The Impact of Outward FDI on the Employment Skills Structure of Chinese Firms

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Abstract: Based on the panel data of China's manufacturing public listed firms from 2011 to 2015, this paper examines the impact of Chinese manufacturing enterprises' foreign direct investment on the employment skills structure using the fixed-effect model. We found that firms with OFDI, compared to those domestic firms, tend to reduce their employment of producer and finance employees, increase the employment of sales, technical and unskilled labor; increase the share of technical workers and reduce the proportion of producer, finance, sales, and unskilled workers. Compare to intermittent OFDI, firms with continuous OFDI have more employment of sales and technical personnel. With respect to OFDI host countries, OFDI toward OECD countries has negative effect on non-skill jobs, while toward non-OECD countries has positive effect on skill jobs, such as finance, sale and tech's job. Using the PSM method to conduct an endogenous test, we find that the key results of OFDI impacts remain robust.

Keywords: Outward FDI, Chinese Manufacturing Multinationals, Employment Skills Structure, PSM.

1. Introduction

Since the reform and opening-up, China's OFDI has gone through five stages: exploration, early-stage, perfection, more mature, and maturity, achieving an all-around improvement in the scale, quality, and efficiency of investment. In recent years, China has attracted a large amount of foreign investment with its cheap labor, land, and raw materials, and the manufacturing industry has developed significantly, but its development has focused on quantity rather than quality. To achieve the quantitative expansion to a qualitative leap, the government has introduced several preferential policies to encourage enterprises to carry out OFDI. The Fifth Plenary Session of the 15th Central Committee and the Third Plenary Session of the 16th Central Committee both mentioned the "Going out" strategy, which aims to encourage domestic enterprises to actively go abroad to learn foreign advanced technology; as China's economy enters a new normal, the "Belt and Road" policy gives policy benefits for listed companies to go abroad and becomes the main driving force for China's OFDI [1]. Despite the prevalence of international investment protectionism and the rise of anti-globalization forces, resulting in the slow development of the global economy, China has made full use of domestic and foreign resources, seized the opportunity to actively promote various strategies and remove investment barriers, so that the scale of OFDI has been expanding. Statistics from the Ministry of Commerce show that China's OFDI reached US$1.98 million in 2018, rising to 6.4% in

the world from 0.4% in 2002; according to the China OFDI report, the total amount of Chinese manufacturing OFDI has slightly decreased in 2013 and 2018 in the past decade, but the overall scale has been rising amidst fluctuations.

China's manufacturing industry occupies a pivotal position in the national economy, and employment is an important indicator of economic and social development. In recent years, the traditional manufacturing industry has developed rapidly and the industrial chains have gradually improved; however, the current global political and economic landscape has undergone significant changes, and the uncertainties faced in conducting international trade and investment activities have increased. The EPS database shows that the change in manufacturing employment in China is in an inverted "U" shape between 2010 and 2019, peaking in 2013.

It has been shown that the transfer of labor-intensive activities in manufacturing firms to overseas markets in developed countries increases the demand for highly skilled labor in the domestic market and optimizes the parent company's workforce structure. In contrast, developing countries' production and exports mainly rely on labor-intensive products with comparative advantages, and low-cost production workers account for a large proportion of the enterprises' workforce structure, and the OFDI of enterprises has a certain substitution effect on low-cost production workers in their own countries, so the parent company's workforce structure cannot be significantly changed in the short term. In the long run, due to the changes in the domestic labor market structure caused by the changes in supply and demand, the enterprises' production gradually transforms and upgrades, and then the parent company's demand for employees gradually shifts from low-cost production workers to high-skilled labor to achieve the optimization of the enterprise's employee structure [2]. It can be seen that the impact of OFDI on the employment skill structure of enterprises in home countries is uncertain and influenced by various factors such as the degree of national development [3-5]. So will the rapid development of OFDI further aggravate the employment pressure in home countries? In the context of the increasing division of labor in global value chains, what impact will OFDI have on the employment of employees engaged in different product segments? Based on this, this paper examines the impact of OFDI on the employment skill structure of parent companies, taking Chinese-listed manufacturing companies as a sample.

2.   The Effect of OFDIs on Firms' Performance

The effects of outward foreign direct invest on firms' performance focus on the following three areas.

First, is the employment effect of OFDI. There are three main views in the established literature: (1) Some literature argues that OFDI will reduce home country investment due to the limited resources of multinational corporations; moreover, outsourcing labor-intensive activities such as production and processing to host countries will reduce home country consumption while expanding overseas markets. Therefore, OFDI has a substitution effect on parent company employment [6-7]. (2) Some literature argues that through OFDI, parent firms providing R&D, supervisory, and sales services to their overseas subsidiaries can increase the employment of non-production employees in the parent firm [8]. Desai et al. argue that OFDI broadens firms' overseas markets and generates greater demand for domestic products thus increasing employment [9]. Thus, OFDI is complementary to parent company employment [10]. (3) Other literature argues that OFDI is both substitution and complementarity to parent company employment and the overall effect depends on the sum of the two effects [11].

Second, is the moderating effect of investment motives. Some studies have argued that the impact of corporate OFDI on parent employment is not a simple substitution and complementarity relationship, but is influenced by factors such as investment motives and global value chain division of labor. The Ministry of Commerce of the People's Republic of China classifies Chinese enterprises' OFDI motives into four types: trade and commerce services, technology R&D, resource development,

and local production and sales [12]. Ja et al. distinguish employment indicators into absolute and relative amounts and argue that commerce service and technology R&D OFDI significantly contribute to the absolute amount of parent company employment in the home country [13]. Li et al. distinguish resource exploitation OFDI into mining and non-mining industries, and argue that mining OFDI that sells access to resources does not affect parent company employment, and non-mining OFDI that processes access to resources significantly promotes parent company employment levels; meanwhile, they distinguish local production OFDI into horizontal and vertical types and argue that as long as it can increase parent company exports of intermediate goods, both horizontal and vertical OFDI can promote employment in parent companies [4].

Third, is the impact of OFDI on the skill structure of employment. using a sample of French manufacturing firms. Laffineur and Mouhoud find that investment in low-income countries significantly increases the share of management employees in the parent company, and investment in high-income countries reduces the share of skilled workers in the parent company [14]. Using data from 2011-2016 for Chinese listed manufacturing firms, Yan et al. find that OFDI can promote an increase in production, sales, technical and managerial staff and with a lag, with a greater increase in production staff [2]. Using Chinese firms' OFDI data from 2010-2018, Li and Che find that OFDI boosts the share of skilled employees in the total workforce of the parent company [15].

From the existing literature, it can be seen that the impact of OFDI on domestic employment has not yet been conclusively established; moreover, domestic and foreign scholars have conducted studies from macro and micro perspectives, however, the subjects of OFDI are heterogeneous enterprises, and OFDI by enterprises affects the employment of parent companies, which in turn affects the overall employment level of the industry or the country. Therefore, the impact of OFDI on the parent company's employment structure cannot be precisely analyzed from the macro or the micro-level. Based on the existing studies, this paper mainly extends the following: first, we use the panel data of Chinese manufacturing listed companies from 2011-2015 to explore the employment effects of OFDI from the micro-level. Second, the research perspective examines the effects of OFDI on the employment structure of enterprises under the heterogeneity of whether enterprises invest in OFDI, the number of OFDI, and the development level of host countries, respectively. Third, the use of the PSM method based on the panel fixed effects model better addresses the problem of model endogeneity.

3. Data and Methodology

3.1. Estimation Specification and Variables

To study the impact of enterprises' OFDI on their employment skill structure, the following econometric equation is constructed by drawing on existing research results and combining the actual information of the sample data in this paper:

$$ln\,employee\_str_{it} = \beta_1 + \beta_2 \cdot OFDI_{it} + \chi \cdot X_{it} + \gamma_j + \gamma_p + \gamma_t + \varepsilon_{it} \qquad (1)$$

In the above equation, the explanatory variable $ln\,employee\_str$ is the natural logarithm of the employment structure of firm i in year t, including the logarithm of the number of production personnel ($ln\_producer$), the logarithm of the number of financial personnel ($ln\_finance$), the logarithm of the number of sales personnel (ln_sales), the logarithm of the number of technical personnel ($ln\_technician$), and the logarithm of the number of unskilled personnel ($ln\_Unskilled\,jobs$). The explanatory variable $OFDI$ is the status of OFDI of firm i in year t, including whether the firm made OFDI in the year ($ofdi$), the number of times the firm made OFDI in the year ($ln\,n\,ofdi$), the cumulative number of times the firm invested in OECD countries

($ln\,ofdifd$), and the cumulative number of times the firm invested in non-OECD countries ($ln\,ofdifz$). X_{it} contains several control variables, including (1) total firm assets ($ln\,size$), expressed as the natural logarithm of total assets; (2) firm age ($ln\,age$), expressed as the difference between the year of study and the number of years of establishment plus one, and taken as the natural logarithm; (3) firm capital intensity ($ln\,kl$), expressed as the ratio of the company's fixed assets to the total number of employees, and taken as the natural logarithm; (4) state-owned enterprises (d_soe), set to 1 if it is a state-owned enterprise and set to 0 vice versa; (5) foreign joint venture (d_mne), set to 1 if the listed company is a foreign joint venture and set to 0 vice versa. In addition, this paper adds industry fixed effects γ_j, province fixed effects γ_p and year fixed effects γ_t to control for unobservable influences that do not change over time and change over time.

The samples in this paper are obtained from the Wind database of listed companies and the Directory of Overseas Investment Enterprises (Institutions) published by the Ministry of Commerce. The former provides the financial data and employee employment data of listed companies as well as the data of cross-border M&A transactions; the latter provides the information related to the names of parent companies and the provinces and cities of parent companies of China's outbound direct investment. To focus on relevant research in the manufacturing sector, this paper only retains data on listed manufacturing companies. The final 6190 observations from 2011-2015 are obtained.

3.2. Data

Table 1: Summary Statistics of Variables.

Variable	N	Mean	SD	Minimum	Maximum
ln producer	5886	7.035	1.346	.693	11.897
ln finance	5166	3.819	1.054	.693	9.608
ln sales	5844	4.978	1.403	.693	9.819
ln technician	6029	5.729	1.192	0	10.377
ln Unskilled jobs	6094	5.562	1.187	2.079	11.093
producer_p	5886	56.104	19.266	.1	94.93
finance_p	5166	2.371	1.838	.18	35.23
sales_p	5844	11.446	12.659	.13	78.58
technician_p	6029	17.739	12.752	.21	90.11
Unskilled jobs_p	6094	15.33	12.975	.42	100
ofdi	6190	.123	.328	0	1
lnnofdi	761	.829	.295	.693	3.258
lnnofdifd	761	.641	.349	0	2.485
lnnofdifz	761	.232	.416	0	2.708
lnsize	6190	21.801	1.141	18.291	26.487
lnage	6190	2.668	.382	1.099	3.892
lnkl	6190	1.061	.401	.123	5.881
d soe	6190	.058	.233	0	1
d mne	6190	.568	.495	0	1

Table 1 shows the results of descriptive statistics of the variables. In terms of the dependent variables, the standard deviation of production, financial, sales, technical, and unskilled labor of the enterprises is greater than 1, indicating a large disparity in the employment structure of each sample enterprise. The independent variables and some control variables have small standard deviations and do not have extreme values, indicating that the overall dispersion of the sample is not high.

From the correlation coefficient matrix[1], it can be seen that the absolute values of the correlation

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[1] The correlation coefficient matrix is shown in Appendix Table 2.

coefficients between the explained variables and the explanatory variables, and between each explanatory variable, are below 0.76 and pass the test basically at the 1% level of significance. According to the rule of thumb, the model is initially judged not to have a high degree of multicollinearity problem.

4. Empirical Analysis

4.1. OFDI Action and Firms' Employee Structure

Table 2: Effect of OFDI actions on firm employment structure.

	(1) producer	(2) finance	(3) sales	(4) technician	(5) Unskilled jobs
ofdi	-0.001	-0.050**	0.004	0.034	0.007
	(-0.05)	(-2.01)	(0.10)	(1.23)	(0.24)
lnsize	0.836***	0.705***	0.716***	0.786***	0.765***
	(78.33)	(82.22)	(54.75)	(83.78)	(72.60)
lnage	0.081***	0.055**	0.057	0.025	-0.087***
	(2.91)	(2.20)	(1.48)	(0.93)	(-2.98)
lnkl	-0.763***	-0.582***	-0.992***	-0.556***	-0.512***
	(-17.48)	(-22.39)	(-22.91)	(-16.55)	(-16.06)
d_soe	-0.024	-0.139***	-0.033	-0.026	-0.138***
	(-0.47)	(-4.02)	(-0.61)	(-0.61)	(-3.11)
d_mne	-0.126***	-0.032	0.156***	-0.003	-0.071***
	(-4.75)	(-1.64)	(4.95)	(-0.14)	(-2.83)
_cons	-9.697***	-9.552***	-8.746***	-10.859***	-10.078***
	(-24.89)	(-24.03)	(-12.40)	(-26.04)	(-32.09)
Industry FE	Yes	Yes	Yes	Yes	Yes
Provincial FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
N	5886	5166	5844	6029	6094
r2	0.694	0.712	0.561	0.658	0.621

Note: Small brackets are t-values. Heteroskedasticity robustness treatment was used, and *, **, and *** indicate compliance with 10%, 5%, and 1% significance levels, respectively, all as in the following table.

The model is first subjected to a benchmark regression. Table 2 shows the estimated coefficients of the impact of OFDI undertaken by firms on the size of employment. Columns (1) to (5) report the regression results with the log of the number of production employees ($ln\_producer$), the log of the number of finance employees ($ln\_finance$), the log of the number of sales employees (ln_sales), the log of the number of technical employees ($ln\_technician$), and the log of the number of unskilled employees ($ln\_Unskilled\ jobs$) of the firm as explanatory variables, respectively. The results show that OFDI will reduce the demand for production and finance employees and increase the demand for sales, technical, and unskilled employees; however, none of the effects are significant except for finance employees. The possible reason is that OFDI firms pursuing low production costs or advanced technologies can increase profit margins and improve overall corporate innovation through learning, improve product quality, expand domestic and overseas markets, and achieve corporate transformation and upgrading; this process will reduce the home country firms' demand for employees producing labor-intensive products and increase the demand for employees in sales, technology, and R&D. At the same time, compared with the absence of OFDI, enterprises will face a

more complex financial environment including exchange rate, the balance of payments and settlement, etc. Therefore, in the short term, the parent company will reduce the demand for financial employees who only meet domestic transactions and increase the demand for financial employees who are highly qualified and adapt to the more complex international financial environment, which will promote the overall level of enterprise employees in the long run.

4.2. OFDI Action and the Proportion of Firms' Employee

Consider the effect of whether or not OFDI has an impact on the share of the firm's five types of employment skill structures. In Table 3, we use the share of employment skill structure as the core explanatory variable, i.e., the share of each employment skill structure in the total number of employees in firm i in year t, including the share of production staff ($producer\_p$), finance staff ($finance\_p$), sales staff ($sales\_p$), technical staff (technician_p), and unskilled staff (Unskilled jobs_p) in the firm. The regression results are presented in columns (1) to (5), respectively. The results show that OFDI will reduce the share of production, sales, and unskilled workers and increase the share of technical employees in the parent company, these results are not statistically significant; OFDI will reduce the share of financial employees in the company by 5% level of significance.

Table 3: Effect of OFDI actions on the proportion of firms' employment structure.

	(1) produce_p	(2) finance_p	(3) sales_p	(4) technician_p	(5) Unskilled jobs_p
ofdi	-0.065	-0.125**	-0.213	0.194	-0.096
	(-0.10)	(-2.17)	(-0.50)	(0.44)	(-0.23)
lnsize	1.284***	-0.251***	-0.543***	-0.371***	-0.575***
	(5.77)	(-9.06)	(-4.26)	(-2.47)	(-3.37)
lnage	1.707***	0.047	-0.639	0.218	-1.868***
	(2.66)	(0.70)	(-1.51)	(0.52)	(-3.37)
lnkl	-2.482***	0.577***	-3.334***	3.150***	3.418***
	(-3.66)	(4.03)	(-8.87)	(6.56)	(6.54)
d_soe	1.546	-0.383***	0.473	0.412	-1.462**
	(1.46)	(-3.55)	(0.81)	(0.58)	(-2.08)
d_mne	-2.319***	-0.069	2.655***	0.612	-0.175
	(-4.07)	(-0.94)	(7.74)	(1.55)	(-0.43)
_cons	29.906***	8.490***	35.240***	22.268**	27.400***
	(3.67)	(10.29)	(4.26)	(2.46)	(6.01)
Industry FE	Yes	Yes	Yes	Yes	Yes
Provincial FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
N	5886.000	5166.000	5844.000	6029.000	6094.000
r2	0.282	0.181	0.355	0.205	0.122

4.3. OFDI Times and Firms' Employee Structure

To explore the differences between continuous and intermittent OFDI during the sample period, we divide the sample firms into two categories and plot the kernel density of the different explanatory variables under the two conditions. As shown in Figure 1, the mean values of the number of production, financial, sales, technical, and unskilled labor employed by the two types of firms differ, and the mean values of the explanatory variables are higher for firms with continuous OFDI than for

firms with intermittent OFDI. Since employee structure is influenced by the times of OFDIs, we use the number of OFDIs ($ln\,nofdi$) for the robustness test of the baseline regression results.
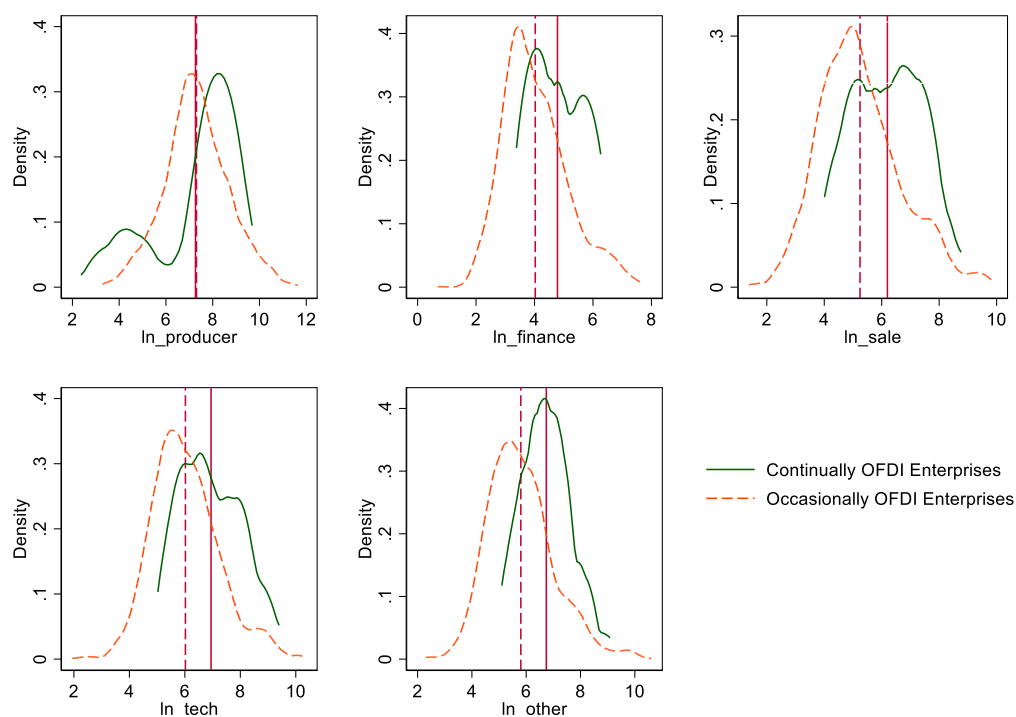

Figure 1: Kernel density plot of explanatory variables.

Table 4: The impact of OFDI times on the structure of enterprise employees.

	(1) producer	(2) finance	(3) sales	(4) technician	(5) Unskilled jobs
lnnofdi	-0.044	0.043	0.306**	0.180**	-0.037
	(-0.47)	(0.56)	(2.50)	(2.20)	(-0.35)
lnsize	0.836***	0.726***	0.694***	0.782***	0.752***
	(29.16)	(32.60)	(19.23)	(31.94)	(25.11)
lnage	0.121	0.145**	0.230**	0.132*	0.083
	(1.56)	(2.18)	(2.02)	(1.82)	(1.12)
lnkl	-1.196***	-0.881***	-1.300***	-0.631***	-0.735***
	(-10.50)	(-11.21)	(-8.91)	(-6.87)	(-8.04)
d_soe	0.078	-0.077	-0.167	-0.082	0.031
	(0.59)	(-0.91)	(-1.17)	(-0.86)	(0.25)
d_mne	0.176**	0.035	0.036	0.051	0.109
	(2.29)	(0.56)	(0.33)	(0.78)	(1.59)
_cons	-11.867***	-11.245***	-9.290***	-13.654***	-11.095***
	(-12.18)	(-14.32)	(-6.40)	(-17.37)	(-12.89)
Industry FE	Yes	Yes	Yes	Yes	Yes
Provincial FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
N	729.000	647.000	723.000	745.000	743.000
R2	0.750	0.799	0.623	0.744	0.714

Columns (1) to (5) of Table 4 report the results of the effect of increasing OFDI on the log of the number of production employees ($ln\_producer$), the log of the number of financial employees ($ln\_finance$), the log of the number of sales employees (ln_sales), the log of the number of technical employees ($ln\_technician$), and the log of the number of unskilled employees ($ln\_Unskilled\ jobs$) of the firm as explanatory variables, respectively. As shown in Table 4, increasing OFDI helps to increase the number of financial employees employed by the firm and significantly increases the number of sales and technical staff employed by the firm at 5% level of significance; it does not help to increase the number of production and unskilled staff employed by the firm and the results are not significant.

4.4. Heterogeneous Effects

In this session, we explore the different effects of OFDI on firms' employment with different characteristics with respect to their locations. The Organization for Economic Cooperation and Development ($OECD$) is an intergovernmental international economic organization composed of 38 market economy countries, and most of its member countries are developed countries. It has been shown that the home country's employment effect of OFDI is influenced by the income level of the OFDI host country [4]. Therefore, to verify the differences in the employment effects of an investment in countries with different income levels, we divide OFDI countries into OECD countries and non-OECD countries.

Table 5: Countries of investment in OECD countries.

	(1) producer	(2) finance	(3) sales	(4) technician	(5) Unskilled jobs
lnnofdifd	-0.097	-0.061	-0.048	-0.055	-0.146*
	(-1.04)	(-0.89)	(-0.44)	(-0.75)	(-1.74)
lnsize	0.835***	0.730***	0.714***	0.794***	0.752***
	(29.82)	(33.36)	(20.51)	(33.78)	(25.16)
lnage	0.117	0.146**	0.244**	0.137*	0.078
	(1.51)	(2.21)	(2.15)	(1.88)	(1.06)
lnkl	-1.189***	-0.883***	-1.320***	-0.644***	-0.728***
	(-10.35)	(-11.29)	(-9.08)	(-6.95)	(-7.92)
d_soe	0.084	-0.068	-0.136	-0.060	0.042
	(0.64)	(-0.82)	(-0.93)	(-0.64)	(0.34)
d_mne	0.175**	0.039	0.055	0.062	0.110
	(2.31)	(0.63)	(0.51)	(0.95)	(1.60)
_cons	-11.774***	-11.239***	-9.532***	-13.771***	-10.971***
	(-12.13)	(-14.15)	(-6.57)	(-17.45)	(-12.56)
Industry FE	Yes	Yes	Yes	Yes	Yes
Provincial FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
N	729.000	647.000	723.000	745.000	743.000
R2	0.750	0.800	0.620	0.743	0.716

Tables 5 and 6 show the effect of the number of firm investments on the structure of employees when the country of investment is an OECD country and a non-OECD country, respectively. As shown in Table 5, increasing investment in OECD countries decreases the number of employees in all categories and significantly reduces the number of employees in unskilled labor categories at 10%

significance level. As shown in Table 6, increasing investment in non-OECD countries increases the number of employees in all categories and significantly increases the number of financial, sales, and technical employees. Comparing the results in Table 5 with those in Table 6, it can be concluded that the estimated coefficients for non-OECD countries are larger than those for OECD countries, and the significance level is higher. The regression results may be related to the characteristics of Chinese firms' OFDI and exports. Compared with developed countries, China's comparative advantage is labor-intensive industries, where firms mainly export low-skilled labor products and the number of production workers in firms is in the majority. The motivation of Chinese enterprises' OFDI is to innovate or to reduce production costs. On the one hand, through OFDI activities with developed countries or countries with comparative advantage in technology level in a certain field, they acquire advanced technology in overseas markets and enhance enterprise productivity and overall innovation capacity through knowledge spillover effect; the change of production technology will drive the employment structure of enterprises from a large number of production personnel to highly skilled and managerial personnel, thus reducing the demand for current employee structure in the short term. On the other hand, the flow of capital from enterprises to developing countries with higher factor abundance will enable enterprises to reduce production input costs and help them expand their scale and upgrade their structure, thus increasing the demand for various types of employees, especially technical employees.

Table 6: Countries that invest in non-OECD countries.

	(1) producer	(2) finance	(3) sales	(4) technician	(5) Unskilled jobs
lnnofdifz	0.060	0.108*	0.320***	0.193***	0.067
	(0.93)	(1.92)	(3.56)	(3.11)	(0.89)
lnsize	0.828***	0.720***	0.686***	0.777***	0.744***
	(27.59)	(30.55)	(18.92)	(31.93)	(23.76)
lnage	0.113	0.136**	0.214*	0.122*	0.075
	(1.46)	(2.06)	(1.90)	(1.68)	(1.00)
lnkl	-1.182***	-0.867***	-1.276***	-0.615***	-0.722***
	(-10.12)	(-11.00)	(-8.80)	(-6.66)	(-7.81)
d_soe	0.071	-0.081	-0.160	-0.078	0.024
	(0.54)	(-0.97)	(-1.12)	(-0.82)	(0.19)
d_mne	0.168**	0.029	0.030	0.046	0.102
	(2.21)	(0.48)	(0.28)	(0.70)	(1.47)
_cons	-11.692***	-11.026***	-8.808***	-13.367***	-10.910***
	(-11.85)	(-13.68)	(-5.94)	(-16.86)	(-12.38)
Industry FE	Yes	Yes	Yes	Yes	Yes
Provincial FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
N	729.000	647.000	723.000	745.000	743.000
R2	0.750	0.800	0.626	0.746	0.714

4.5. Endogeneity Test

Since the sample contains a total of 1497 manufacturing listed companies from 2011-2015, the strong heterogeneity among companies may have an impact on whether companies invest in OFDI or not. To overcome the sample estimation bias caused by this factor, we use the propensity score matching method (PSM) for endogeneity testing. The specific steps are as follows: (i) the total assets of the

firm ($\ln size$), the age of the firm ($\ln age$), the capital intensity of the firm ($\ln kl$), the state-owned enterprise dummy variable (d_soe), the foreign joint venture dummy variable (d_mne), the dummy variable of the firm's location[2] ($area$), and the number of employees of the firm[3] ($ln\_employees$) are selected as factors affecting the firm's OFDI decision; (ii) based on Imbens and Rubin, the covariates that make the best model fit are screened by comparing the maximum likelihood values of different models [16]; (iii) propensity score values are calculated; (iv) based on the results of propensity scores, the differences of sample coefficients before and after matching are compared.

Table 7: Coefficients and differences before and after propensity score matching.

Explained variables	producer	finance	sales	technician	Unskilled jobs
Post PSM coefficient	-0.044	-0.55	-0.017	0.035	0.001
Coefficient P-value	0.885	0.025	0.966	0.193	0.968
Coefficient difference test p-value	0.1581	0.003	0.018	0.318	0.013

As can be seen from Table 7, there is no significant difference between the coefficients of production personnel and technical personnel before and after the matching of propensity scores. Although there is a significant difference in the coefficients of financial personnel and unskilled personnel before and after the propensity score matching, however, by comparing the coefficients before and after the matching, it can be seen that the estimated values and significance levels of the coefficients of firms' demand for both types of employees before and after the matching are similar. In contrast, the coefficients before and after matching for sales personnel change significantly, indicating that by matching propensity scores, foreign direct investment by firms will reduce home country firms' demand for sales employees, but this finding is not statistically significant.

5.   Concluding Remarks

By distinguishing five types of employment skill structures: producer, financial staff, sellers, technician, and unskilled labor, this paper investigates the impact of OFDI by Chinese manufacturing firms on the employment skill structures of home country firms using data from listed manufacturing firms from 2011-2015 using a fixed-effects model. In the benchmark regression model, this paper explores whether OFDI has an impact on the firm's employee structure. The results of the study find that firms' OFDI will reduce the demand for production and finance employees and increase the demand for technical, sales, and unskilled employees; the effects are not significant except for finance employees. The results of the endogeneity test using the PSM method show that, unlike the results of the benchmark regression, OFDI by firms will reduce the demand for sales employees by home country firms, but this finding is not statistically significant; the other findings are similar to the results of the benchmark regression. Considering the effect of whether or not OFDI has an impact on the share of the firm's five types of employment skill structures, results show that OFDI will reduce the share of production, sales, and unskilled workers, and increase the share of technical employees, these results are not statistically significant; OFDI will reduce the share of financial employees in the company by 5% level of significance. Since continuous OFDI and intermittent OFDI have different impacts on the employment structure of firms, to ensure the robustness of the benchmark regression results, this paper further discusses the impact of the number of OFDI on the firm's employee structure. The results find that increasing OFDI helps to increase the number of financial employees employed

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[2] According to the National Bureau of Statistics, we divided the enterprises into the eastern region, central region, and western region, and recorded the eastern region as 1, the central region as 2, and the western region as 3. See Appendix C for details of the division.

[3] The specific formula is: $ln\_employees$ = ln(number of employees in the company + 1).

by firms and significantly boosts the number of sales and technical staff employed; it does not help to increase the number of production and unskilled employees employed by firms, but the results are not significant. Since the effect of OFDI is influenced by the economic development level of the host country, this paper distinguishes OECD countries from non-OECD countries and conducts regressions separately. The results show that there is a significant difference between investing in OECD countries and non-OECD countries, and the estimated coefficient of non-OECD countries is larger than that of OECD countries, and the significance level is higher; meanwhile, increasing investment in OECD countries will decrease the number of all types of employees employed by enterprises, and increasing investment in non-OECD countries can increase the number of all types of employees employed by enterprises and significantly increase the number of financial, sales, and technical employees.

The findings of this paper have multiple implications. First, the impact of OFDI on the employment skill structure of firms is the result of a combination of factors, which varies according to the motivation of investment, the degree of development of the investing country, and other factors; therefore, the employment effect of OFDI on the home country should be viewed differently when measuring it. Second, in the short term, the impact of OFDI on the employment skill structure of enterprises varies; however, combined with the experience of existing studies, OFDI by enterprises in developed countries can promote the employment skill structure, product productivity, and innovation ability of enterprises in the long term. Therefore, the government should strongly support enterprises to cooperate with developed countries or countries with comparative advantages in a certain field, advocate enterprises to "go out", adhere to the double-cycle strategy, and provide certain support to enterprises that actively go abroad [17]; enterprises should make good use of the dual domestic and international markets, strive to explore overseas markets, carry out foreign investment activities, seek lower-cost production materials, and learn from overseas advanced technology and production experience, to enhance their independent innovation capability and realize structural transformation and upgrading [18-19].

Acknowledgements

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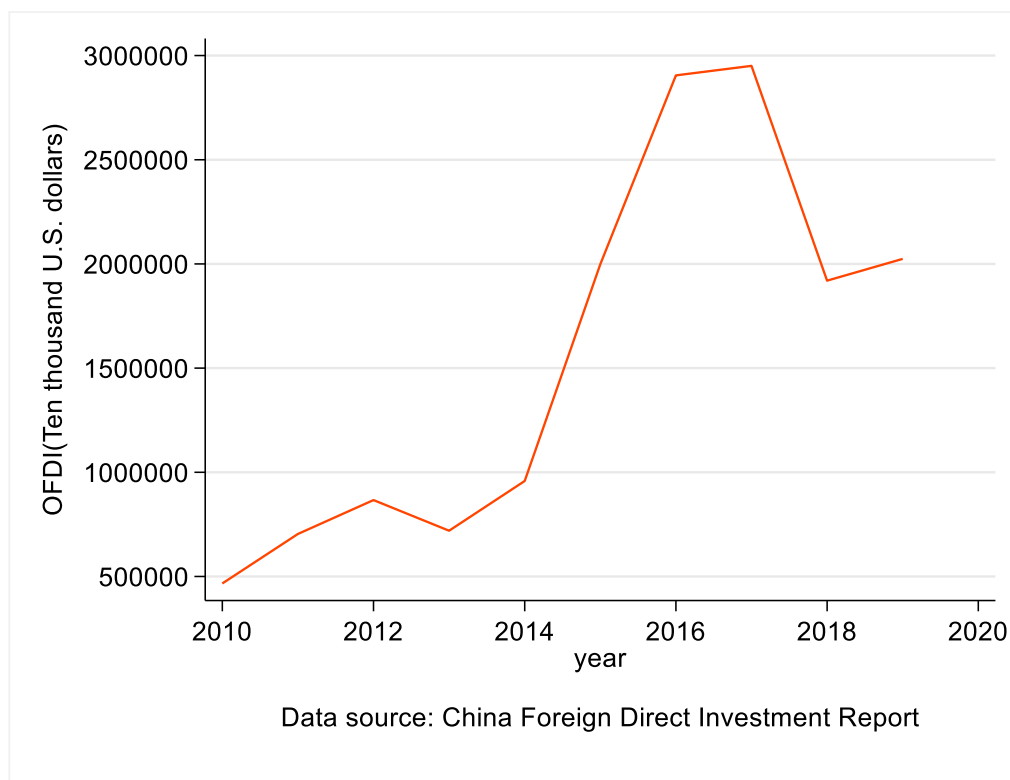
Appendix

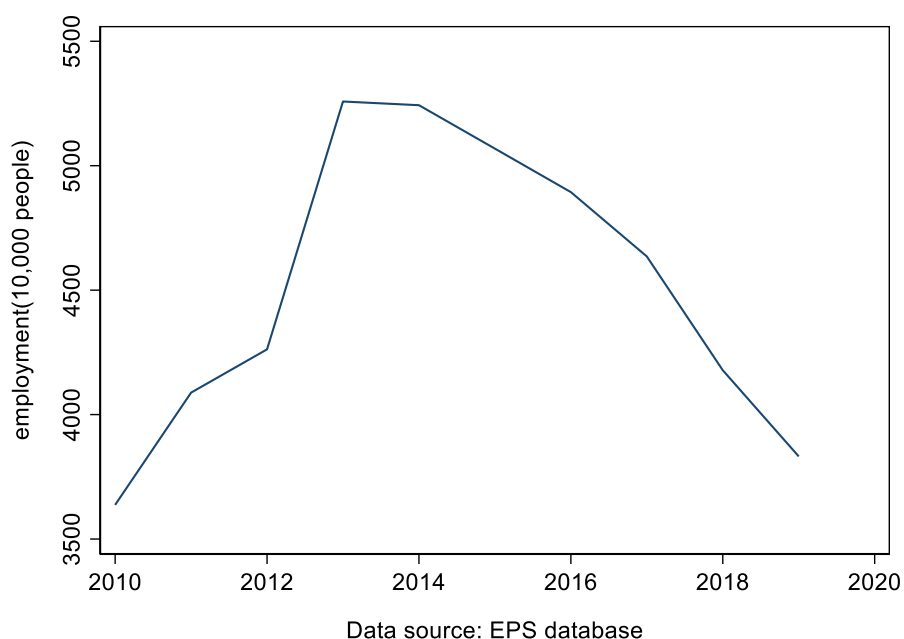Figure 1: Trend of OFDI in China's manufacturing industry.

Figure 2: Trend of domestic employment in China's manufacturing industry.

Table 1: OFDI and its employment size in China's manufacturing sector, 2010-2019.

	Manufacturing OFDI (USD million)	Manufacturing OFDI growth rate (%)	Manufacturing employment size (Unit:10,000 people)	Manufacturing employment growth rate (%)
2010	466417	-	3637.2	-
2011	704118	50.96	4088.3	12.40
2012	866741	23.10	4262.2	4.25
2013	719715	-16.96	5257.9	23.36
2014	958360	33.16	5243.1	-0.28
2015	1998629	108.55	5068.703	-3.33
2016	2904872	45.34	4893.84	-3.45
2017	2950737	1.58	4635.46	-5.28
2018	1919768	-34.94	4178.31	-9.86
2019	2024181	5.44	3832	-8.29

Table 2: Correlation coefficient matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) ln_producer	1.000										
(2) ln_finance	0.719	1.000									
(3) ln_sale	0.459	0.752	1.000								
(4) ln_tech	0.688	0.715	0.562	1.000							
(5) ln_Unskilled Jobs	0.728	0.808	0.598	0.709	1.000						
(6) ofdi	0.121	0.117	0.107	0.155	0.133	1.000					
(7) lnsize	0.753	0.759	0.507	0.729	0.756	0.164	1.000				
(8) lnage	0.147	0.157	0.096	0.111	0.114	-0.018	0.150	1.000			
(9) lnkl	-0.328	-0.296	-0.295	-0.245	-0.240	-0.034	-0.128	-0.042	1.000		
(10) d_soe	-0.025	-0.047	-0.027	-0.029	-0.031	0.048	-0.033	-0.020	0.014	1.000	
(11) d_mne	-0.262	-0.236	-0.085	-0.194	-0.250	0.033	-0.276	-0.288	0.084	-0.271	1.000

Table 3: List of OECD Countries or Territories.

1	Australia	11	Germany	21	Lithuania	31	Spain
2	Austria	12	Greece	22	Luxembourg	32	Sweden
3	Belgium	13	Hong Kong, China	23	Malta	33	Switzerland
4	Canada	14	Iceland	24	Netherlands	34	Taiwan, China
5	Cyprus	15	Ireland	25	New Zealand	35	United Kingdom
6	Czech Republic	16	Israel	26	Norway	36	United States
7	Denmark	17	Italy	27	Portugal		
8	Estonia	18	Japan	28	Singapore		
9	Finland	19	Korea	29	Slovakia		
10	France	20	Latvia	30	Slovenia		

Table 4: Enterprise Location.

	Eastern Region	Central Region	Western Region
1	Beijing	Shanxi	Sichuan
2	Tianjin	Jilin	Chongqing
3	Hebei	Heilongjiang	Guizhou
4	Liaoning	Anhui	Tibet
5	Shanghai	Jiangxi	Yunnan
6	Jiangsu	Henan	Gansu
7	Zhejiang	Hubei	Qinghai
8	Fujian	Hunan	Ningxia
9	Shandong		Xinjiang
10	Guangdong		Inner Mongolia
11	Hainan		Guangxi
12			Shaanxi