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The Role of Foreign Direct Investment as an Instrument in Enhancing Manufacturing Productivity: Evidence from Chinese Provinces

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Abstract: ***Since productivity has been proposed as a prime determinant of the country's prosperity, and with the increased research and development(R&D), and the knowledge flows from high-tech manufacturing firms, China has experienced a considerable period of development in manufacturing industrial structure, which had affected the country growth overall. However, because previous studies have not settled the relationship between foreign direct investment (FDI) and productivity in a robust and consistent manner. This study will try to resolve the dispute by analyze the indirect relation between FDI and the manufacturing industrial productivity through R&D, using two-stage least squares (2SLS) that helps to overcome the correlation problem of the independent variables with the error term by using the instrumental variable i.e.(FDI). By employing a provincial data from the National Bureau of Statistics of China on manufacturing industry from 2008 to 2016, we were able to find that FDI flows into China has increased the competitiveness in the Chinese market, prompting industrial firms to invest more in R&D particularly in the labor-intensive provinces. On the other hand, we have noted that the increased expenditure in R&D is no longer sufficient to spur productivity growthand confront strong competition, especially since the manufacturing market has reached an advanced level of development,it is necessary to promote creativity and innovation more effectively, in addition, to improve the production methods rather than only increasing the production quantity.***

Keywords: Foreign Direct Investment, Chinese's Provinces, Manufacturing Industry, Research and Development,Two-Stage Least Square.

1. Introduction

Productivity is the relevant key that puts the development of researches in the execution position. Recently, China has focused on attracting high-technology manufacture industry (Catalogue, 2007). In responding to the prevalent trend that had characterized by quantity-oriented production, low application of technology, little product diversity, rather than quality improvements direction (Bei, 2013; K. Liu & Daly, 2011b). China had become the world's largest manufacturer of produced goods according to the World Bank statistics from 2010 until 2015. However, with the deepening of China's opening up, the opportunities for improving the manufacturing industry with the contribution of other countries ownership are also increased. FDI has played an important role in promoting economic development. It has received great attention for the magnificent role in flourishing the hosting economies, especially in developing countries. Such contributions are deemed a powerful tool for economic growth. Also, a dynamic mechanism to transfer technology and technological knowledge via channels such as spillovers transfer of management expertise, International Investors found China as a convenient environment for their investment, with its big market, richness in labor and environment resources. China had received around 20% of the whole FDI to developing countries over the period from 2000 to 2010. The actually utilized FDI was about 3.5 billion USD in 1990 and with the large-scale coming investments. It reached to 40.71 billion and 100.73 billion USD in the next two decades respectively. In addition, the manufacturing industry has formed the largest portion of these foreign investments, where manufacturing sectors had formed about 63% of it in 2000, and 47%, 28% in 2010, 2016 respectively. Which was growing positively from 2000 and yet, starting to decline after 2011 to reach 35.5 billion USD (National Bureau of Statistics of China). In the manufacturing area, Many studies had been accomplished to investigate how the FDI presence affect the productivity power in the country, especially on the domestic firms (Anwar & Sun, 2014; Buckley, Clegg, & Wang, 2007; Demir&Duan, 2018; Galina & Cheryl, 2011; Sun & Anwar, 2017).

Considering the neoclassic principles of economic growth (Solow, 1957) and specifically in the point of productivity growth, Total factor productivity (TFP) is well-known as a good measurement of factor productivity in addition to labor and capital productivity in the economic growth process. Also, the role of FDI in encouraging or discouraging the TFP has been extensively argued. Although FDI is known as a vital tool to transfer spillovers for the local firms, there is no decisive evidence about FDI effects on TFP. Some studies have recommended the presence of FDI and suggested some guidelines showing the benefits of hosting investments (Z. Liu, 2002; Tian, 2007; Ya-ping, 2007; Yang & Qi, 2001) these studies had found that FDI can raise both the level and growth rate of productivity of manufacturing industries. Others studies did not find significant effects from the presence of FDI being resulted, Moreover, some of them had found negative results (Hu & Jefferson, 2002; Lo, Hong, & Li, 2016; Orlic, Hashi, &Hisarciklilar, 2018; Wang & Wang, 2015). In this paper, attempts were made to evaluate the indirect effect of FDI on manufacturing productivity through the R&D, considering the instrumental variable FDI using Chinese provincial manufacturing data between 2008 and 2016. Firstly, we took the relationship between the instrumental variable FDI and the R&D in the manufacturing industry. Secondly, we are estimated the R&D and manufacturing productivity relation, in order to investigate the indirect impact of foreign investments on productivity in the manufacturing industry.

The rest of the paper is organized as follows: section II we

figure out the previous literature about the above discussions Section III will deal with the primary statistic description and the application of methodology. In section IV, we offer the results and discussions and finally, section V would be the conclusion.

2. Literature Review

2.1 The Importance of Foreign Direct Investment in Manufacturing Industry

Foreign direct investment has attracted considerable attention in studies around the world. Keller (2010) showed that firms involved in FDI are more likely to be larger and more productive comparing with companies that run only domestically. Thus, the lastly mentioned may have the ability to grow their productivity within communicating and interacting with foreign firms. In addition, Abraham, Konings, &Slootmaekers (2010) argued that domestic firms operating in sectors where foreign firms are also active have higher total factor productivity. Houkai (2002) found that FDI's inflows lead approximately to ninety percent of the gap in GDP growth rate between eastern developed regions and western undeveloped regions in China. FDI has emerged as a positive factor as in the study of Z. Liu (2002) who found FDI in Shenzhen province to be a good sign leading to significant and large indirect effects in that it raises both the level and growth rate of manufacturing productivity in the form of technological progress. Also Ya-ping (2007) had taken the industry-level data and found positive productivity spillovers from FDI through backward linkages. Moreover, Yang & Qi (2001) found a very important spillover results for a specific province. In addition, Xu & Sheng (2012) suggested positive spillovers from FDI arise from forward linkages where domestic firms purchase high-quality intermediate goods or equipment from foreign companies in the upstream sectors. Moreover, it showed that domestic companies is significantly different in the extent to which they benefit from FDI. Another study on local manufacturing companies showed that it benefit from the existing of foreign firms in downstream manufacturing sectors. Demonstration impact guarantee that labor mobility and the growing competition is an evidence to be the main channels of horizontal knowledge spreading (Orlic, Hashi, &Hisarciklilar, 2018b). Chinese achievement in seeking efficient FDI has formed a locomotion from low towards high tech manufacturing industry (K. Liu & Daly, 2011a).

2.2 The Effect of Foreign Existence on Total Factor Productivity

The mechanism of FDI effect on TFP is mainly reflected in: Firstly, FDI has a competitive effect. Multinational corporations are advanced in technology, while host enterprises are relatively low in technology. In the technological innovation and spillover mechanism of industrial agglomeration, multinational corporations play a key role. Through export-oriented and innovative learning, advanced knowledge is obtained from the external cluster, and technological innovation and spillover are carried out to promote the technological progress of the host country. Meanwhile, intensified competition among enterprises will stimulate manufacturing enterprises to increase production efficiency, The reason is that, if the manufacturing enterprises with low productivity are unable to reduce the cost and improve the quality of service products in the fierce market competition, they will be forced to withdraw from the industry, which leads to the reconfiguration of resources to higher productivity service enterprises, which makes the technological level of the manufacturing enterprises improve. Secondly, FDI has spillover effect. The improvement in productivity also leads to an increase in external competitiveness and attracts FDI. A country can attract FDI through "learning by doing" effect, manufacturing enterprises can digest and absorb advanced technology and management concept of foreign countries, effectively increase the knowledge reserve. The accumulated knowledge and technology can be used in the daily production activities of enterprises and improve the production technology of enterprises. At the same time, it encourages enterprises to establish green development consciousness. On the one hand, with the deepening of the manufacturing industry development, the foreign firms will continue to enter the market. The local firms will face competitive pressure from high-quality products or services from abroad. However, the manufacturing firms can also raise the level of the science and technology of the industry by imitating, absorbing and creating more competitive products of the same kind (Benito &Narula, 2007; Goerzen, Asmussen, & Nielsen, 2013). The continual interaction between effective local authorities between MNEs may provide information on resources such as infrastructure, finance, and labor (Mariotti, Piscitello, &Elia, 2010; Mudambi, 2002; Spencer, 2008).

2.3 The Disadvantages of Foreign Existence on Manufacturing Productivity

Other studies have had a different view of previous researches, Jin et al (2017) proposed that leverage of FDI in the food manufacturing sector may be different from other the manufacturing sectors. It can hold the negative effect on TFP. Demir&Duan (2018) did not found a serious effect of two-sided FDI streams on both physical capital growth or on host country productivity growth or even on the productivity gap within both the host and the frontier country. Furthermore, their study showed that these outcomes could not consider as sensitive findings in terms of direction of FDI flows. Yet, they only found a positive effect of South-to-South FDI flows. Tian (2007) argued that technological positive spillovers from FDI to domestic firms occur through tangible assets rather than intangible assets. Which give less importance to TFP spillover. Again,Ya-ping (2007) found negative productivity spillovers from FDI through the horizontal channel; Hu & Jefferson (2002) also found the same result horizontally in the electronic and textile industries. Yang & Qi (2001) argued for a specific industry, the spillover effect of FDI on Chinese industrial firms is not significant, if not negative. Orlic et al. (2018a) emphasized that there is negatively associated effect with domestic firms' productivity in manufacturing sector from the presence of FDI. Moreover, Wang et al (2015) didn't find any proof that there is further productivity gains of foreign ownership rather they find that foreign acquisition improves output, employment, exports and wage of target firms. In addition, Lo et al. (2016) found that FDI is supporting the allocative efficiency but it is harming productive efficiency. Also,

Haiyang (2005) found the activity of FDI do not have significant effect on domestic manufacturing, in other words, In high-tech industries, the domestic manufacturing could not absorb the high tech fromFDI as their low absorptive ability of the benefits comparing to the higher absorptive ability In the traditional industries.

3. Data and Methodology

Our data are collected from the National Bureau of Statistics of China, which includes the main indicators of industrial enterprises. Above designated size, in this data set we are taking manufacturingindustry only, neither the mining industry .nor the provision of gas water and electricity data set. Our data is covering the provinces of China which containing 31provinces. Table 1 is concluding the definition and measurements of the variables.A descriptive statistics table is introduced to describe and summarize the main features of the data. In addition, correlation table to initiallymeasures the strength of the relationships among variables.

Since previous studies have not settled therelationship betweenFDI andproductivity in a robust and consistent manner. We will try to resolve the dispute and clarify thisrelationship using two-stage least squares (2SLS) that helps overcome the problem of correlation of independent variables with the error term by using the instrumental variable i.e. (FDI). Also to examine the indirect relation between FDI and the productivity of manufacturing industry through the R&D. Our model is shown as:

$$X_{it} = \alpha_1 + b_2 Z_{it} + \varepsilon_{1it} \quad (1)$$

$$Y_{it} = \alpha_2 + b_2 \hat{X}_{it} + \varepsilon_{2it} \quad (2)$$

Where: i denotes to the province, t denotes to year. The dependent variableY_{it} denotes to the total factor Productivity of manufacturing industry in province i and year t. The median variable $\hat{X}_{it}$ denotes to expenditure on R&D ofthe industrial enterprises in a province i and a year t. the independent variable Z_{it} denote to FDI in a province i and a year t.

Table 1: Definition of Variables

Variables	*Definition*	*Dependency*
FDI_{it}	Total investments of fixed assets of industrial enterprises with Hong Kong, Macao, Taiwan and foreign funds inyear t and province i	Independent
TFP_{it}	Total factor productivity inmanufacturing urban units inyear t and province i	Dependent
EMP_{it}	Number of employed persons inmanufacturing urban units inyear t and province i	Dependent
PR_{it}	Total profits of industrial enterprises above designated sizeinyear t and province i	Independent
VA_{it}	Value-added of industry year t and province i	Independent
NUM_EN_{it}	Number of industrial enterprises above designated sizeinyear t and province i	Independent
O_PR_{it}	Operating profits of industrial enterprises above designated size	Independent
L_FA_{it}	Total value of fixed assets of industrial enterprises above designated size	Independent
R_D_{it}	Expenditure on R&D of industrial enterprises above designated size	Independent
D	The dummy variable is referring to provinces that have investments in fixed assets exceeding 0.3 trillion Yuan	Independent

Table 2: Descriptive Statistics

Variables	N	Mean	SD	Min	Max
Emp	279	141.1	160.1	0.660	1,020
PR	279	1,850	2,021	-91.89	10,574
TFP	279	2.468	0.839	0.499	4.505
R&D	279	2.275e+06	3.158e+06	1,637	1.676e+07
FDI	279	1,745	2,531	3.180	12,901
Number of Provinces	31	31	31	31	31

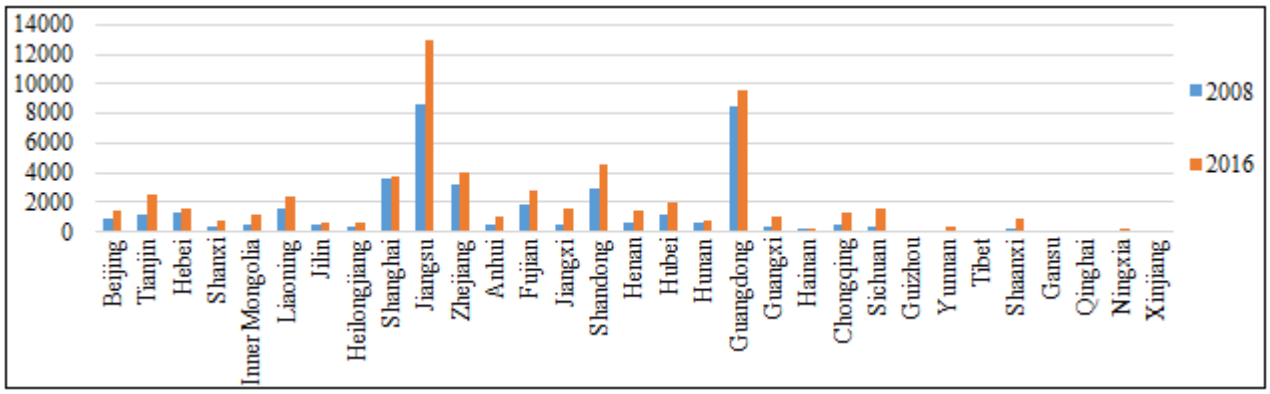

Figure 1: Foreign Investment of Industrial Enterprises Hong Kong, Macao, Taiwan and Foreign Funds

According to the correlation matrix, our independent variables do not encounter any problem with multicolinearity, table 3 is below for the correlation matrix.

Table 3: Correlation Matrix

	lnEmp	**lnPR**	**lnTFP**	**lnR&D**	**lnFDI**	**D**
lnEmp	1.0000					
lnPR	0.5394	1.0000				
lnTFP	0.7708	0.7712	1.0000			
lnR&D	0.9581	0.9401	0.7166	1.0000		
lnFDI	0.4163	0.4906	0.4335	0.8277	1.0000	
D	0.5186	0.4794	0.2644	0.5246	0.5731	1.0000

4. Results and Discussions

For the model selection between fixed effect and random effect, the Hausman test is applied. In the following part, table 4 presents the Hausman test results. The statistically significant values of Hausman test indicate that fixed effect model is better than random effect model due to its higher efficiency.

Table 1: Hauseman Test			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. D.f.	Prob.
Cross-section random	43.23	275	.0000

In the first stage, we will use the fixed effect regression, our dependent variable is the R&D of industrial enterprises, and this stage is taking the effect of the exogenous variables i.e., (FDI, manufacturing employees' number, and total profits of industrial enterprises). Then we used the predicted variable of R&Din the second stage as endogenous variable by Eq(3), we got the results as shown in the Table 4.

$$R\_D_{i,t} = ß_0 + ß_1 FDI_{i,t} + ß_2 \mathrm{EMP}_{i,t} + ß_3 PR_{i,t} \quad (3)$$

We employ the Cobb-Douglas functional form to compute Total Factor Productivity. To apply Cobb-Douglas production function we need three parameters 1- the output (Y) which is a function of 2- labor (L) and 3-capital (K), with labor and capital coefficients being α and β respectively. The production function is:

$$Y_{it} = A_{it} L_{it}^{\alpha} K_{it}^{\beta} \quad (4)$$

A_{it} measuresTFP_{it}, which can be used to pick up the changes of production efficiency of i across sections over time t. We skipped the restriction of $(\alpha + \beta)$ is not equal to one (Tuan et al., 2009). By writing Production function in natural logarithms form, we get:

$$lnY_{it} = lnA_{it} + \alpha lnK_{it} + \beta lnL_{it} \quad (5)$$

Then we will estimate Production function by the methods of pooled OLS with fixed effects specification. In the second stage of 2SLS.,also with the fixed effect term, the total factor productivity is the dependent variable. In addition, will have the estimated value of R&D as an independent variable, as the Eq(6).

$$TFP_{i,t} = ß_0 + ß_1 \widehat{R\_D}_{i,t} \quad (6)$$

The results for the two stages is shown in the following table

Table 5: Empirical Results

Variables	Stage 1	Stage 2
lnFDI	0.665***	
	(0.0703)	
lnPR	0.260***	
	(0.0522)	
lnEmp	0.845***	
	(0.125)	
Rdhat		-0.0381
		(0.0268)
D	0.475***	0.028
	(0.0623)	(0.0581)
Constant	3.875***	1.359***
	(0.479)	(0.368)
Observations	277	277
R-squared	0.648	0.008
Number of Provinces	31	31

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The foreign direct investment, that presents the contribution of foreign industrial manufacturing firms in the Chinese provinces, has a coefficient of 0.665 at 0.000 significance level and 0.0703 standard error of estimation, which is a highly significant positive effect on the R&D expenditures. The rest of the variables can also be interpreted in the same way. The first model has strong explanatory power. We can indicate that the coming FDI has enhanced the Expenditure of R&D; it may be reflected by the reason of increased competition with the local firms to dominate the market, locally and globally. We note that the labor-intensive provinces (Shanghai, Jiangsu, Zhejiang, Guangdong, and Shandong) enjoy more R&D, especially those in the manufacturing industry. Moreover, a large number of workers provides a direct incentive to provide R&D work in industrial enterprises, and it indirectly stimulate the entry ofhigh-tech foreign investment that reflect in advance R&D. This is in line with the fact that the most attractive provinces of foreign investment experience a great deal of R&D. Also, the results indicate an increasing amount in total profits can bring more funding for R&D. We also found in the second stage, which measures the impact ofR&D (affected by foreign investment) on productivity of provincial manufacturing industries,which resulted insignificant negative value, refereeing that the more expenditure of R&D as a behavior to overcome the competition challenges was not a proper attitude to enhance productivity. Which does not return much of the benefit to productivity in the Chinese provinces.But it may be more appropriate to explain that the local workforce has a greater ability to rely on itself in moving towards the prosperity of industrial productivity. Moreover, in enhancing the role of R&D locally without dependence on others.

5. Conclusion

Foreign investment plays a key role in achieving the economic development of developing countries. Where FDI is considered the main gateway to enter the latest technologies and means of production to developing countries. The equation is based on the fact that foreign companies benefit from the resources available in the host country. In return, the host country benefits from entering modern production technologies and increasing productivity, which is the basis for the advancement of society and development.

In this research, we study the indirect relation between FDI and productivity through R&D expenditure as a mediator variable. In this study， we employ provincial data from the National Bureau of Statistics of China on manufacturing industry from 2008-2016, and we were able to find that the FDI flows into China has increased the competitiveness of the Chinese market, prompting industrial firms to invest more in R&D. On the other hand, we have noted that the increased R&D spending is not enough to spur productivity growth, and to confront strong competition, especially since the manufacturing market has reached an advanced level of development, it is necessary to promote creativity and focus on improvement in the production methods, not on the production itself. Therefore, the marginal benefit of research and development spending is decreasing recently.

These results indicate that Chinese economy has entered new age and it became able to lead the development process, So at the beginning of this stage, we advise the decision makers to develop new policy depend mainly on local investment and start to extend by investing in new markets abroad. In this case, China will be as a bridge between developed and developing countries and it will play the main role in achieving the development in the world.

References

[1] Abraham, F., Konings, J., & Slootmaekers, V. (2010). FDI spillovers in the Chinese manufacturing sector. Economics of transition, 18(1), 143-182.
[2] Anwar, S., & Sun, S. (2014). Heterogeneity and curvilinearity of FDI-related productivity spillovers in China's manufacturing sector. Economic Modelling, 41, 23-32.
[3] Barro, R. J., & Xavier, S.-i.-M. (2003). Economic growth 2nd Edition: The MIT Press, Cambridge, Massachusetts London, England.
[4] Beerli, A., Weiss, F. J., Zilibotti, F., & Zweimüller, J. (2018). Demand forces of technical change evidence from the Chinese manufacturing industry. China Economic Review.
[5] Bei, J. (2013). The Strategic Direction for the Restructuring of Industry in China. English Edition of Qiushi Journal, Vol.5 No.3.
[6] Buckley, P. J., Clegg, J., & Wang, C. (2007). Is the relationship between inward FDI and spillover effects linear? An empirical examination of the case of China. Journal of International Business Studies, 38(3), 447-459.
[7] Catalogue, Minstry of Commerce. (2007). Catalogue for Guidance of Foreign Investment Industries.
[8] Cheung, K.-y., & Lin, P. (2004). Spillover effects of FDI on innovation in China: Evidence from the provincial data. China Economic Review, 15(1), 25-44.
[9] Demir, F., & Duan, Y. (2018). Bilateral FDI Flows, Productivity Growth, and Convergence: The North vs. The South. World development, 101, 235-249.
[10] Dianchun, J., & Yu, Z. (2008). Institutional Constraints on FDI Productivity Spillovers: The Case of China [J]. Economic Research Journal, 7, 004.
[11] Galina, H., & Cheryl, L. (2011). Are There Productivity Spillovers From Foreign Direct Investment In China? Pacific Economic Review, 16(2), 135-153.
[12] Griffith, R., Redding, S., & Van Reenen, J. (2003). R&D and absorptive capacity: theory and empirical evidence. The Scandinavian Journal of Economics, 105(1), 99-118.
[13] Gunby, P., Jin, Y., & Robert Reed, W. (2017). Did FDI Really Cause Chinese Economic Growth? A Meta-Analysis. World development, 90, 242-255.
[14] Haiyang, Z. (2005). Two Faces of R&D, Activity of FDI and the Growth of Productivity of Domestic Manufacturing in China [J]. Economic Research Journal, 5, 107-117.
[15] Houkai, W. (2002). Effects of Foreign Direct Investment on Regional Economic Growth in China [J]. Economic Research Journal, 4, 19-26.
[16] Hu, A. G., & Jefferson, G. H. (2002). FDI impact and spillover: evidence from China's electronic and textile industries. The World Economy, 25(8), 1063-1076.
[17] Jeon, Y., Park, B. I., & Ghauri, P. N. (2013). Foreign direct investment spillover effects in China: Are they different across industries with different technological levels? China Economic Review, 26, 105-117.
[18] Jin, S., Guo, H., Delgado, M. S., & Wang, H. H. (2017). Benefit or damage? The productivity effects of FDI in the Chinese food industry. Food Policy, 68, 1-9.
[19] Johansson, & Lööf. (2008). The Impact of Firm's R&D Strategy on Profit and Productivity.
[20] Keller, W. (2010). Chapter 19 - International Trade, Foreign Direct Investment, and Technology Spillovers. In B. H. Hall & N. Rosenberg (Eds.), Handbook of the Economics of Innovation (Vol. 2, pp. 793-829): North-Holland.
[21] Lewis, J. I., & Wiser, R. H. (2007). Fostering a renewable energy technology industry: An international comparison of wind industry policy support mechanisms. Energy policy, 35(3), 1844-1857.
[22] Li, L. (2017). China's manufacturing locus in 2025: With a comparison of "Made-in-China 2025" and "Industry 4.0". Technological Forecasting and Social Change.
[23] Liang, F. H. (2017). Does foreign direct investment improve the productivity of domestic firms? Technology spillovers, industry linkages, and firm capabilities. Research Policy, 46(1), 138-159.
[24] Liu, K., & Daly, K. (2011). Foreign Direct Investment in China Manufacturing Industry–Transformation from a Low Tech to High Tech Manufacturing (Vol. 6).
[25] Liu, Z. (2002). Foreign Direct Investment and Technology Spillover: Evidence from China. Journal of Comparative Economics, 30(3), 579-602.
[26] Lo, D., Hong, F., & Li, G. (2016). Assessing the role of inward foreign direct investment in Chinese economic development, 1990–2007: Towards a synthesis of alternative views. Structural Change and Economic Dynamics, 37, 107-120.
[27] Lu, Y., Tao, Z., & Zhu, L. (2017). Identifying FDI spillovers. Journal of International Economics, 107, 75-90.
[28] Mingyong, L., Qun, B., Shuijun, P., & Xin, Z. (2005). Foreign Direct Investment and Technology Spillover: A Theoretical Explanation of Absorptive Capability [J]. Economic Research Journal, 8, 95-105.
[29] Orlic, E., Hashi, I., & Hisarciklilar, M. (2018). Cross sectoral FDI spillovers and their impact on manufacturing productivity. International Business Review.
[30] Ortega-Argilés, R., Piva, M., & Vivarelli, M. (2011). Productivity gains from R&D investment: Are high-tech sectors still ahead?
[31] Ortega-Argilés, R., Potters, L., & Vivarelli, M. (2011). R&D and productivity: testing sectoral peculiarities using micro data. Empirical Economics, 41(3), 817-839.
[32] Pandey, M., & Dong, X.-y. (2009). Manufacturing productivity in China and India: The role of institutional changes. China Economic Review, 20(4), 754-766.

[33] Park, B. I., & Ghauri, P. N. (2011). Key factors affecting acquisition of technological capabilities from foreign acquiring firms by small and medium sized local firms. Journal of World Business, 46(1), 116-125.
[34] Qun, B., & Mingyong, L. (2003). The dynamic measurement and explanation of FDI technology outflow [J]. Statistical Research, 6, 008.
[35] Ru, P., Zhi, Q., Zhang, F., Zhong, X., Li, J., & Su, J. (2012). Behind the development of technology: The transition of innovation modes in China's wind turbine manufacturing industry. Energy policy, 43, 58-69.
[36] Smarzynska Javorcik, B. (2004). Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages. American economic review, 94(3), 605-627.
[37] Sun, S., & Anwar, S. (2017). Foreign direct investment and the performance of indigenous firms in China's textile industry. The Quarterly Review of economics and finance, 65, 107-113.
[38] Taotao, C. (2003). How Capacity Gaps between Foreign and Domestic Firms Shape Industry-to-industry Spillover of China's FDI [J]. Social Sciences In China, 4, 002.
[39] Terza, J. V., Basu, A., & Rathouz, P. J. (2008). Two-stage residual inclusion estimation: addressing endogeneity in health econometric modeling. Journal of health economics, 27(3), 531-543.
[40] Tian, X. (2007). Accounting for sources of FDI technology spillovers: evidence from China. Journal of International Business Studies, 38(1), 147-159.
[41] UNCTAD. (2010). World investment report: United Nations Press, New York and Geneva.
[42] Wang, J., & Wang, X. (2015). Benefits of foreign ownership: Evidence from foreign direct investment in China. Journal of International Economics, 97(2), 325-338.
[43] Wenqing, P. (2003). The Spill-over Effects of FDI on China's Industrial Sectors: A Panel Data Analysis [J]. World Economy, 6, 000.
[44] Xu, X., & Sheng, Y. (2012). Productivity Spillovers from Foreign Direct Investment: Firm-Level Evidence from China. World development, 40(1), 62-74.
[45] Ya-ping, Y. (2007). FDI Intra-industry Spillovers or Inter-industry Spillovers——An Empirical Analysis Based on Industry-level Panel Data from Guangdong [J]. China Industrial Economy, 11, 73-79.
[46] Yanbing, W. (2006). R&D and Productivity: An Empirical Study on Chinese Manufacturing Industry [J]. Economic Research Journal, 11, 60-70.
[47] Yang, Y., & Qi, Z. (2001). An Analysis of Technological Efficiency of Chinese industrial firm [J]. Economic Research Journal, 10, 13-19.
[48] Young, S., & Lan, P. (1997). Technology transfer to China through foreign direct investment. Regional studies, 31(7), 669-679.