary of the tertiary industry is the highest, the average salary of the primary industry is the lowest, and the average salary of the secondary industry is in the middle. The difference in average pay across industries tends to expand each year. In 2020, the difference between primary and tertiary industries was 58,765 yuan, the difference between secondary and tertiary industries was 27,231 yuan, and the difference between primary and secondary industries was 31,534.6 yuan.

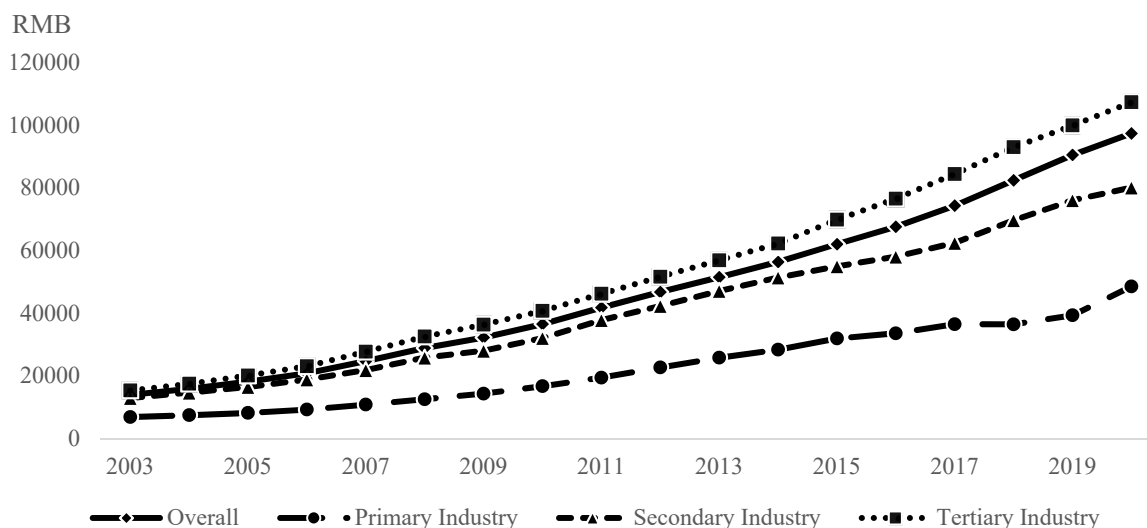


Fig.9 Varying trend of average income by major industry from 2003 to 2020

Photo credit: Original

3.3 The Impact Mechanism of FDI Scale on Industry Income Gap

The paper considers two important mechanisms:

1). Advanced technologies and knowledge are brought to the country through FDI, while the abilities to absorb FDI in different industries are different. Therefore, industries with stronger FDI absorption capacity have higher labor productivity. For example, the degree of labor productivity improvement in science and technology innovation industries is greater than that in traditional retail and residential service industries.

2). When foreign enterprises enter the market of the host country, they will choose industries with strong profitability. At the same time, foreign companies tend to attract skilled labor by paying higher wages. When skilled labor is concentrated in certain foreign companies, domestic companies raise wages to retain skilled labor. This will lead to a corresponding change in the structure of supply and demand in the labor market. In industries with more foreign investment, the competition between foreign capital and domestic capital is high, and the wage of skilled labor is higher and higher. In industries with little foreign investment, the competition for capital is low and the wage for unskilled labor is also low. These two opposite trends will lead to income gaps in different industries.

4. Empirical Study of the Impact of FDI on Industry Income Gap

4.1 Model Setting and Variable Selection

The paper chooses the average wage of the industry as the explained variable. Since the wage level will be affected by specific factors, the paper chooses the scale of FDI absorbed by the industry as the core explanatory variable and select the degree of monopoly, capital intensity, employment scale, industry-added value, and education level of the industry as control variables to better fit the regression equation.

At the same time, because the industries in the sample are from different industries and there is strong heterogeneity among different industries, the paper can use the fixed effects model to alleviate the omitted variable bias caused by the characteristics of the industry itself.

In order to make the data more stable, the paper chooses the logarithmic processing of Wage and FDI, which can not only facilitate the interpretation of regression coefficients as elasticities but also reduce the degree of heteroscedasticity of samples and the volatility of variables. After comprehensive consideration, the model of this paper is set as:

$$\ln Wage_{it} = \beta_1 \ln FDI_{it} + \beta_2 Monopoly_{it} + \beta_3 Capital_{it} + \beta_4 EDU_{it} + \beta_5 GDP_{it} + \alpha_i + \mu_{it} \quad (2)$$

In this model, Wage represents the average income level in different subsectors; FDI represents the real utilized FDI scale; Monopoly is the proportion of employees working in state-owned units; Capital is calculated by dividing the fixed asset investment by the total urban employment in that industry; GDP is the gross industry product in each industry; EDU is calculated by the number of persons with undergraduate degree divided by the total number of urban employed persons; α_i is industry dummy variables.

4.2 Descriptive Statistics and Correlation Analysis

Descriptive statistics and correlation analysis were conducted on the variables involved, and the statistical results were shown in the following two tables. The results showed that $\ln Wage$ and $\ln FDI$ were significantly correlated, and the correlation was positive. This shows that our hypothesis is reasonable, that is, FDI has a promoting effect on industry average compensation.

Table 1. Statistical characteristics of variables

Variables	Mean Value	Standard Deviation	Minimum	Maximum
$\ln Wage$	10.8042	0.5599	9.1344	12.0870
$\ln FDI$	11.9868	1.8517	5.98	15.47
Monopoly	0.4453	0.3094	0.0102	0.9661
Capital	46.3353	79.9676	0.3234	385.8631
EDU	4.5693	4.6107	0.4	24
GDP	31880.24	42962.74	945.80	266417.8

Table 2. Correlation analysis

	lnWage	lnFDI	Monopoly	Capital	GDP	EDU1
lnWage	1					
lnFDI	0.210***	1				
Monopoly	-0.321***	-0.649***	1			
Capital	0.0640	0.222***	-0.0800	1		
GDP	0.161***	0.493***	-0.421***	0.0470	1	
EDU1	0.143**	-0.167***	0.0880	-0.286***	0.376***	1

4.3 The Empirical Test

Through the comparison of multiple regression models, the chi-square value of the model was reported to be 142.27 and the P value was 0.0000 using the Hausman test. The conclusion shows that the fixed effect model should be selected for correlation analysis. The results of the fixed effects regression are shown in the following table.

Table 3. Empirical analysis results

Variable	(1)	(2)	(3)	(4)	(5)
lnFDI	0.122** (2.81)	0.136** (2.54)	0.117** (2.75)	0.110** (2.70)	0.207*** (3.98)
Monopoly	-2.080*** (-7.37)	-2.605*** (-6.91)	-1.994*** (-7.68)	-2.312*** (-8.78)	Null
Capital	0.002*** (5.21)	0.002*** (3.26)	0.002*** (5.89)	Null	0.004*** (5.32)
EDU1	-0.034 (-1.00)	-0.048 (-1.31)	Null	-0.039 (-1.27)	-0.003 (-0.06)
GDP	0.000*** (3.70)	Null	0.000*** (4.06)	0.000*** (3.58)	0.000*** (3.24)
Fixed Effect	√	√	√	√	√
R ²	0.856	0.776	0.852	0.842	0.699
Sample Size(N)	270	270	270	270	125
F test	0	6.26e-10	0	9.55e-11	5.54e-08

From the regression results, after changing the type and number of control variables, lnFDI is still significant and the coefficient is positive. The above results show that foreign direct investment has a significant promoting effect on the expansion of the income gap of the industry.

4.3 Grouped Regression Model

Since the sample contains different major industries, it is necessary and meaningful to carry out the regression of different industries. FDI may affect different industries in different degrees and directions. Therefore, the following table reflects the results of the regression grouped by secondary and tertiary industries.

It is found that the regression results of different industries are still significant, and the positive promotion effect of foreign direct investment on the secondary industry (0.147) is greater than that of the tertiary industry (0.097). This shows that although the scale of FDI utilization by the tertiary industry exceeds that of the secondary industry, the secondary industry is more mature and the degree

of FDI utilization is higher. The regression direction of monopoly degree is the same in the secondary and tertiary industries, indicating that monopoly degree has a significant effect on reducing wages in both industries. Capital intensity, which is significant in the initial regression, is no longer significant in the regression for the secondary industry, but it is significant in the tertiary industry. This indicates that wages in the tertiary industry are more likely to be affected by capital intensity than wages in the secondary industry.

Table 4. Grouped empirical analysis results

Variable	Secondary Industry	Tertiary Industry
lnFDI	0.147** (0.039)	0.097** (2.26)
Monopoly	-1.648** (-0.324)	-1.872*** (-4.66)
Capital	0.007 (0.004)	0.002*** (4.12)
EDU1	0.127 (0.094)	-0.051** (-2.41)
GDP	6.57e-06** (1.18e-06)	0.000*** (3.71)
Fixed Effect	√	√
R ²	0.941	0.865
Sample Size(N)	60	195
F test	0	2.55e-08

4.3 Robustness Test

To further illustrate the robustness of the model, it can be verified that FDI always plays a significant role in industry income by replacing control variables. The following table replaces industry Value added (GDP) with Industry Value added share (IGDP), and education replaces undergraduate students (EDU1) with graduate students (EDU2). It can test the robustness without affecting the significance. If the role of FDI is still non-negligible in the following result, then robustness is ensured. The regression results are shown in the following table.

Table 5. Robustness test results

Variable	fe
lnFDI	0.146** (2.44)
Monopoly	-2.521** (-6.60)
Capital	0.002*** (3.45)
EDU2	-0.025 (-1.44)
PGDP	-2.551 (-0.39)
Fixed Effect	√
R ²	0.775
Sample Size(N)	270
F test	1.00e-09

The conclusion shows that the model is still valid on the basis of replacing the control variables. Among them, the institutional factor (degree of monopoly) is significantly negative in multiple regressions, which indicates that industries with high monopoly will have a negative impact on income level. Other variables, such as capital intensity and education level, are not consistent in significance in different regressions. For example, capital intensity is no longer significant in the

regression by industry. Part of the reason is that the model itself has some problems of cross-sectional correlation and serial correlation. The other part is that replacing control variables will affect the significance of other control variables. But in general, there is no doubt that foreign direct investment promotes the industry income gap.

5. Conclusion

This paper mainly studies the impact of FDI on the industry income gap. Through the method of empirical research, it is proved that the scale of FDI absorbed by the industry has a significant promoting effect on the average level of industry income. At the same time, the following conclusions are obtained:

In terms of the scale of FDI absorption by different industries, the tertiary industry currently exceeds the secondary industry and becomes the main force of FDI absorption. At the same time, industry absorption of FDI has an obvious "head effect". Manufacturing, real estate, leasing, and commerce accounted for more than two-thirds of the total utilized FDI.

From the perspective of the income level of different industries, in the absolute index, the extreme value difference of different industries widened year by year, rising from 240,013 yuan in 2003 to 129,044 yuan in 20 years. Among the relative indexes, the extreme value ratio fluctuated and decreased from 4.49 to 3.66. Theil index kept a decreasing trend from 0.65 to 0.45. The coefficient of variation is stable and always keeps at about 0.33. At the same time, compared with the average salary of different industries, the tertiary industry is the highest.

From the perspective of influencing mechanism, it can be divided into the technology spillover effect and wage spillover effect. The technology spillover effect improves the labor productivity of local enterprises through the high and new technologies brought by foreign investors and then increases the marginal return of labor. The wage spillover effect refers to the foreign investment in certain potential industries, through high wages to attract skilled labor, and then cause changes in the local labor market supply and demand structure, affecting wages.

References

- [1] MacDougall G D A. The Benefits and Costs of Private Investment from Abroad: A Theoretical Approach. *Economic Record*, 1960, 36: 13-35.
- [2] Kuznets S. *Modern Economic Growth: Rate Structure, and Spread*. London: Yale University Press, 1966.
- [3] Figini P, Görg H. Multinational Companies and Wage Inequality in the Host Country: The Case of Ireland. *Review of World Economics*, 1999, 135: 594-612.
- [4] He Feng, Xu Guilin. There is an inverted U-shaped relationship between FDI and the income gap between urban and rural residents of China. *International Trade Issues*, 2009, 11: 89-96.
- [5] Basu P, Guariglia A. Foreign Direct Investment, inequality and growth. *Journal of Macroeconomics*, 2007, 29: 824-839.
- [6] Sun Churen, Wen Juan, Zhu Zhongli. An Empirical Study on Foreign Direct Investment and Regional Wage Differentials in China. *World Economic Studies*, 2008, (02): 8-14+28+86.
- [7] Xuan Ye, Zhao Shudong. The Wage Effect of Foreign Direct Investment: An Empirical Study on Jiangsu Province. *Nankai Economic Research*, 2005, (01).
- [8] Xu Lan, Qiao Lijie, Yang Lianna. The Impact of FDI on Regional Income Gap: A Case study of Pan-Yangtze River Delt. *Journal of Beijing University of Chemical Technology (Social Science Edition)*, 2011, 02: 33-37.
- [9] Aitken B, Harrison A, Lipsey R E. Wages and Foreign Ownership: A Comparative Study of Mexico, Venezuela, and the United States, *Journal of International Economics*, 1996, 40, 345-371.
- [10] Figini P, Görg H. Does Foreign Direct Investment Affect Wage Inequality? An Empirical Investigation. *The World Economy*, 2011, 34: 1455-1475.