ISSN 2616-5902 Vol. 5, Issue 22: 150-156, DOI: 10.25236/AJBM.2023.052221

Impact of Producer Services FDI on Manufacturing Upgrading in Pearl River Delta from the Perspective of Intellectual Property Protection

Dan Sun[1,a], Bo Li[1,b], Yuxiang Cao[2,c], Lihui Liu[1,d,*]

[1]Department of Economics and Management, Foshan University, Foshan, Guangdong, China
[2]Department of Accounting and Finance, The Hong Kong Polytechnic University, Hong Kong, China
[a]sundan_sc@qq.com, [b]2066922500@qq.com, [c]caoyuxiangacca@163.com, [d]821500198@qq.com
[*]Corresponding author

Abstract: *Using the urban panel data of the Pearl River Delta, we explore the impact of producer services FDI on manufacturing upgrading. Considering the threshold effect of intellectual property protection in the process of producer services FDI affecting manufacturing upgrading, we establish a panel threshold model for empirical testing. The results show that producer services FDI can promote manufacturing upgrading, especially in improving technological efficiency. Producer services FDI has a single threshold of intellectual property protection for total factor productivity and technical efficiency. When the intensity of intellectual property protection is lower than the threshold, producer services FDI has a significant negative impact on manufacturing upgrading. When the intensity of intellectual property protection exceeds the threshold, the impact is significantly positive.The results show that the Pearl River Delta should pay attention to the supporting role of producer services FDI in manufacturing upgrading, properly improve the level of intellectual property protection of producer services, and help the development of local producer services while attracting high-quality FDI to promote manufacturing upgrading.*

Keywords: *Intellectual Property Protection; Producer Services FDI; Manufacturing Upgrading*

1. Introduction

Although the Pearl River Delta in China has a relatively completed industrial chain, the manufacturing industry has not yet got rid of the situation of low added value, insufficient innovation ability and weak competitiveness. In recent years, the global supply chain industry chain is undergoing restructuring in the face of the normalization of the COVID-19, the Sino US trade war, the conflict between Russia and Ukraine, and the tide of digitalization and low-carbon. The manufacturing industry in the Pearl River Delta is facing the dual challenges of the return of manufacturing industry in developed countries and the low-cost advantages of developing countries. The dilemma of insufficient high-tech and low-tech surplus is highlighted, it is necessary to find new impetus for industrial transformation and upgrading. As an advanced factor of production, producer services are not only the demand result of the expansion of the manufacturing industry (Cohen&Zysman, 1989)[1], but also the integration and interaction with the manufacturing industry (Grubel&Walker, 1989; Pang, 2017)[2]-[3]. The two factors are driving the transformation and upgrading of the manufacturing industry by reducing the transaction costs of the manufacturing industry, promoting professional division of labor and improving innovation capabilities (Eswaran&Kotwal, 2002; Markusen, 1989; Fernandes et al., 2012)[4]-[6]. However, the modern service industry in the Pearl River Delta starts late, especially the producer services, which have a weak foundation and a low level of development. Producer services do not match the transformation and upgrading of the manufacturing industry. The support for the upgrading of the manufacturing industry is not strong, and it is difficult to integrate with each other to form a linkage development. Therefore, it is urgent and far-reaching to introduce high-quality producer services FDI from developed countries or regions to boost the upgrading of manufacturing in the Pearl River Delta.

As an important institutional arrangement to encourage and protect innovation, intellectual property protection(IPR) is an important factor for affecting FDI (Coeurderoy&Murray, 2008; Khoury&Peng, 2011)[7]-[8]. Excessive intellectual property protection in developing countries may lead to technology monopoly problems of foreign-funded enterprises and increase the imitation cost of local enterprises,

ISSN 2616-5902 Vol. 5, Issue 22: 150-156, DOI: 10.25236/AJBM.2023.052221

which is not conducive to the technological progress of host country enterprises, and ultimately restricts the transformation and upgrading of host country industries (Abdel Latif, 2015)[9].However, developed countries with technological advantages hope that the host country will formulate a strict intellectual property protection system, and reduce the risk of knowledge and technology leakage and imitation.Obviously, developing host countries are faced with a dilemma between the motivation of attracting foreign investment and the motivation of technology imitation. The two motivations are considered in a coordinated way and are affected by the level of intellectual property protection.

The contribution of this article is:Firstly, we focus on the key role of producer services FDI in upgrading the manufacturing industry, making up for the shortcomings of existing research as well as providing new ideas for the transformation and upgrading of the manufacturing industry in the Pearl River Delta. Secondly, in order to adjust and formulate IPR protection policies for the government, the threshold effect of intellectual property protection in the process of producer services FDI affecting the upgrading of manufacturing industry is discussed. We provide a theoretical basis for the Pearl River Delta to optimize the strategy of attracting investment in producer services, and formulate intellectual property protection policies.

2. Literature Review

The research of Francois (1990)[10], Hoekman (2006)[11] and Ren&Liu (2010)[12] confirmed that countries with backward service industries can improve a country's technology level and human capital stock by introducing productive services such as finance, telecommunications and transportation, thus enhancing the international competitiveness of the host country's manufacturing industry. Producer services FDI can not only improve the total factor productivity of manufacturing industry through technology spillover effect (Javorcik&Yue, 2013)[13], but also improve the innovation ability of manufacturing industry through enterprise product and technology innovation (Fernandes et al., 2012)[6].

Service products have the characteristics of high added value, the knowledge elements in them are easier to be copied and imitated. Therefore, developed countries require that the developing countries formulate a strict intellectual property protection system in order to ensure the technology monopoly position and investment income of investors within a certain period of time (Adams, 2010)[14]. But developing countries at a technological disadvantage hope to moderately relax the protection of intellectual property rights (Petricevic&Teece, 2019)[15]. Some scholars found that the relationship between intellectual property protection and foreign direct investment is uncertain or nonlinear, and FDI is not linear with the industrial upgrading and technological innovation of the host country (Fang et al, 2019; Ma&Li, 2015)[16]-[17]. The above research results provide a new way of thinking for this study, that is, the effect of producer services FDI on manufacturing upgrading may also be affected by the level of intellectual property protection and has nonlinear characteristics.However, the existing literature on the relationship between producer services FDI and the manufacturing upgrading of host countries rarely address the important factor of intellectual property protection, and the transmission mechanism of intellectual property protection on the relationship between them remains to be clarified.

Therefore, considering the effect of intellectual property protection in the process of FDI in producer services affecting manufacturing upgrading, we put producer services FDI, manufacturing upgrading and intellectual property protection under a unified framework to explore the relationship between them.

3. Theoretical analysis and research hypothesis

3.1. The mechanism of producer services FDI affecting the manufacturing upgrading

There are two ways for producer services FDI to affect manufacturing upgrading.The one is direct effect: Firstly, the introduction of producer services FDI reduces the price of producer services by enriching the supply of local producer services in the host country. Secondly, the introduction of advanced and professional producer services with the help of producer services FDI can reduce the cost of each link of manufacturing enterprises, especially reduce the transaction costs and uncertainties of enterprises in domestic and international trade. so the manufacturing enterprises can invest more funds and energy in optimizing products and innovative technologies, and accelerate the formation of competitive advantages of local manufacturing enterprises.Finally, transnational company(TNCs) in

ISSN 2616-5902 Vol. 5, Issue 22: 150-156, DOI: 10.25236/AJBM.2023.052221

producer services industry will prefer to invest developed manufacturing regions, and a country with advanced producer services FDI in turn becomes a favorable condition for attracting overseas high-end manufacturing FDI (Kolstad, 2008)[18].The other is indirect effect: According to the theory of FDI technology spillover, TNCs' overseas investment can realize technology transfer and form technology diffusion, which in turn brings external economy to the host country and promotes producer services FDI to form a large number of technology spillovers in the host country 's local producer services. Therefore, the first hypothesis is as follows:

H1: The introduction of producer services FDI can directly or indirectly promote the upgrading of the host country's manufacturing industry.

3.2. The mechanism of intellectual property protection in the process of producer services FDI affecting the manufacturing upgrading

For developing countries, under the condition that their labor cost advantages are gradually decreasing, appropriate strengthening of intellectual property protection is conducive to attract foreign capital and obtain advanced technologies from developed countries to develop their own economies and industries (Dussaux et al, 2022)[19]. But excessive protection of intellectual property rights will also bring negative effects. For example, the technology monopoly of foreign-funded enterprises will squeeze the survival and development space of national enterprises, and may also increase the imitation cost of local enterprises, which is not conducive to the technological progress and industrial upgrading of the host country (Zhou, 2019)[20]. So the impact of intellectual property protection on a country's industry has two sides. The intensity of intellectual property protection may not be a simple linear relationship in the process of the impact of producer services FDI on the manufacturing upgrading. When the intensity of intellectual property protection is low, foreign capital may flow to more low-tech and labor-intensive industries.With the intensity of intellectual property protection improved, it may enhance the willingness of TCNs to invest in high-tech and knowledge intensive industries, thus driving the technological development of the host country's industries. But the intensity of intellectual property protection can not be too strong, too strict intellectual property protection system will hinder foreign technology spillovers. Therefore, there is a moderate protection of intellectual property rights in theory, and excessive or weak protection will not be conducive to the healthy development of the host country's industry.Therefore, the second hypothesis is as follows:

H2: Intellectual property protection may have a threshold effect when producer services FDI affects the upgrading of the host country's manufacturing industry.

The relationship among intellectual property protection,producer services FDI and manufacturing upgrading is shown in Figure 1.

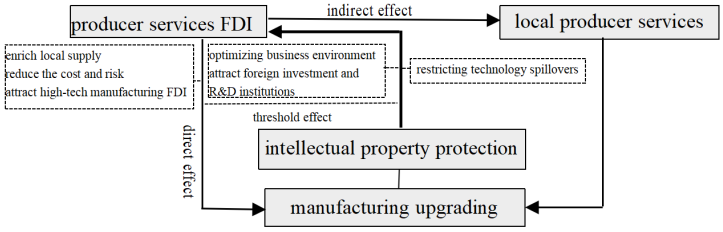

Figure 1: The relationship among intellectual property protection, producer services FDI and manufacturing upgrading.

4. Research Design

4.1. Data sources

We adopt total factor productivity(TFP) to depict the manufacturing upgrading,and the data from 2005 to 2019 comes from Guangdong Industrial Yearbook, Guangdong Statistical Yearbook and statistical Yearbook of these cities.The data of the producer services FDI comes from statistical yearbooks of these cities.The indicator of intellectual property protection in the Pearl River Delta is measured using the GP index (Ginarte and Park, 1997) [21]and taking into account intellectual property law enforcement factor. And the data comes from Yearbook of Intellectual Property Rights in China,

ISSN 2616-5902 Vol. 5, Issue 22: 150-156, DOI: 10.25236/AJBM.2023.052221

Guangdong Intellectual Property Yearbook and each city's bar associations. Among the control variables, the data of trade openness and financial development variables are from China Urban Statistical Yearbook. And the data of human capital, R&D capital investment and degree of marketization are from Guangdong Statistical Yearbook.

4.2. Regression Model

We construct model (1) to test the impact of producer services FDI on manufacturing upgrading:

$$Upgrade=\alpha_0+\alpha_1 lnFDI+\alpha_2 HC+\alpha_3 lnRD+\alpha_4 Open+\alpha_5 Market+\alpha_6 Fin+\Sigma city+t+\varepsilon \quad (1)$$

In order to test the possible threshold effect of intellectual property protection on producer services FDI in the process of manufacturing upgrading, we establish a panel threshold model, as shown in model(2):

$$Upgrade=\beta_0+\beta_1 lnFDI\times I(lnIPR\leq q_1)+\beta_2 lnFDI\times I(lnIPR>q_1)+\Sigma Controls+\Sigma city+t+\varepsilon \quad (2)$$

In the model(1) and model(2), the explained variable is Upgrade,it represents the manufacturing upgrading and is measured by total factor productivity(TFP).TFP, the decomposed technological progress (BPC) and technical efficiency (TEC) indicators are calculated by the Malmquist index method. BPC and TEC are used as alternative variables.

The explanatory variable lnFDI represents the natural logarithm of producer services FDI. Controlled variables, HC, lnRD, Open, Market, Fin represent human capital, R&D investment, trade openness, marketization degree and financial development respectively. And the threshold variable is lnIPR for the intensity of intellectual property rights protection. t is the time trend term and Σcity is the city fixed effect. In model(2), ΣControls represents all controlled variables in model(1).

5. Empirical results

5.1. The impact of producer services FDI on manufacturing upgrading

We test the impact of the producer services FDI on manufacturing upgrading, according to the setting of the model (1), the regression is conducted with producer services FDI as the core explanatory variable and TFP as the explained variable. At the same time, TFP is decomposed into technological progress (BPC) and technical efficiency (TEC), which are respectively included in model (1) for regression analysis.

As shown in Table 1, the producer services FDI can significantly improve the manufacturing total factor productivity in the Pearl River Delta and promote the upgrading of the manufacturing industry. The producer services FDI does not significantly promote the manufacturing technology progress (BPC) during the sample period, but the producer services FDI significantly promotes the improvement of the manufacturing technology efficiency (TEC).

Table 1: Regression results.

	TFP (1)	BPC (2)	TEC (3)
lnFDI	0.032*** (3.49)	-0.006 (-1.34)	0.030*** (6.96)
HC	1.799 (0.87)	4.924*** (4.90)	-2.023*** (-4.42)
Open	0.018 (0.45)	0.004 (0.22)	-0.014 (-0.70)
lnRD	0.137*** (3.17)	-0.001 (-0.10)	0.067*** (4.43)
Market	0.557*** (5.80)	0.038 (0.10)	0.191*** (3.27)
Fin	-0.070* (-1.84)	-0.016 (-1.24)	0.005 (0.32)
Fixed effect	yes	yes	yes
Time trend	0.090*** (21.22)	0.109*** (20.64)	-0.011*** (-4.34)
Constant	-1.510*** (-2.91)	0.754*** (4.26)	-0.193 (-1.00)
N	135	135	135

Note: The z-value is indicated in parentheses. ***, **, * indicate significant at the 1%, 5%, and 10% levels.

ISSN 2616-5902 Vol. 5, Issue 22: 150-156, DOI: 10.25236/AJBM.2023.052221

Therefore, the positive role of producer services FDI in manufacturing upgrading is mainly reflected in the improvement of technological efficiency rather than technological progress. The reasons may be as follows: On the one hand, the technical level of the manufacturing industry has been continuously improved in recent years, and the gap with the international advanced technology level of the international manufacturing industry has been continuously narrowing, leading to the insignificant role of producer services FDI on the technological progress of the manufacturing industry. On the other hand, in terms of the structure of foreign investment, the structure of producer services FDI is low, and the main areas that foreign capital flows in are traditional industries, such as transportation, warehousing and postal service, leasing and business services. These industries are low value-added and labor-intensive,so the technology spillover effect is limited.

5.2. The Threshold effect of intellectual property protection on manufacturing upgrading

According to the theoretical analysis mentioned above, with intellectual property protection as the threshold variable, the threshold regression model is used to test the threshold effect of producer services FDI on intellectual property protection in the process of manufacturing upgrading.The regression results are shown in columns (1) and (2) of Table 2.

According to the regression results in column(1) and (2) of Table 2, when the intensity of intellectual property protection is lower than the threshold value, the effect of producer services FDI on total factor productivity and technical efficiency of manufacturing is negative.When the intensity of intellectual property protection is higher than the threshold value, the influence coefficient of producer services FDI is significantly positive. Therefore, intellectual property protection is an important factor affecting producer services FDI to improve manufacturing total factor productivity and technical efficiency.Increasing IPR protection can help to attract better FDI, provide high-quality productive services for local enterprises, and reduce the negative impact of local enterprises' excessive technology gap and insufficient absorption capacity on manufacturing upgrading. Strengthening intellectual property protection can also help to encourage enterprises' innovation behavior and constantly improve technology and production process.

Producer services FDI has no threshold effect of intellectual property protection on technological progress. On the one hand, producer services FDI may flow into more labor-intensive industries that have low technical content and are insensitive to changes in intellectual property protection. On the other hand, the synergistic effect of producer services FDI and intellectual property protection may be linear or unrelated. Therefore, we make a further test: constructing the interaction term lnFDI*lnIPR between producer services FDI and intellectual property protection, and estimating the coefficient using the comprehensive FGLS model, as shown in column (3). The coefficient of the interaction term in column (3) is significantly positive, which indicating that there is a positive synergistic relationship between intellectual property protection and producer services FDI. Improving intellectual property protection can strengthen the promoting effect of producer services FDI on technological progress in manufacturing.

Table 2: Model parameter estimation results.

	TFP (1)	TEC (2)	BPC (3)
$lnIPR \leq q_1$	-0.064* (-1.97)	-0.032** (-2.04)	
$lnIPR > q_1$	0.064** (2.21)	0.035*** (2.77)	
lnFDI			-0.054*** (-4.22)
lnFDI*lnIPR			0.052*** (4.33)
lnIPR			-0.686*** (-5.41)
Controlled variables	yes	yes	yes
Time trend	0.081*** (7.28)	-0.013*** (-2.67)	0.114*** (18.57)
Constant	-1.749 (-1.32)	-0.369 (-0.67)	1.308*** (5.25)
N	135	135	135

Note: The value in brackets is t-value in column (1) and (2), the value in brackets is z-value in column (3) . ***, **, * indicate significant at the 1%, 5%, and 10% levels.

ISSN 2616-5902 Vol. 5, Issue 22: 150-156, DOI: 10.25236/AJBM.2023.052221

5.3. Robustness test

In order to solve the problem of two-way causality between the effect of producer services FDI on manufacturing upgrading, we conduct the following robustness test: Firstly,as shown in the Panel A in Table 3, the regression is performed with the lag term of the producer services FDI as the explanatory variable. Secondly, as shown in the Panel B in Table 3,we use the lag phase of FDI in the Pearl River Delta as the tool variable for the current FDI of producer services. Thirdly, we add the lag term of the explained variable as the control variable to alleviate the endogenous problem caused by the omission of important variables, and adopt the bias corrected LSDV method suitable for long Panel data to estimate the model, as shown in Panel C in Table 3. The results are consistent with the above that producer services FDI has a significantly positive effect on total factor productivity and technical efficiency of manufacturing industry, while producer services FDI has an insignificant effect on promoting technological progress.

Table 3: Test of Robustness.

Panel A	TFP	BPC	TEC
l.lnFDI	0.095** (2.52)	0.013 (0.78)	0.079*** (3.60)
Controlled variables	yes	yes	yes
Panel B	TFP	BPC	TEC
lnFDI	0.066* (1.87)	0.014 (0.83)	0.043*** (2.84)
Controlled variables	Yes	Yes	Yes
Panel C	TFP	BPC	TEC
l.lnUpgrade	0.926*** (14.60)	0.759*** (8.78)	0.744*** (9.01)
lnFDI	0.046** (2.42)	-0.006 (-0.48)	0.029** (2.02)
Controlled variables	yes	yes	yes

Note: The z-value is indicated in parentheses. ***, **, * indicate significant at the 1%, 5%, and 10% levels.

6. Conclusions

Working with a mix of panel data on producer services FDI and manufacturing upgrading for the Pearl River Delta for 2005-2019, we study the impact of producer services FDI on manufacturing upgrading from the perspective of intellectual property protection. The conclusions are as follows: Firstly, producer services FDI has a significant positive impact on the productivity and technical efficiency of the manufacturing industry, but has no significant effect on technological progress. Secondly, producer services FDI has a single threshold of intellectual property protection for total factor productivity and technical efficiency. When the intensity of intellectual property protection is below the threshold value, producer services FDI has a negative impact on total factor productivity and technical efficiency, and when the intensity of intellectual property protection is higher than the threshold value, the coefficient is significantly positive.But there is no threshold effect on technological progress. Lastly, producer services FDI and intellectual property protection have a linear synergistic effect on technological progress, so strengthening the intellectual property protection can enable producer services FDI to promote technological progress.

References

[1] Cohen S, Zysman J. Manufacturing matters: The myth of the post-industrial economy[J]. California Management Review, 1989, 29(3), 9-26.
[2] Grubel H G, Walker M A. Service Industry Growth: Causes and Effects[M]. Fraser Institute Press, 1989.
[3] Pang B H. Logistic Symbiotic Dynamic Model for Producer Services and Manufacturing Industry [C]. Proceedings of International Conference on Economics, Finance and Statistics, 2017.
[4] Eswaran M, Kotwal A. The role of the service sector in the process of industrialization[J]. Journal of Development Economics, 2002, 68(2), 401-420.
[5] Markusen J. Trade in Producer Services and in Other Specialized Intermediate Inputs[J]. American Economic Review, 1989 , 79(1), 85-95.
[6] Fernandes A, Paunov C. Foreign direct investment in services and manufacturing productivity:

ISSN 2616-5902 Vol. 5, Issue 22: 150-156, DOI: 10.25236/AJBM.2023.052221

Evidence for Chile[J]. Journal of Development Economics, 2012, 97(2), 305-321.
[7] Coeurderoy R, Murray G. Regulatory environments and the location decision: Evidence from the early foreign market entries of new-technology-based firms[J]. Journal of International Business Studies, 2008, 39(4), 670-687.
[8] Khoury T A, Peng M W. Does institutional reform of intellectual property rights lead to more inbound FDI? Evidence form Latin America and the Caribbean[J]. Journal of world Business, 2011, 46(3), 337-345.
[9] Abdel-Latif A. Intellectual property rights protection and the transfer of climate change technologies: issues, challenges, and way forward[J]. Climate Policy, 2015, 15, 103–126.
[10] Francois J F. Producer services, scale, and the division of labor[J]. Oxford economic articles, 1990, 42(4), 715-729.
[11] Hoekman B. Liberalizing trade in services : a survey[R]. Policy Research Working article Series, 2006, 397-402.
[12] Ren H L, Liu H H. A study on the impact of productive service trade on the international competitiveness of manufacturing industry: An empirical analysis based on China[J]. Technology & Innovation Management, 2010, 30(5), 323-326.
[13] Javorcik B S, Yue L. Do the Biggest Aisles Serve a Brighter Future? Global Retail Chains and Their Implications for Romania[J]. Journal of International Economics, 2013, 90(2), 348-363.
[14] Adams S. Intellectual property rights, investment climate and FDI in developing countries[J]. International Business Research, 2010 3(3), 201-209.
[15] Petricevic O, Teece D J. The structural reshaping of globalization: Implications for strategic sectors, profiting from innovation, and the multinational enterprise[J]. Journal of International Business Studies , 2019, 50(9), 1487–1512.
[16] Fang H, Peng B, Wang X. The Effect of Intellectual Property Rights Protection in Host Economies on The Sustainable Development of China's Outward Foreign Direct Investment——Evidence from a Cross-Country Sample[J]. Sustainability, 2019, 11(7), 2100.
[17] Ma L L, Li Q. Intellectual property protection, industry characteristics and China's manufacturing export comparative advantage[J]. Southern Economy, 2015, (5), 82-96.
[18] Kolstad I, Villanger E. Determinants of foreign direct investment in services[J]. European Journal of Political Economy, 2008, 24(2):518-533.
[19] Dussaux D, Dechezleprêtre A, Glachant M. The impact of intellectual property rights protection on low-carbon trade and foreign direct investments[J]. Energy Policy, 2022, 171, 113269.
[20] Zhou C. Can intellectual property rights within climate technology transfer work for the UNFCCC and the Paris Agreements[J]? International Environmental Agreements, 2019, 19, 107-122.
[21] Ginarte J C, Park W G. Determinants of Patent Rights: A Cross-national Study[J]. Research Policy, 1997, 26(3), 283-301.