Empirical Study on Manufacturing Outward Foreign Direct Investment and Premature Deindustrialization

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Abstract

Based on the data of 283 cities in China from 2005 to 2017, this paper constructs a dynamic panel model to study the relationship between China's manufacturing outward foreign direct investments and deindustrialization. The results show that the manufacturing outward foreign direct investment will accelerate deindustrialization on the whole, but this effect will be obviously various with the difference of source region, ownership, investment mode and investment motive. Further mechanism analysis found that manufacturing outward foreign direct investment mainly affects de-industrialization by influencing domestic investment and imports.

Keywords: manufacturing outward foreign direct investments; deindustrialization; investment; import

Rodrik（2015）defines the premature deindustrialization as a deindustrialization phenomenon which occurs in a country when its industrial scale is relatively small and per capita income level is relatively low. It is generally believed that the manufacturing is the engine of economy development（Kaldor, 1966）. The premature deindustrialization in developing countries such as China may lead to a lack of support and impetus for sustainable growth of economy, even finally imperil these countries into the Middle-income Trap.

Based on the history of industry development in Japan, the deindustrialization is

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closely related to outward foreign direct investment (hereinafter referred as OFDI). In 1990 the scale of employment by domestic manufacturing industry in Japan was 15 million, which reduced to 13 million in 2000. During this period the overseas employment in Japanese enterprises has increased from 1 million to 3 million. Globally there was no obvious decrease on the actual quantity of employment in Japanese manufacturing enterprises during this period, just from 16.4 million to 16 million (JETRO, 2002). However since the "Going out" policy was put forward by Chinese government, OFDI of China has increased rapidly. Up to 2015, China has been the third biggest OFDI country after America and Japan.

So this paper will use the method of empirical study to discuss whether OFDI of manufacturing, an important part to form the OFDI of China, push the generation of premature deindustrialization in China, and further, whether the differences of OFDI sources, ownership of the OFDI enterprises, OFDI modes and motivations contribute to different influences on the deindustrialization process? What's more, on the premise that deindustrialization effect exits, what kind of mechanism will OFDI specifically take to affect the industrial scale ?

1. Benchmark Model Building and Analysis

Based on the study of Aldersen (1999), this paper builds up the following empirical model with data from 283 Chinese prefecture-level cities during the time of 2005-2017:

$$mavagdp_{it} = \partial_0 + \beta_1 OFDI_{it} + \beta_2 Z_{it} + d_t + \mu_{it} + \varepsilon_{it} \quad (1)$$

Where $mavagdp_{it}$ denote the proportion of industrial added value in city i and year t, more specifically,the proportion of added value from industrial sector in GDP, for the use of measuring the deindustrialization degree of each prefecture-level city. The explanatory variable $OFDI_{it}$ is used to measure the OFDI level in each city; Z_{it} is the other control variable in this model and will be explained in detail by the following passages; d_t controls the fixed effect of year; μ_i controls the fixed effect of city and ε_{it} is the random disturbance term irrelevant with the fixed effect.

There will be a path dependence existing in the development of industrial sector, therefore based on the static panel model this paper takes the first-order and second-order lag of explained variable into consideration to lighten the interference on empirical results caused by possible missing variables and endogenous issues. The dynamic model is as follows:

$$mavagdp_{it}=\beta_0 magdp_{i,t-1}+\beta_1 magdp_{it-2}+\partial_0+\beta_2 OFDI_{it}+\beta_3 Z_{it}+d_t+\mu_{it}+\varepsilon_{it} \quad (2)$$

At the same time, in order to ease the reverse causality between OFDI and deindustrialization, this paper will use the lagged first-order and high-order of OFDI level as instrumental variables.

1.1 Data Explanation

The macro data used in this paper comes from 283 prefecture-level cities in China, with a time span from 2005 to 2017, among which data for the industrial added value proportion, GDP, per capita GDP and enterprise profit of real estate investment industry in each prefecture-level city is sourced from *Regional Statistical Yearbook* and *City Statistical Yearbook*. The data of imports in manufacturing industry is from CNKI (China National Knowledge Internet) and Annual Customs Data Bank of China Economic Information Network. Data of number and value of OFDI, ownership of OFDI enterprises, OFDI target country and target industry comes from the OFDI data of Chinese enterprises sorted in BvD Zephyr database and fDi Markets database. The date of imports and exports in each country and bilateral trade volume in China used to identify the investment motive is from UN Comtrade.

1.2 Variables Explanation

1.2.1 The level of deindustrialization. Referring to the method used by Sung (2011), Alderson (2015) and Rodrik (2016), this paper measures deindustrialization through the proportion of industrial added value in GDP.

1.2.2 OFDI. The measurement in this paper is conducted by using the number of OFDI of manufacturing industry and the proportion of OFDI value in regional GDP.

1.2.3 The level of deindustrialization in a city is affected by many factors. Based on the previous researches, this paper takes the following variables (see Table 1 for details) into consideration:

The first one is the developing level of regional economy, which covers the relationship between different stages of economic development and deindustrialization evolution. The second variable is the productivity of tertiary industry, which reflects the influence on structural transformation caused by productivity change. The third one is the profits of industry sector. The amount of profit will change the vitality of enterprises thus affecting the development of sectors. The fourth variable is the investment level in real estate, which is measured by the proportion in GDP occupied by gross investment in real estate

of a city. An over-investment in real estate will inevitably reduce the investment in industry, speeding up the shrink on industrial scale. Investment in real estate mainly affects the deindustrialization degree through its influence on the investment level of manufacturing industry, so there will probably be a certain hysteresis effect. Therefore this paper takes lagged first-order of real estate investment as the control variable for this model. The fifth variable is the level of foreign investment. The entrance of foreign-invested enterprises will raise the demand for productivity and labor in host country and enlarge the local industrial production and trade scale. While the decrease in foreign investment level will not only directly downsize the sector scale through closing factories, but also indirectly reflect the weakening of advantages for this sector's being an accepting place for international industrial transfer, as a result, the development of local enterprises will also be restricted.

Table 1　Main variables and definitions

Variables		Definition
Deindustrialization	mavagdp	The proportion of regional industrial added value in GDP
OFDI number	OFDI	Number of manufacturing OFDI
OFDI value	OFDIvalue	The proportion of OFDI value in regional GDP
Economy development level	lnpgdp	The log of the regional per capital GDP
Tertiary productivity	productivity	The value added of the service sector divided by the number of employees in the service sector
Profits of industry sector	profitgdp	The proportion of profits of industrial enterprises above designated size in GDP
Investment in real estate	propertygdp	The proportion of real estate investments in GDP
Level of foreign direct investment	FDI	The proportion of foreign direct investment value in GDP

This paper evaluates the dynamic panel data model through OLS（Ordinary Least Squares), fixed effect and system GMM（Generalized Method of Moments）respectively, among which the system GMM requires first-order serial autocorrelation of residual, second-order serial uncorrelation of residual and instrumental variables with exogenousness. In order to guarantee the consistency and effectiveness of result, this paper tests the exogenousness of instrumental variable by Hansen Statistics and conduct the Arellano-Bond serial correlation test on estimation result. See Table 2 for model estimation result.

As shown in Table 2, the effect of the number and value of manufacturing OFDI to the

scale of industrial sector is significantly negative at a level of 5%, which means OFDI of manufacturing will push the downsizing of city's industrial sector and speed up the progress of deindustrialization. The estimation results of other control variables are relatively consistent with speculations by preceding passages. Industrial enterprise profit (*profit*) is significantly positive to the industrial sector scale, showing that the increase of profit in enterprises will promote the development of this sector. The effect of regional development level (*lnpgdp*) is significantly positive, verifying the positive correlation be-

Table 2 Benchmark regression results

	(1) OLS	(2) OLS	(3) FE	(4) FE	(5) SYS-GMM	(6) SYS-GMM
	mavagdp	mavagdp	mavagdp	mavagdp	mavagdp	mavagdp
L.mavagdp	0.639***	0.640***	0.832***	0.833***	0.560***	0.542***
	(8.50)	(8.50)	(35.53)	(35.09)	(10.89)	(9.77)
L2.mavagdp	0.227***	0.227***			0.133***	0.113***
	(3.21)	(3.21)			(4.85)	(4.10)
OFDIvalue	−0.245***		−0.281***		−0.379***	
	(−3.85)		(−5.92)		(−4.99)	
OFDI		−0.000534***		−0.000614***		−0.00115***
		(−4.43)		(−3.02)		(−4.05)
lnpgdp	0.0153***	0.0156***	0.0186***	0.0188***	0.0247***	0.0283***
	(6.91)	(6.80)	(6.07)	(5.92)	(4.78)	(4.91)
thirdproductivity	−0.00672***	−0.00670***	−0.00694***	−0.00690***	−0.00745***	−0.00746***
	(−13.54)	(−13.47)	(−11.59)	(−11.57)	(−17.37)	(−17.20)
profit	0.0123***	0.0123***	0.0124***	0.0124***	0.0289**	0.0319***
	(6.33)	(6.32)	(4.60)	(4.59)	(2.47)	(2.68)
property	−0.0824***	−0.0825***	−0.109***	−0.109***	−0.307***	−0.355***
	(−5.76)	(−5.76)	(−5.29)	(−5.29)	(−3.21)	(−3.37)
FDI	0.216	0.225	0.232	0.243	1.177	1.136
	(1.34)	(1.35)	(1.23)	(1.26)	(1.24)	(1.17)
Constant	−0.0681***	−0.0708***	−0.111***	−0.113***	0	−0.132***
	(−3.61)	(−3.65)	(−4.57)	(−4.51)	(.)	(−3.04)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
City fixed effect			Yes	Yes	Yes	Yes
Observations	2923	2924	3195	3196	2923	2924
AR(1)					0	0
AR(2)					0.215	1.28
Hansen					0.482	0.239

Note：① ***, **, * denotes significance at the levels of 1%, 5%, and 10%, respectively. The numbers in parentheses are the corresponding t-values. ② AR (1)、 AR (2)are the P-value of serial correlation test ③ L. represents the lag of the variables. The following table is the same.

tween manufacturing industry and economic development. The effect of tertiary sector productivity (*thirdproductivity*) is significantly negative, which means that the service industry productivity in China is negatively correlated with scale of industrial sector in general. The effect of lagged one period investment of real estate (*property*) is significantly negative, proving that the overheated investment in real estate in China will impede the development of the real economy. The effect of foreign investment attracting level (*FDI*) is positive, consistent with the expectation but insignificant.

2. Robustness Test

This paper further tests the robustness of estimation result with the following method. Firstly, replace the proportion of industrial added value with the proportion of secondary industry employment in prefecture-level city (*second worker*) to measure the regional deindustrialization level. Secondly, eliminate the influence of industrial policy. In December of 2012, Chinese government has set the keynote of its industrial upgrading policy which focuses on service sector, probably affecting the progress of regional deindustrialization. Therefore, this paper eliminates the interference on regression result caused by policies for industrial structure adjustment through testing whether deindustrialization effect of OFDI around year of 2013 obviously changed or not. Thirdly exclude OFDI from regions of tax heavens like Hong Kong, Cayman Islands and etc... Some enterprises may invest in the regions above out of tax avoidance or being benefited from preferential policies for foreign investment, but such investments, on one hand, have relatively small influence on the production and operation activities of enterprises, and on the other hand may eventually flow back into enterprises in a way of foreign investing.

Contents for the first and second column in Table 4 are regression results replacing explained variable. The effect of manufacturing OFDI to industrial sector scale is still significantly negative when using the employment proportion of secondary industry to measure the level of deindustrialization. The third column and the sixth column are estimation results of sub-samples for two periods whose boundary is the year of 2013. The comparison indicates that the coefficient of explanatory variable is significantly negative without obvious difference, verifying the robustness of test for deindustrialization effect of OFDI. OFDI with motivations like tax avoidance and etc. may influence the regression results, so this paper excludes data of tax heavens to conduct regression on benchmark model again. See the seventh and eighth column in table for results, and it's can be known that the estimation coefficient of OFDI level is still significantly negative.

Table 3 Robustness test results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	secondworker	secondworker	mavagdp	mavagdp	mavagdp	mavagdp	mavagdp	mavagdp
L.secondworker	0.551***	0.551***						
	(25.06)	(26.66)						
L2.secondworker	0.169***	0.157***						
	(11.13)	(11.01)						
L.mavagdp			0.545***	0.441***	0.502***	0.755***	0.536***	0.56***
			(6.18)	(6.07)	(4.52)	(10.09)	(9.85)	(10.53)
L2.mavagdp			0.213***	0.0881**	0.289***	-0.0157	0.109***	0.13***
			(3.19)	(2.10)	(2.74)	(-0.34)	(4.02)	(4.67)
OFDI	-0.000593***		-0.0014**	-0.0015***				
	(-2.70)		(-2.58)	(-3.22)				
OFDIvalue		-0.298***			-0.244**	-0.292***		
		(-3.60)			(-2.00)	(-2.83)		
OFDI*							-0.001***	
							(-4.17)	
OFDIvalue*								-1.01***
								(-4.51)
lnpgdp	0.00863*	0.00699	0.00327	0.0451***	-0.007	0.032***	0.0294***	0.025***
	(1.76)	(1.36)	(0.60)	(4.29)	(-0.86)	(5.83)	(4.95)	(4.77)
thirdproductivity	0.00127	0.00132	-0.011***	-0.008***	-0.009***	-0.007***	-0.007***	-0.007***
	(1.01)	(1.12)	(-3.26)	(-13.81)	(-2.66)	(-13.12)	(-16.52)	(-17.68)
profit	0.0211***	0.0288***	0.0214**	0.055***	0.021**	0.05***	0.03**	0.03**
	(2 .70)	(3 .91)	(2 .15)	(3 .58)	(2 .00)	(2 .88)	(2 .49)	(2 .59)
property	-0.0353	0.0336	-0.149*	-0.45***	-0.19*	-0.39***	-0.33***	-0.34***
	(-0.43)	(0.45)	(-1.87)	(-3.99)	(-1.74)	(-3.85)	(-3.43)	(-3.37)
fdi	0.743	0.399	0.454	0.632	1.562	-0.67	1.190	1.090
	(0.82)	(0.43)	(0.43)	(0.57)	(1.23)	(-0.28)	(1.17)	(1.15)
Constant	0	0.00361	0.103*	-0.26***	0.19**	-0.21***	-0.14***	0
	(.)	(0.08)	(1.93)	(-3.26)	(2.34)	(-3.96)	(-3.06)	(.)
Observations	2657	2656	1869	1055	1596	1327	2924	2923
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	0	0	0	0.04	0	0.017	0	0
AR(2)	0. 2	0.279	0.57	0.395	0.201	0.227	0.2	0.19
Hansen	0.113	0.245	0.297	0.125	0.128	0.105	0.217	0.29

3. Heterogeneity Analysis

This paper analyzes heterogeneity from four aspects. Firstly, the uneven peace of economic development among regions causes that OFDI may have different impact on the industrial sector. The overall data is divided into four sub samples: the east, the central, the west and the northeast to investigate the regional heterogeneity. Secondly, considering companies of various ownerships have differences in business decision-making goals or financing channels, this paper divides OFDI into state-owned OFDI, private OFDI, HMT(Hong Kong, Macao and Taiwan)-funded OFDI and foreign-funded OFDI. The third heterogeneity is between different investment modes. When decide overseas investment, enterprises face two investment modes: greenfield investment and M&A investment. The difference of investment risk, cost and income between the two modes will affect investment decisions made by enterprises and thus the economic activities in the home country. The fourth is OFDI investment motives. Various investment motives contribute to different economic effects on domestic manufacturing and industrial sectors. This paper identifies the investment motives of each OFDI and finally sums it up to the city level. The specific method is as follow: In the identification process, the business scope of the target enterprise, the business scope of the investment enterprise, the investment mode, the target country and the production mode of the industry involved are used at the same time to ensure the accuracy of motive identification. For example, the natural resources seeking motivation is identified according to the proportion of natural resources involved in the business scope of the target enterprise in the total export of the target country and the wealth of this resources in the target country. OFDI in advantageous technology intensive industries in European and American developed countries is identified as technology seeking OFDI. OFDI recognized as market seeking motivation is generally the investment of Chinese enterprises with advantageous industries in host countries where the development level of the industry is low and the demand for related products depends on imports. Local production OFDI needs to be judged comprehensively by further combining with the information such as the average wage level and the bilateral trade volume of products involved in the business scope of the host country with China, and whether it is greenfield or M&A investment with the equity ratio of no less than 51%.

Table 5 presents the estimated results of the four regions. The deindustrialization effect of eastern OFDI and northeastern OFDI is significant. The central and western OFDI does not lead to the shrinkage of the local manufacturing sector, while the central OFDI will promote the scale growth of manufacturing sector. A possible reason is that for

Table 4 Analysis of regional heterogeneity

	Eastern region		Northeast region		Central region		Western region	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	mavagdp	mavagdp	mavagdp	mavagdp	mavagdp	mavagdp	mavagdp	mavagdp
L.mavagdp	0.431***	0.439***	0.596***	0.612***	0.552***	0.540***	0.841***	0.844***
	(6.35)	(6.85)	(8.58)	(5.04)	(8.75)	(8.24)	(10.03)	(9.93)
L2.mavagdp	0.261***	0.261***	0.263***	0.163***	0.186***	0.182***	0.0270	0.0282
	(8.11)	(8.35)	(3.23)	(3.94)	(5.37)	(5.33)	(0.37)	(0.38)
OFDI		−0.001***		−0.008**		0.0009		−0.0008
		(-3.36)		(-2.20)		(0.54)		(−0.88)
OFDIvalue	−0.369***		−1.202*		1.674		−0.119	
	(−3.42)		(−1.97)		(1.65)		(−0.26)	
lnpgdp	0.012*	0.0143**	0.0381**	0.0450***	0.0278***	0.0281***	0.0161***	0.0159***
	(1.82)	(2.16)	(2.29)	(3.02)	(4.29)	(4.05)	(3.62)	(3.69)
thirdproductivity	−0.006***	−0.006***	−0.013***	−0.014***	−0.007***	−0.007***	−0.009***	−0.009***
	(−11.17)	(−10.62)	(−5.56)	(−5.86)	(−12.01)	(−11.96)	(−2.88)	(−3.09)
profit	0.0336**	0.0270**	−0.00152	0.00547	0.0258***	0.0278***	0.017***	0.017***
	(2.32)	(2.34)	(-0.14)	(0.56)	(2.69)	(2.87)	(3.20)	(3.21)
property	−0.167***	−0.183***	0.0318	0.0295	−0.257**	−0.246***	−0.106***	−0.09***
	(−4.52)	(−4.48)	(0.30)	(0.34)	(−2.50)	(−2.78)	(−3.57)	(−3.01)
fdi	−0.427	−0.280	−0.395	−0.229	3.849**	3.969***	0.552	0.602
	(−0.42)	(−0.27)	(−0.46)	(−0.25)	(2.36)	(2.65)	(1.14)	(1.11)
Constant	0	−0.00623	−0.309*	−0.377**	0	0	−0.107***	−0.107***
	(.)	(−0.12)	(−1.92)	(−2.62)	(.)	(.)	(−2.84)	(−2.93)
Observations	948	948	363	329	966	966	646	647
Year and city fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	0	0.03	0	0	0	0	0	0
AR(2)	0.95	0.36	0.573	0.23	0. 8	0.248	0.54	0.23
Hansen	1	1	1	1	1	1	1	1

the central and western regions, positive effects brought by OFDI, such as spillover effect of reverse technology can alleviate the uneven technological progress among regions to a certain extent, thus balancing the negative impact of OFDI on industrial scale.

See the first column of Table 6 for the estimated results[4] of heterogeneity analysis on ownership of investors. The deindustrialization effect of state-owned OFDI (*stateofdi*) and foreign-funded OFDI (*privateofdi*) is significant, while that of private OFDI and HMT-

4 There are some missing values of OFDI data. Further grouping based on heterogeneity analysis leads to most or complete missing of OFDI data in some regions. In order to avoid interference with the regression results, this paper takes only the OFDI projects number in the heterogeneity analysis.

funded OFDI（*HATofdi*）is opposite. The state-owned OFDI usually possesses a certain policy orientation. Therefore, the investment behavior without the goal of profit maximization may lead to the reduction of investment return and even loss, restricting the domestic economic activities of enterprises. For foreign-funded enterprises, its OFDI partly indicate the "capital flight" caused by the fact that the current location of subsidiaries is no longer the optimal choice for the parent company to save production costs or increase profits, thus inhibiting the sector scale.

The model shown in the second column of Table 5 covers both greenfield OFDI（*greenofdi*）and M&A OFDI（*merge OFDI*）. The estimation results show that greenfield investment will promote deindustrialization, while M&A investment poses no significant impact on the industrial scale. Due to the high fixed cost and operation risk of greenfield investment, it is easier to squeeze out domestic investment. At the same time, this investment is often accompanied by the transfer of production, resulting in the increase of imports and the decrease of domestic demand, which further intensify the deindustrialization effect. For M&A investment model, when choose this kind of investment, enterprises embrace small risk of loss and low initial cost, giving rise to little impact on domestic capital liquidity and market demand. Therefore, the deindustrialization effect is not significant. The third column displays the impact of OFDI with different motives on the scale of the industrial sector. The estimation results show that except for the negative influence of local production OFDI（*localofdi*）and market seeking OFDI（*marketofdi*）on the sector scale, asset seeking OFDI（*assetofdi*）and resource seeking OFDI（*resourceofdi*）will not deepen the regional deindustrialization. Enterprises often transfer their factories or production lines to countries with lower production cost. On the one hand, the overseas construction of factories requires high capital, aggravating the constraints on the economic activities liquidity of the home country. On the other hand, the transfer of production lines will also generate the domestic and export demand replacement in the home country. Although market OFDI has minor impact on the investment and import in theory, its coefficient is significantly negative. The reason might be that when invest with this motive, some enterprises outsource some production to host country enterprises or co-produce in order to reduce trade and transportation costs, and at this time, the investment of enterprises bears two motives: local production and market seeking, which leads to the significant deindustrialization effect of market OFDI. Though OFDI with the other two motives will occupy some enterprise liquidity, the deindustrialization effects of these investments are not significant because they can advance technological innovation and stimulate the increase of domestic and foreign demand to a certain extent.

Table 5 Other heterogeneity analysis

	Ownership	Investment mode	Investment motivation
	(1)	(2)	(3)
	mavagdp	mavagdp	mavagdp
L.mavagdp	0.566***	0.545***	0.560***
	(11.54)	(10.43)	(10.99)
L2.mavagdp	0.150***	0.127***	0.145***
	(6.28)	(4.95)	(6.06)
privateofdi	0.000396		
	(0.64)		
stateofdi	-0.00184***		
	(-5.14)		
foreignofdi	-0.00465**		
	(-2.17)		
HATofdi	-0.00033		
	(-0.09)		
greenofdi		-0.00307***	
		(-3.40)	
mergeofdi		-0.0000436	
		(-0.09)	
localofdi			-0.00581***
			(-3.51)
assetofdi			0.000350
			(0.48)
resourceofdi			-0.0000469
			(-0.05)
marketofdi			-0.00199***
			(-3.47)
Control variables	Yes	Yes	Yes
Observations	2924	2924	2924
Year and city fixed effect	Yes	Yes	Yes
AR(1)	0	0	0
AR(2)	0.149	0.138	0.248
Hansen	1	0 .99	1

4. Mechanism Test

Manufacturing OFDI mainly influences the industrialization process through the following two ways: firstly, OFDI affects the scale of industrial sector by crowding out domestic investment, leading to continuous capital outflow. If the capital stock of the industry in the home country is relatively fixed and it is unable to offset the capital outflow by

attracting sufficient foreign capital, it will exert upward pressure on the actual interest rate and inhibit the formation of new investment. In addition, OFDI signifies that enterprises transfer part of their internal funds abroad, which will reduce the liquidity for domestic investment and is detrimental to the formation of new investment. When industrial capital flows out continuously and the formation rate of new investment slows down, it will inevitably result in the decline of labor demand and the shrinkage of industrial scale, accelerating the process of deindustrialization. Secondly, OFDI affects deindustrialization through the import increasing effect. The domestic supply originally provided by OFDI enterprises needs to be supplemented by imports, contributing to an increase in imports. The enterprises that fail to go global are uncompetitive in the market compared with the enterprises that obtain comparative advantages through OFDI. Therefore, the influx of imported products will squeeze their market share in China and eventually bring about the shrinkage of production scale. In this regard, this paper sets the following model to test the mechanism of investment and manufacturing imports:

$$magdp_{it}=\beta_0 magdp_{i,t-1}+\beta_1 magdp_{it-2}+\partial_0+\beta_2 invest_{it}+\beta_3 Z_{it}+d_t+\mu_{it}+\varepsilon_{it} \quad (3)$$

$$invest_{it}=\partial_0+\beta_0 invest_{i,t-1}+\beta_1 invest_{it-2}+\beta_2 OFDI_{it}+\beta_3 Z_{it}+d_t+\mu_{it}+\varepsilon_{it} \quad (4)$$

$$magdp_{it}=\beta_0 magdp_{i,t-1}+\beta_1 magdp_{it-2}+\partial_0+\beta_2 import_{it}+\beta_3 Z_{it}+d_t+\mu_{it}+\varepsilon_{it} \quad (5)$$

$$import_{it}=\partial_0+\beta_0 import_{i,t-1}+\beta_1 import_{it-2}+\beta_2 OFDI_{it}+\beta_3 Z_{it}+d_t+\mu_{it}+\varepsilon_{it} \quad (6)$$

Equation (3) is used to test the impact of domestic investment and manufacturing imports on regional deindustrialization. Equation (4) tests whether OFDI generates crowding out effect. Thereinto, the investment level is measured by the proportion of the annual average balance of net fixed assets in GDP. Equation (5) is used to estimate the impact of manufacturing imports on regional deindustrialization, and equation (6) tests whether OFDI will increase manufacturing imports. Due to the lack of manufacturing imports data of prefecture-level cities, this paper adopts the total imports to weight the proportion of manufacturing imports obtained from provincial trade data and approximates the manufacturing import level.

Table 7 presents the estimated results of the mechanism test. The first column in the table shows the regression results of equation (3). The effect of fixed assets on the scale proportion of industrial sector is significantly positive. The estimation results of equation (4) are shown from column 2 to 4 in the table. The estimation results of both static model[5]

5 As the estimation result AR (1) of the dynamic model shows that there is no first-order auto-correlation, this paper adopts the static fixed effect model for estimation to ensure the accuracy of the regression results.

and dynamic model show that OFDI will inhibit the formation of domestic investment. The estimation results of equation (6) in column 6 of the table show that the increase of manufacturing imports will inhibit the scale expansion of regional industrial sector. The estimation results in columns 7 and 8 prove that the increase of OFDI will help enhance manufacturing import volume. Therefore, investment crowding out effect and import increasing effect are the transmission channels of OFDI to generate deindustrialization effect.

Table 6 Mechanism Test

	Investment					Import		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	mavagdp	investment	investment	investment	investment	mavagdp	import	import
L.mavagdp	0.539***					0.499***		
	(10.38)					(8.71)		
L2.mavagdp	0.122***					0.101***		
	(5.01)					(3.84)		
investment	0.00711***							
	(2.62)							
L.investment		0.107*	0.104*					
		(1.89)	(1.89)					
L2.investment		0.143**	0.131**					
		(2.40)	(2.29)					
import						-0.003*		
						(-1.90)		
L.import							0.66***	0.65***
							(11.89)	(11.39)
L2.import							0.23***	0.23***
							(6.91)	(7.19)
OFDIvalue		-1.911***		-0.728**			2.45**	
		(-3.93)		(-2.02)			(2.27)	
OFDI			-0.00615***		-0.0016**			0.015**
			(-4.45)		(-2.49)			(2.58)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.111***	0	1.547***	-0.504	-0.488	-0.19***	-2.47**	-2.37**
	(-2.84)	(.)	(5.07)	(-1.30)	(-1.25)	(-3.29)	(-2.27)	(-2.11)
Year and city fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obeservations	2915	2910	2911	3188	3189	2887	2850	2851
AR (1)	0	0.186	0.184			0	0	0
AR (2)	0.214	0.14	0.16			0.198	0.115	0.105
Hansen	0.204	0.193	0.144			0.281	0.382	0.307

5. Conclusion

In recent years, premature deindustrialization has emerged successively throughout China. Is this phenomenon related to the rapidly increasing OFDI of manufacturing? To solve this problem, based on the theoretical analysis of OFDI impact on deindustrialization, this paper establishes a dynamic panel model using the data of 283 prefecture-level cities in China from 2005 to 2017, and proves the deindustrialization effect of OFDI. The mechanism of OFDI impact on the scale of industrial sector has also been analyzed. The main conclusions are as follows: (1) OFDI has significant negative impact on the scale of industrial sector. That is, OFDI promotes the emergence of premature deindustrialization in China. (2) Diverse source regions, ownership of investors, OFDI modes and OFDI motive result in significant differences in the deindustrialization effect of OFDI. Specifically, from the perspective of enterprise location, eastern and northeastern OFDI have a significant deindustrialization effect, while OFDI from other regions has no significant deindustrialization effect. From the perspective of investment modes, greenfield investment will accelerate reducing industry scale, while M&A investment will not. From the perspective of the four categories of enterprises divided by ownership, the OFDI from private enterprises and HMT-funded enterprises does not significantly advance the process of deindustrialization, while the OFDI from state-owned enterprises and foreign-funded enterprises has a deindustrialization effect. From the perspective of investment motives, local production and market seeking OFDI arise the deindustrialization effect, while OFDI for the purpose of natural resource and strategic asset does not significantly impact the scale of industrial sector. (3) This paper theoretically analyzes the intrinsic ways of OFDI affecting the scale of industry, and empirically proves that OFDI negatively impacts the scale of industrial sector in the home country mainly by crowding out domestic investment and improving manufacturing imports.

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