Foreign Direct Investment and China's Employment Structure Transformation: An Empirical Analysis Based on Urban Panel Data

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Abstract. Against the backdrop of high-quality development and an employment-first strategy, how foreign direct investment (FDI) shapes urban employment structures is of significant practical importance, as it relates to industrial upgrading and the well-being of the people, contributing new insights from three aspects: research perspective, data granularity, and heterogeneity analysis. This paper uses panel data from 283 prefecture-level cities and four municipalities in China from 2010 to 2023 to construct a two-way fixed effects model and analyze the impact of FDI on the proportion of employment in the secondary industry. The findings reveal that FDI significantly increases the share of employment in the secondary sector, and this conclusion holds under a series of robustness tests. Heterogeneity analysis indicates that the effect is stronger in ordinary prefecture-level cities and central-western regions, while it is insignificant or negative in eastern regions, municipalities/sub-provincial cities, and northeastern regions; FDI has a certain "crowding-out" effect on the tertiary sector and a weak impact on the primary sector; its role is more pronounced in cities with relatively underdeveloped digital inclusive finance. Based on these findings, the study proposes differentiated investment attraction and employment coordination strategies to enhance the structural employment spillover effects of FDI.

Keywords: Foreign Direct Investment, Employment Structure, Secondary Industry, Tertiary Industry, Reform and Opening-up.

1. Introduction

Since China's reform and opening-up, large-scale foreign direct investment (FDI) has introduced capital and technology into China and had a profound impact on the domestic labor market [1]. According to data from the United Nations Conference on Trade and Development (UNCTAD), China's actual utilization of foreign capital reached US$163.25 billion in 2023, remaining at a historical high [2]. Currently, China's economic development philosophy has undergone a significant shift, moving from a focus on speed to a focus on quality, with an emphasis on achieving high-level opening up. In this context, as an important driving force for promoting the optimization and upgrading of China's industrial structure, what impact has FDI had on the employment structure of the host country? Has it facilitated the flow of labor toward high-productivity sectors, or has it exacerbated imbalances between industries? This has gradually become a focal point of concern for both the academic community and government departments.

However, there is still room for expansion in existing research: first, the research perspective focuses more on total employment rather than structural changes; second, the research data is mostly at the provincial level, failing to fully capture the heterogeneity between cities; third, there is insufficient discussion of the complex effects of FDI in different industries, which may be mutually exclusive.

The marginal contribution of this paper lies in the following aspects: First, in terms of research perspective, this paper primarily focuses on changes in employment structure, using the proportion of employment in the secondary industry as the core indicator to explore the impact of foreign investment on regional employment structure under the backdrop of economic transformation. Second, in terms of sample data selection, unlike previous studies that used provincial-level data, we employ city-level panel data. This more granular data better reflects the characteristics of regional

employment structure changes, reduces statistical biases, and enhances the robustness and reliability of empirical results. Third, through heterogeneity analysis, we reveal that FDI may have differing or even opposite effects on the employment shares of the secondary and tertiary sectors. This provides new evidence for comprehensively understanding the effects of FDI on employment and also offers some reference value for optimizing investment attraction policies.

2. Literature Review

Over the years, scholars such as Ricker and Wickramarachchi have conducted in-depth studies revealing the formation mechanisms of FDI and its multifaceted impacts on host country economies [3]. Additionally, the number of jobs created per unit of capital by foreign-owned enterprises is typically lower than that of domestic enterprises [4]. Meanwhile, research in the field of employment structure further indicates that despite the overall increase in global FDI, the number of jobs created per unit of FDI has decreased by approximately 17% over the past decade, reflecting a declining trend in capital-employment conversion efficiency [5]. Emako (2022) analyzed panel data from 44 developing countries and found that there is a stage-dependent threshold effect between FDI and industrial structure upgrading, with changes in the employment share of the secondary sector only showing a significant promotional effect after reaching a critical level [6]. Meta-regression studies further indicate that institutional environments and policy orientations across different industries and regions significantly moderate the impact of FDI on employment structure [7].

Research on the impact of employment structure has accumulated a certain body of evidence. Nguyen et al. (2024) conducted an empirical analysis of data from 29 Asia-Pacific countries and found that overall employment grows with increases in FDI [8]. Inflows of FDI significantly promote employment expansion in the formal manufacturing sector, providing an important driving force for local industrial upgrading [9]. Furthermore, from a global value chain perspective, FDI that deeply engages in regions with positive GCV can effectively drive manufacturing employment growth [10]. In the Chinese context, labor market flexibility can enhance the positive pull effect of FDI on employment [1]. Liu (2024) empirically demonstrated using panel data from 2011 to 2020 that FDI can enhance employment absorption capacity through structural optimization [11].

Based on this, the following hypotheses are proposed:

H1: Foreign investment is conducive to human capital accumulation;

H2: The impact of foreign investment on human capital varies across regions;

H3: The impact of foreign investment on human capital varies across industries.

3. Research Design

3.1. Model Design

This paper uses a two-way fixed effects model for benchmark regression. The specific model settings are as follows:

$$pcapital_{it}=\beta_0+\beta_1 fdiin_{it}+\beta_2 controls_{it}+\lambda_i+\delta_t+\epsilon_{it} \quad (1)$$

where the subscripts and represent cities and years, respectively.$pcapital_{it}$is the explained variable, i.t., the employment structure of a city in a given year; $fdiin_{it}$ is the core explanatory variable, representing the logarithmic value of FDI; $controls_{it}$ is a set of control variables; β_1 is the coefficient of primary interest in this study, measuring the net effect of FDI on the employment structure; λ_i is the city-specific fixed effect, controlling for factors such as geographical location and historical culture that do not change over time;δ_t is the year-specific fixed effect, controlling for common time trends such as national macroeconomic cycles and policy shocks; and ϵ_{it} is the random disturbance term.

3.2. Variable Explanation

This paper uses the logarithm of actual foreign direct investment (FDI) as the core explanatory variable to measure FDI, while the dependent variable is the logarithm of the ratio of employment in the secondary industry to total employment. Control variables are drawn from relevant literature [1], and this paper selects the following city-level variables that may influence the employment structure as control variables: (1) Economic development level (pgdp): measured by the logarithm of per capita GDP. The stage of economic development is the primary factor determining employment structure. (2) Industrial structure (lninds): measured by the logarithm of the ratio of secondary industry output to tertiary industry output. (3) Natural population growth rate (peorate): measured by the natural population growth rate. (4) Proportion of fiscal science and technology expenditure (zckx_ratio): measured by the proportion of local government fiscal science and technology expenditure to local government fiscal planned expenditure. (5) Proportion of fiscal education expenditure (zcjy_ratio): measured by the proportion of local government fiscal education expenditure to local government fiscal planned expenditure.

3.3. Data sources

The research sample for this paper consists of panel data from 2010 to 2023 for prefecture-level cities in China, including 283 prefecture-level cities and four municipalities. The sample period from 2010 to 2023 fully covers the critical period when China's economic development philosophy shifted from focusing on speed to focusing on quality, industrial upgrading, and profound adjustments in the labour market structure.All original data for the variables are sourced from CEIC databases, the CSMAR , and the China Urban Statistical Yearbook. Descriptive statistics for the variables are shown in Table 1.

Table 1. Descriptive statistics of the main variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	N	mean	sd	min	max	p25	p50	p75
lninds	3,513	-0.000635	0.502	-1.780	2.219	-0.294	0.00290	0.302
pgdp	3,876	29.03	599.0	0.0553	15,285	0.316	0.472	0.724
peorate	2,568	4.387	5.241	-16.50	40.78	1.210	4.415	6.745
fdiin	3,487	16.48	2.082	7.192	22.29	15.25	16.65	17.88
pcapital	2,964	-0.933	0.389	-3.552	0.171	-1.148	-0.865	-0.665
zckx_ratio	3,914	0.0205	0.0598	0.000517	1	0.00553	0.0114	0.0220
zcjy_ratio	4,003	0.176	0.0442	0.000959	0.876	0.149	0.174	0.202

4. Empirical Results

4.1. Benchmark Regression

Table 2 shows the impact of FDI on the employment structure. The regression coefficient of FDI is 0.0219, which is significant at the 1% level. After adding control variables, the results remain significant. The results indicate that, under certain conditions, foreign direct investment can significantly optimize the employment structure.

Table 2. Benchmark Regression

	(1)	(2)	(3)
	pcapital	pcapital	pcapitall
fdiin	0.0219***	0.0127**	0.0113**
	(0.005)	(0.005)	(0.005)
lninds		0.1052*	0.0956*
		(0.055)	(0.053)
zcjy_ratio		0.0553	-0.2589
		(0.252)	(0.295)
zckx_ratio		1.0011***	1.0955**
		(0.374)	(0.556)
pgdp		-0.0013	0.0262
		(0.091)	(0.086)
peorate		-0.0015	-0.0027*
		(0.001)	(0.001)
_cons	-1.2805***	-1.1241***	-0.9642***
	(0.088)	(0.105)	(0.103)
N	2748	1427	1427
F	17.1742	5.5458	
Year fixed effects	√	√	√
Region fixed effects	√	√	√
Adj.R2	0.8586	0.8386	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$,Return to clustering at the city level, the same applies below.

4.2. Robustness Testing

4.2.1. Replacing the Regression Model

During the robustness testing of the model, this paper further employed the Poisson regression method to re-estimate the core variables. Compared to ordinary least squares (OLS), Poisson regression is more suitable for handling count-type or non-negative variables and can effectively mitigate estimation bias caused by heteroscedasticity. The regression results are shown in Column (3) of Table 2. After applying the Poisson regression setting, the regression coefficients of the core explanatory variables still passed the statistical test at the 5% significance level. This result not only validates the internal consistency of the benchmark regression model but also further demonstrates that the empirical conclusions of this study exhibit strong robustness across different regression methods.

4.2.2. Replacing explanatory variables and dependent variables

Replacing explanatory variables. Considering that differences in urban economic scale may affect the absolute value of FDI, this study uses the logarithm of the ratio of FDI to urban GDP to replace fdiin in the benchmark regression. The regression results are shown in columns (1) and (2) of Table 3, and the results are robust. This paper also uses the logarithm of the number of foreign-invested enterprises (qfdi) as a replacement for additional robustness testing. Columns (3) and (4) show that the direction and significance of the coefficients remain unchanged.

To further test the robustness of the empirical results, this paper conducts alternative treatments on the dependent variables. The original variables were replaced with the logarithm of the average annual number of employees (pepwork) and the logarithm of the number of urban individual workers (renl), respectively. This approach aims to examine whether the core variables have consistent effects

on the employment structure from the perspective of different types of labor employment populations. The regression results are shown in columns (3) and (4) of Table 3, and the conclusions remain robust.

Table 3. Replacement variable measures

	(1)	(2)	(3)	(4)
	pcapital	pcapital	pepwork	renl
ratio	0.0109**			
	(0.005)			
qfdi		0.0836***		
		(0.025)		
fdiin			0.0230***	0.0261**
			(0.005)	(0.010)
_cons	-1.0214***	-1.1419***		
	(0.080)	(0.083)		
N	1427	1503	1697	1382
F	5.3474	7.7687	11.1035	3.2587
Control variables	√	√	√	√
Year fixed effects	√	√	√	√
Region fixed effects	√	√	√	√
Adj.R2	0.8383	0.8314	0.9777	0.8991

4.2.3. Changing the time period

Furthermore, to rule out the potential impact of specific period shocks (such as major public health events) on the research conclusions, we conducted a robustness test by changing the sample time period. This paper excluded 2019 (the year when the public health event fully erupted) and subsequent years from the sample to test whether the core conclusions still hold after excluding potential abnormal years. After excluding data from 2019 and subsequent years and conducting the regression again, the results (see Table 4) show that the coefficient for FDI remains significant. This indicates that the findings of this paper are robust and not driven by anomalous data from specific years.

4.2.4. Truncation

After truncating the data at 1% and 5%, respectively, the regression results, as shown in columns (2) and (3) of Table 4, remain significant.

Table 4. Other robustness tests

	(1)	(2)	(3)
	Exclude abnormal years	Winsor 1%	Winsor 5%
	pcapital	wpcapital	wpcapital
fdiin	0.0116**		
	(0.006)		
wfdiin		0.0137**	0.0118*
		(0.006)	(0.006)
_cons	-1.0911***	-1.1228***	-1.0046***
	(0.105)	(0.103)	(0.123)
N	1297	1427	1427
F	5.3555	5.9032	5.3034
Control variables	√	√	√
Year fixed effects	√	√	√
Region fixed effects	√	√	√
Adj.R2	0.8408	0.8562	0.8627

5. Heterogeneity Analysis

Building on the baseline regression, this paper further examines the heterogeneity of employment structure by considering regional and factor endowment differences, specifically analyzing the heterogeneous effects of geographical location and administrative level on employment structure.

5.1. Location Heterogeneity

In terms of location heterogeneity, the impact on employment structure exhibits significant geographical differentiation. As shown in columns (3) to (6) of Table 5, in the eastern and northeastern regions, the coefficient is negative and statistically insignificant. This result suggests that these regions, especially the eastern coastal areas, have begun industrial structure upgrading earlier and are currently undergoing a transition from manufacturing to services. They are more inclined to flow toward high-end services, leading to a gradual weakening or even negative impact on employment in the secondary sector. In the central and western regions, the coefficient is positive and statistically significant. This aligns with the national strategy of shifting industrial layout toward inland regions[12]. Leveraging their cost advantages and proactive policy support from local governments, the central and western regions have attracted a significant amount of manufacturing investment transferred from the eastern regions, becoming a key driver of industrialization and increasing the share of manufacturing employment in the region.

The heterogeneity of urban administrative levels further validates the rationality and robustness of the aforementioned conclusions. As shown in Table 5, columns (1) and (2), when the sample excludes municipalities and sub-provincial cities, the positive impact on secondary industry employment is statistically significant. In contrast, in the sample comprising municipalities and sub-provincial cities, the coefficient is statistically significant and negative. This indicates that China's core cities, as regional economic centers, have entered a highly service-oriented stage in their industrial structure. With the inflow of FDI, the service sector has further expanded, accelerating the deindustrialization process of these cities and leading to a continuous trend toward concentration in the tertiary sector. In contrast, ordinary prefecture-level cities widely distributed across the country have relatively weak industrial foundations and are still in the critical stage of industrialization and manufacturing expansion. In this context, FDI has become a crucial driving force for industrial development, enhancing the employment absorption capacity of manufacturing, and expanding the scale of employment in the secondary sector. It is also key to achieving urban economic growth and structural optimization.

Table 5. Regression of locational heterogeneity

	(1)	(2)	(3)	(4)	(5)	(6)
	Prefecture-level cities	Municipalities and Sub-provincial divisions	Eastern region	Central region	Western region	Northeastern region
	pcapital	pcapital	pcapital	pcapital	pcapital	pcapital
fdiin	0.0127**	-0.0518*	-0.0354	0.0215*	0.0156**	-0.0140
	(0.005)	(0.026)	(0.022)	(0.012)	(0.008)	(0.014)
_cons	-1.0902***	-0.1271	0.1995	-0.9856***	-1.2088***	-0.4588
	(0.112)	(0.587)	(0.557)	(0.228)	(0.154)	(0.335)
N	1298	129	294	382	573	176
F	5.5060	3.5998	1.4732	1.0429	1.6676	3.7656
Control variables	√	√	√	√	√	√
Year fixed effects	√	√	√	√	√	√
Region fixed effects	√	√	√	√	√	√
Adj.R2	0.8278	0.9478	0.9163	0.8461	0.7728	0.8718

5.2. Heterogeneity in industrial and economic development levels

To account for the impact of heterogeneity in industrial employment structure, this paper replaces the dependent variable with the proportion of employment in the tertiary sector, as shown in Column (1) of Table 6. The regression coefficient for FDI is significantly negative. However, when replaced with the proportion of employment in the primary sector, Column (2) shows that the coefficient is negative but not significant. This suggests that, to some extent, FDI inflows in China's current stage primarily promote the secondary sector and exert a certain "crowding-out effect" or structural transformation effect on the tertiary sector, but have a relatively minor direct impact on the primary sector. To examine the impact of economic development level heterogeneity, this study grouped cities based on the Digital Inclusive Finance Index. As shown in columns (3) and (4) of Table 6, the impact of FDI is significant in cities with a less developed index but not significant in developed cities. Specifically, in regions where financial markets are still underdeveloped, foreign investment plays a crucial role in addressing local capital shortages, and its marginal effect on the secondary sector is stronger. In contrast, in financially developed regions, enterprises have access to diverse financing channels, and the relative importance of FDI diminishes.

Table 6. Other heterogeneity

	(1)	(2)	(3)	(4)
	Tertiary industry	Primary industry	Regions with developed digital inclusive finance	Regions with underdeveloped digital inclusive finance
	Pcapital3	Pcapital1	pcapital	pcapital
fdiin	-0.0120**	-0.0168	0.0101	0.0161*
	(0.005)	(0.021)	(0.008)	(0.009)
_cons	-0.5926***	-4.7768***	-1.0248***	-1.0231***
	(0.093)	(0.401)	(0.173)	(0.168)
N	1421	1410	609	770
F	4.8671	1.5874	3.1946	1.6989
Control variables	√	√	√	√
Year fixed effects	√	√	√	√
Region fixed effects	√	√	√	√
Adj.R2	0.8815	0.9343	0.8495	0.8329

6. Conclusions and Recommendations

Based on a sample of cities from 2010 to 2023 and a two-way fixed effects estimation, this paper confirms that FDI generally contributes to increasing the proportion of employment in the secondary industry, and the conclusion remains robust under various robustness tests. The effects exhibit significant differentiation, with more pronounced impacts on ordinary prefecture-level cities and central-western regions, while eastern regions, municipalities/sub-provincial cities, and northeastern regions show no significant effects or negative effects; there is a certain crowding-out effect on the tertiary sector, with minimal impact on the primary sector; and the marginal effects are stronger in regions lagging behind in digital inclusive finance.

Based on the above conclusions, this paper offers the following policy recommendations: Given the current significant downward pressure on China's economy and the urgent need to stabilize growth through stabilizing and optimizing foreign investment to advance China's modernization development, first, regional differentiated investment attraction. Central and western regions should continue to attract manufacturing transfers, targeting key components, local supply chains, and logistics infrastructure to leverage FDI's strong pull effect on secondary industry employment; Eastern regions

and core cities should focus on high-end manufacturing and productive services, enhancing the quality of employment and technological spillover per unit of FDI. Second, optimize factor and human resource supply. Align vocational education and on-the-job training with the skills required by FDI projects, establish a "project-institution-enterprise" collaborative training mechanism, and enhance workers' adaptability in equipment manufacturing, process improvement, and quality management, thereby expanding FDI's capacity to absorb jobs in the secondary sector. Third, improve the financial and business environment. In cities with relatively underdeveloped financial sectors, increase credit enhancement and financing convenience to leverage the synergistic effects of FDI; simultaneously, through a legalized, transparent business environment and intellectual property protection, stabilize foreign investment expectations and extend investment horizons. Fourth, coordinate structural transformation. In regions with rapid expansion of the service sector, use industrial policies and tax tools to guide FDI toward complementary sectors such as advanced manufacturing, modern logistics, and R&D design, avoiding displacement effects on the tertiary sector; for labor-intensive projects, establish employment performance metrics and local procurement ratios to amplify the employment multiplier effect.

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