The Relationship between FDI and Economic Performance (BRICS)

Malepekola Precious Monaheng, Zhang Donghui, Qamar Uz Zaman*
School of Economics, Shandong University, China
*E-mail: qamar.zaman303@hotmail.com

Abstract

FDI is an important force to promote economic development. As the main way of international capital flows FDI has an increasingly significant impact on host country's economy. We took into account its impact on economic performance. From the perspective of econometric analysis, the relationship between the FDI and economic performance of the BRICs countries is examined by DEA model. The empirical analysis shows that FDI has a positive impact on the overall economic performance of the BRICS countries; however FDI occurs to have a negative impact on the economic performance of China.

Key words: BRICS; FDI; economic performance; DEA model

Introduction

In December 2010, South Africa joined the "BRIC" as a full member. BRICS, as emerging economies, are gaining focus of the world and contributing to global economic growth. The comparative analysis of the performance of FDI in BRICS countries has always been an issue of great concern to the economic community, and the most popular study of the factor caused economic growth of the BRICS countries is FDI.

With the rapid development of multinational corporations after the Second World War, western economists have done a lot of research on the foreign direct investment activities of multinational corporations. The International Production Compromise Theory (OLI theory, 1977) of Dunning, a professor of the University of British reading, combines the related theories of herm and Barclays, creatively linking the specific environment of the developing countries to the role of foreign direct investment, and believes that direct investment is mainly dominated by ownership and superior to the location, potential and internalization advantages. The economists, such as Romer (1986) and Lucas (1988), published some achievements on economic growth in 1980s, forming a new theory of economic growth. The theory further illustrates the economic growth of a country with increasing returns to scale effect and endogenous technology, emphasizing the role of knowledge and technology in economic growth. The technology spillover effect of FDI makes the technical level and organizational efficiency of the host country increasing, thus improving the productivity level of the national economy

For the empirical study of the relationship between FDI and economic growth, Richard Rubinson (1978) has researched 76 developing countries, and found that FDI has promoted economic growth in the short term. De Mello (1999) used panel data to study the comprehensive effect of host country's absorption of FDI, and that foreign direct investment not only increased the capital stock and economic growth but also introduced advanced technology and equipment for countries, Many Chinese scholars have also done a lot of research, such as JunYang Xi (2001), Zheng Xiao (2002), Nichao Wu(2004) and other large numbers of scholars have used the empirical method to verify that foreign direct investment can promote the economic growth of the host country, at the same time, it

also involves improving the capital investment and promoting the technology of the country. With the time goes on, the industrial structure of Chinese has been changed.

Although many research results support the economic growth of the host country, there are many empirical results that show the economic growth effect of FDI is not obvious in many developing countries. The main reason is that the FDI effect is restricted by the national policy of the host country, such as its own environment and absorptive capacity, etc. Jeffrey (1998) studied 50 years of data and came to the opposite conclusion. Elmawazini and other empirical analyses suggest that FDI has no effect on economic growth in developing countries, which is mainly due to the lack of technical ability and human capital of enterprises in developing countries. Nathalie (2002) studied Russia's FDI, and found that it is not related to economic growth, Pradhan analyzed the India pharmaceutical industry and concluded that FDI did not play an important role in the productivity growth of India's domestic pharmaceutical industry. Scholars generally think that FDI promotes China's economic growth. Yongju Ren and Yao Shujie, respectively, use regression analysis to study that foreign direct investment has a long-term impact on economic growth through technology. That means the GDP of a country is positively related to the foreign investment in the country. However, Lijuan Wan believes that both the long-term and short-term effect of China's foreign direct investment in economic growth are not significant.

Obviously, both in theory and in empirical analysis, the academic scholars have no unified conclusions on the relationship between impact of FDI and the economic growth, that is, not all countries can get the positive effect of economic growth from international direct investment. The systematic comparative study of the five emerging economies of BRICs countries using the relationship between FDI and economic growth is a new perspective in this paper. The five countries are in the period of rapid economic development, the development of the economy needs international direct investment. Then the relationship between two things will help us understand the initial global economic structure of the global economic recovery.

Methodology
Research progress
In the process of producing gross domestic product in each country, they will inevitably obtain harmful substances such as CO_2, SO_2, waste water and solid waste. This article calls it undesirable output. Of course, every country hopes that the less desirable output is as small as possible in the course of economic development. Therefore, this paper will consider the undesirable output of economic production and the GDP (desirable output) of each country as an output indicator on the basis of the past, and refer to the oil, labor force and capital input of each country as input indicator. The economic performance is calculated by using the DEA model under Managerial disposability. Finally, OLS regression is used to get the correlation between FDI and the economic performance of various countries.

Data selection
The introduction of FDI in Brazil and India was earlier; China began to reform and hug the world since 1979 and had FDI statistics in 1980; Russia disintegrated from the former Soviet Union in 1991, and there was a formal independent FDI statistics in 1993; South Africa has been less direct investment since the 1994 general election. In order to make the results of the empirical analysis more reliable and comparable, we unify the data samples of China, Brazil, India, South Africa and Russia from 2008 to 2015. The selection of FDI indexes in five countries takes into account the effect of capital accumulation on economic growth. This paper uses the FDI stock of each country in each year as an analysis sample. The overall economic level of each country is reflected by the gross

domestic product (GDP) of the macroeconomic gross index (GDP), in order to eliminate the impact of price changes on the GDP. This article uses the US dollar exchange rate on the day of January 24, 2018 of the world bank to calculate national GDP statistics, in which the capital stock, national GDP and FDI were measured by US billon, and carbon dioxide, oil and the working population were measured by millions of units. The FDI statistics come from BRICs Investment Handbook and World Bank Database, and GDP data are from World Bank statistics.

Model introduction

Production technology set

The first step in this section is to describe the production activities of decision makers in mathematical language. Hypothetical economy. We suggested there are 5 independent decision makers, this article refers to the BRIC countries. They have the production input vector $x \in R_+^M$, we assume all production input can be transformed to the output through technology. Including desirable output $y \in R_+^S$ and undesirable output $b \in R_+^J$. So the production process of any decision maker can be represented by the set（x，y，b）.

With regard to production technology, we assumed that all the axioms of production theory are established, the output set P (x) have some properties.

(1) The output set is a bounded, convex and closed set.

(2) $0 \in P(x)$, that is, the production input factor can be 0, but the non-zero output set can not be produced by 0.

(3) P (x) satisfies the strong disposability of output: if output $q \in P(x)$, and output is $q \le q^*$. So $q^* \in P(x)$.

(4) P (x) satisfies the strong disposability of input: if output Q can be produced by x input, then it will be effective for the input $x^* \ge x$. Therefore, on the premise of meeting the above four characteristics, the production technology set (T) can be technically expressed as:

$$T=\{(x, y, b): x \text{ can produce } y \text{ and } b\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Among them, undesirable output b and desirable output y are generated by the production process, and there is a concomitant relationship between them, that is, desirable output increases and undesirable output increases. From the perspective of production mode, this situation can be categorized into the nature of disposal, that is, the traditional mode of production. But in terms of economic performance with environment factors, considering the innovation of production technology, the undesirable output will be reduced while the decision maker increases the desirable output, so we should use the production technology set under managerial disposability as follows:

$$P^M\left(X\right) = \left\{ \begin{array}{l} (Y, B)\text{：} \ Y \le \sum_{n=1}^{N} Y_n \lambda_n, B \ge \sum_{n=1}^{N} B_n \lambda_n, X \le \sum_{n=1}^{N} X_n \lambda_n, \\ \sum_{n=1}^{N} \lambda_n = 1 \ \& \ \lambda_n \ge 0 \left(n = 1, ..., N\right) \end{array} \right\} \ldots\ldots\ldots\ldots(2)$$

The above formula implies that economic efficiency under managerial disposability can be achieved by increasing production input to the efficient frontier. And the above formula $Y \le \sum_{n=1}^{N} Y_n \lambda_n, B \ge \sum_{n=1}^{N} B_n \lambda_n$ means that the efficiency frontiers of the desired output will be above all observed values (including observations on the efficiency frontiers), while the efficiency frontiers of undesirable output will be under all observed values (including observations on the efficiency front).

In other words, these conditions can make the decision maker achieve the technology effective state by maximizing the desirable output or minimizing the undesirable production.

DEA Model

Before we introduce the model, we first need to set the weight vector in the objective function. According to the method in Sueyoshi and Goto (2016), the weight vectors are constructed according to the upper and lower bounds of input output data as follows:

$$R_m^x = \left(m+s+j\right)^{-1} \left(\begin{matrix} \max\left\{ |x_{mnt}| \,|\, n=1,...N \,\&\, t=1,...,T \right\} \\ -\min\left\{ |x_{mnt}| \,|\, n=1,...N \,\&\, t=1,...,T \right\} \end{matrix} \right)^{-1}$$

$$R_s^y = \left(m+s+j\right)^{-1} \left(\begin{matrix} \max\left\{ |y_{snt}| \,|\, n=1,...N \,\&\, t=1,...,T \right\} \\ -\min\left\{ |y_{snt}| \,|\, n=1,...N \,\&\, t=1,...,T \right\} \end{matrix} \right)^{-1} \quad \dots\dots\dots\dots(3)$$

$$R_j^b = \left(m+s+j\right)^{-1} \left(\begin{matrix} \max\left\{ |b_{jnt}| \,|\, n=1,...N \,\&\, t=1,...,T \right\} \\ -\min\left\{ |b_{jnt}| \,|\, n=1,...N \,\&\, t=1,...,T \right\} \end{matrix} \right)^{-1}$$

So the DEA model under manageability disposability can be obtained by Introducing relaxation variables and transforms them for production technology set (2), as shown in (4). And we can get the economic performance under the manageability disposability by calculate (5).

$$Maximize \quad \xi + \varepsilon_a \left(\sum_{m=1}^{M} R_m^x d_m^{x-} + \sum_{s=1}^{S} R_s^y d_s^y + \sum_{j=1}^{J} R_j^b d_j^b \right)$$

$$s.t. \quad \sum_{n=1}^{N} x_{mn}\lambda_n - d_m^{x-} \qquad = x_{mk} \quad \left(m=1,...,M\right),$$

$$\sum_{n=1}^{N} y_{sn}\lambda_n - d_s^y - \xi y_{sk} = y_{sk} \quad \left(s=1,...,S\right),$$

$$\sum_{n=1}^{N} b_{jn}\lambda_n + d_j^b + \xi b_{jk} = b_{jk} \quad \left(j=1,...,J\right), \qquad \dots\dots(4)$$

$$\sum_{n=1}^{N} \lambda_n = 1,$$

$$\lambda_n \geq 0 \left(n=1,...,N\right), \ \xi:URS, d_m^{x-} \geq 0 \left(m=1,...,M\right),$$

$$d_s^y \geq 0 \ , \ d_j^b \geq 0 \quad \left(s=1,...,S\right).$$

$$UEM = 1 - \left[\xi^* + \varepsilon_a \left(\sum_{m=1}^{M} R_m^x d_m^{x-*} + \sum_{s=1}^{S} R_s^y d_s^{y*} + \sum_{j=1}^{J} R_j^b d_j^{b*} \right) \right]$$

$$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \dots\dots\dots(5)$$

$$= 1 - \left[\sum_{m=1}^{M} v_m^* x_{mk} - \sum_{s=1}^{S} u_s^* y_{sk} + \sum_{j=1}^{J} w_j^* b_{jk} + \sigma^* \right]$$

Results

According to the relevant data of the paper, we can make a descriptive statistics on the economic efficiency of the input and output of BRICS. So the descriptive statistics are as follows:

Table 1: The data of Brazil

Country	Year	Inputs				Desirable Output (GDP)	Undesirable Output (CO2)
		FDI	Oil	Labor	Capital		
Brazil	2008	50.70	243.90	122.70	697.75	967.77	374.90
Brazil	2009	31.50	243.00	124.40	819.41	1037.24	352.10
Brazil	2010	88.50	267.60	126.00	977.92	1209.28	400.30
Brazil	2011	101.20	279.70	127.50	1151.42	1361.93	426.40
Brazil	2012	86.60	284.80	129.00	1335.64	1498.35	447.30
Brazil	2013	69.20	296.80	130.40	1536.22	1659.20	486.60
Brazil	2014	96.90	304.90	131.80	1725.25	1798.41	508.30
Brazil	2015	74.70	302.60	133.10	1868.96	1865.89	491.30

Follow table 1, we can see that the FDI in Brazil climbed from 2008 to 2011 and decreased from 2011 to 2013. The max FDI in Brazil is 101.2 hundreds of millions. Even though, the GDP of Brazil was increasing year by year.

Table 2: The data of Russia

Country	Year	Inputs				Desirable Output (GDP)	Undesirable Output (CO2)
		FDI	Oil	Labor	Capital		
Russia	2008	92.40	683.50	1080.66	290.54	789.60	1578.30
Russia	2009	90.00	848.00	1107.65	312.56	742.36	1464.10
Russia	2010	105.70	673.30	1118.53	327.69	885.85	1509.80
Russia	2011	116.00	694.90	1122.26	387.37	1070.62	1572.10
Russia	2012	111.70	695.20	1128.90	450.13	1210.59	1582.20
Russia	2013	117.60	686.80	1132.25	500.29	1298.86	1533.80
Russia	2014	119.60	689.20	1137.89	532.94	1406.59	1542.20
Russia	2015	126.30	681.00	1143.77	547.28	1478.21	1521.90

Follow table 2, we can see that the FDI in Russia fluctuated in these years. The max FDI in Russia is 126.3 hundreds of millions. Even though, the GDP of Russia was increasing year by year, but the undesirable out is almost stable.

Table 3: The data of South Africa

Country	Year	Inputs				Desirable Output (GDP)	Undesirable Output (CO2)
		FDI	Oil	Labor	Capital		
South Africa	2008	9.20	124.40	30.18	79.04	198.20	447.50
South Africa	2009	7.50	124.30	30.80	86.62	209.80	447.10
South Africa	2010	3.60	125.30	31.17	84.47	229.90	449.20
South Africa	2011	4.20	123.60	31.80	87.79	252.86	440.70
South Africa	2012	4.60	121.90	32.26	95.40	271.50	435.60
South Africa	2013	8.30	123.60	32.88	106.94	296.17	439.40
South Africa	2014	5.80	125.20	33.30	119.35	317.68	444.00
South Africa	2015	1.70	120.10	33.69	127.65	337.45	421.80

Follow table 3, we can see that the FDI in SA fluctuated from 2008 to 2013 but rapidly decreased to 2015. The FDI in 2015 is only 1.7 hundreds of millions because of the economic policy in that year. In terms of the GDP, we can see that GDP almost depends on the domestic production rather than FDI from another country.

Table 4: The data of India

Country	Year	Inputs				Desirable Output (GDP)	Undesirable Output (CO2)
		FDI	Oil	Labor	Capital		
India	2008	41.90	475.70	692.00	554.40	856.62	1472.20
India	2009	37.70	513.20	701.00	607.92	940.36	1601.70
India	2010	36.00	537.10	726.77	689.79	1145.13	1667.20
India	2011	46.60	568.70	750.32	825.79	1344.73	1741.20
India	2012	34.30	611.60	758.94	930.97	1513.02	1872.80
India	2013	36.00	621.50	778.89	1002.20	1711.01	1933.10
India	2014	45.10	663.60	800.96	1074.78	1916.40	2085.90
India	2015	55.60	685.10	549.25	1139.92	2086.67	2157.40

Follow table 4, we can see that the GDP in India climbed rapidly these years, the GDP in 2015 is more than two times that as the GDP in 2008.But the FDI just fluctuated between 34 and 55 hundreds of millions. So the GDP of India also depends on domestic production.

Table 5: The data of China

Country	Year	Inputs				Desirable Output (GDP)	Undesirable Output (CO2)
		FDI	Oil	Labor	Capital		
China	2008	74.80	2229.00	96.60	3396.54	5016.39	7362.30
China	2009	36.60	2328.10	96.00	4147.63	5480.58	7692.50
China	2010	43.20	2491.10	95.30	4982.36	6484.58	8118.70
China	2011	55.10	2690.30	94.60	5891.71	7682.02	8806.70
China	2012	50.60	2797.40	93.74	6723.37	8483.77	8979.40
China	2013	69.20	2905.30	92.88	7453.12	9345.34	9218.80
China	2014	22.00	2970.60	93.30	8098.67	10110.39	9224.10
China	2015	6.90	3005.90	92.30	51273.08	10818.12	9164.50

Follow table 5, we can see that the GDP in China climbed rapidly these years, the GDP in 2015 is more than two times that as the GDP in 2008.So compare the 5 countries, we can find that Russia and Brazil are depended on FDI more than other countries. So the effect between economy and FDI are different between these countries.

In the same way, we can calculate the economic efficiency of the BRICs countries in terms of constant or changing return to scale and scale economic efficiency based on the DEA model under the manageability disposability. The results are as follows.

Table 6: The economic performance of Brazil

Country	Year	Economic performance		
		VRTS	CRTS	SEM
Brazil	2008	0.9436	0.9427	0.9990
Brazil	2009	1.0000	1.0000	1.0000
Brazil	2010	1.0000	0.9875	0.9875
Brazil	2011	1.0000	0.9897	0.9897
Brazil	2012	0.9908	0.9853	0.9944
Brazil	2013	0.9728	0.9680	0.9951
Brazil	2014	0.9734	0.9692	0.9957
Brazil	2015	1.0000	1.0000	1.0000

Table 7: The economic performance of Russia

Country	Year	Economic performance		
		VRTS	CRTS	SEM
Russia	2008	0.9099	0.9063	0.9960
Russia	2009	1.0000	1.0000	1.0000
Russia	2010	0.9813	0.9807	0.9994
Russia	2011	0.9474	0.9470	0.9995
Russia	2012	0.9483	0.9477	0.9994
Russia	2013	0.9814	0.9810	0.9996
Russia	2014	0.9818	0.9817	0.9999
Russia	2015	1.0000	1.0000	1.0000

Table 8: The economic performance of South Africa

Country	Year	Economic performance		
		VRTS	CRTS	SEM
South Africa	2008	0.7868	0.4028	0.5119
South Africa	2009	0.7875	0.4028	0.5115
South Africa	2010	0.7838	0.4042	0.5156
South Africa	2011	0.7990	0.4064	0.5086
South Africa	2012	0.8083	0.4055	0.5016
South Africa	2013	0.8013	0.4076	0.5086
South Africa	2014	0.7930	0.4086	0.5152
South Africa	2015	0.8348	0.4172	0.4998

Table 9: The economic performance of India

Country	Year	Economic performance		
		VRTS	CRTS	SEM
India	2008	0.6793	0.6656	0.9799
India	2009	0.6383	0.6380	0.9995
India	2010	0.6534	0.6534	0.9999
India	2011	0.7068	0.6646	0.9403
India	2012	0.7451	0.6489	0.8709
India	2013	0.8077	0.6596	0.8167
India	2014	0.8446	0.6491	0.7685
India	2015	0.7923	0.5484	0.6922

Table 10: The economic performance of China

Country	Year	Economic performance		
		VRTS	CRTS	SEM
China	2008	0.8682	0.4387	0.5053
China	2009	0.8769	0.4385	0.5001
China	2010	0.9025	0.4446	0.4926
China	2011	0.9127	0.4473	0.4900
China	2012	0.9377	0.4627	0.4934
China	2013	0.9552	0.4751	0.4974
China	2014	0.9799	0.4922	0.5023
China	2015	1.0000	1.0000	1.0000

Table 11: Average economic performance of BRICS

	VRTS	CRTS	SEM
All Average	0.8831	0.7042	0.7894
Brazil Average	0.9851	0.9803	0.9952
China Average	0.9291	0.5249	0.5601
India Average	0.7334	0.641	0.8835
Russia Average	0.9688	0.9681	0.9992
SA Average	0.7993	0.407	0.5091

Based on table 6 to table 11: for the VRTS, we can find that the Brazil's economic performance is the best, the India's economic performance is the worst but for CRTS we can find that South Africa and China performed not so good, so as the SEM.

We can use the OLS regression after we get the results from the DEA models. Besides FDI, we can use the GDP, labor, capital as control variable. And then we can get the results as follows:

Table 12: The relationship between FDI and economic performance

	Economic performance(VRTS)	Economic performance(CRTS)	Economic performance(SEM)
BRICS（FDI）	(.0017)*** 0.000	(.0047)*** 0.000	(.0038)*** 0.000
Brazil（FDI）	(.0002) 0.564	(.00007) 0.839	(.0001)** 0.050
Russia(FDI)	(.0466) 0.522	(.0008) 0.416	(.00005) 0.173
South Africa(FDI)	(.0039) * 0.089	(.0011)* 0.093	(.0011) 0.274
India(FDI)	(.0038) 0.382	(.0037)* 0.053	(.009)* 0.100
China(FDI)	(-.0013)* 0.100	(-.0058)* 0.057	(-.0052)* 0.070

From table 12, we can find that FDI has a positive impact on the economic performance of the 5 BRICs countries generally regardless of the situation, but FDI has a negative impact on the economic performance of china. And Russia's economic performance was not depended on the FDI.

Conclusion

In recent years, FDI has promoted economic development in all countries except China, and of course brought many environmental problems, but the introduction of FDI, in general, is greater than the disadvantages.

In recent years, the impact of FDI on China's economic performance is negative. That is to say, compared with economic development, FDI has brought more environmental problems. This is due to the existence of irrational investment of foreign direct investment. In the face of these problems and the shortcomings of the policy of attracting foreign investment, China should improve its investment environment and increase investment attraction.

Brazil has a high degree of openness, early opening time, a broad market and a complete law. The real large-scale use of foreign direct investment in the automobile manufacturing industry, in a relatively short period of time to promote its rapid economic development, is a typical of foreign investment to promote economic growth, but the golden thawing crisis has restricted the economic development of Brazil. Therefore, the establishment of a solid financial system is a problem that Brazil needs to solve in the introduction of FDI.

After the collapse of the Soviet Union in early 1990s and the implementation of economic reforms in Russia, foreign investment began to re-enter to Russia. Although Russia has rich natural resources, broad market, but Russia's economic structure is not reasonable, the vast majority of its income comes from the resource industry, and the incomplete legal system restricts the impact of FDI on Russian economic performance.

South Africa is rich in natural resources, and has a relatively complete financial and legal system, but the economic growth was slow in the early 1980s to early 90s, affected by international sanctions. Therefore, since the establishment of New South Africa in 1994, the economy has increased significantly, so FDI has a positive impact on South Africa's economic performance.

Since the implementation of economic reform in India in 1991, the India government has gradually relaxed the restrictions on foreign direct investment in the field of foreign direct investment, which has made India use foreign direct investment in recent years to achieve rapid growth. Similarly, its human strengths, English advantages and educational advantages have made great progress in the non entity service industries such as software, finance and services. However, the investment environment and infrastructure in India have been lagging behind. How to effectively attract funds and co-ordinate development is the next step for India.

References

Bi GB, Song W, Zhou P, L Liang. (2014). Does environmental regulation affect energy efficiency in China's thermal power generation? Empirical evidence from as lacks-based DEA model [J]. Energy Policy. 66:537-546.

Bian, Y., He, P., Xu, H. (2013). Estimation of potential energy saving and carbon dioxide emission reduction in China based on an extended non-radial DEA approach [J]. Energy Policy. 63:962-971.

Bian Y, Yang F. (2010). Resource and environment efficiency analysis of provinces in China: A DEA approach based on Shannon's entropy [J]. Energy Policy. 38(4):1909-1917.

Bougnol, ML., Dulá, JH., Lins, MPE (2010). Enhancing standard performance practices with DEA [J]. Omega, 38(1-2):33-45.

Chen, L., Wang, YM., Lai, F. (2017). Semi-disposability of undesirable outputs in data envelopment analysis for environmental assessments [J]. European Journal of Operational Research, 260(2):655-664.

Choi, Y., Zhang, N., Zhou, P. (2012). Efficiency and abatement costs of energy-related CO2 emissions in China: A slacks-based efficiency measure [J]. Applied Energy, 98:198-208.

Dai, X., Kuosmanen, T. (2014). Best-practice benchmarking using clustering methods: Application to energy regulation [J]. Omega, 42(1):179-188.

De,Mello (1999). Foreign Direct Investment-led Growth: Evidence from Time Series and Panel Data[J]. Oxford Economic Papers, 51: 133 －151.

Domer (1946). Capital Expansion, Rate of Growth, and Employment[J]. Econometric, 14(2) : 137 －147.

Dunning. (1994). Transpacific FDI and the Investment Development Path: The Record Assessed[D]. University of South Carolina.

Elmawazini ,K and Saadi S. (2005). Does FDI Imply Productivity Growth for the Host Economy? [J]. Journal of American Academy of Business, 6(3).85-91

Fan, Y., Bai, B, Qiao, Q., Kang, P., Zhang, Y., Guo, J. (2017). Study on eco-efficiency of industrial parks in China based on data envelopment analysis [J]. Journal of environmental management, 192:107-115.

Fang, CL., Guan, XL., Lu, SS., Zhou, M., Deng, Y. (2013). Input–Output Efficiency of Urban Agglomerations in China: An Application of Data Envelopment Analysis (DEA)[J]. Urban Studies, 50(13):2766-2790.

Iribarren, D., Vázquez-Rowe, I., Moreira, MT., Feijoo, G. Further potentials in the joint implementation of life cycle assessment and data envelopment analysis.

Jeffrey, Kentor. (1998). The Long-Term Effects of Foreign Investment Dependence on Economic Growth[J]. The American Journal of Sociology, 103(41):1024－1046.

Kojima (1978). Direct Foreign Investment: A Japanese Model of Multinational Business Operations[M].London: Croom Helm.

Nathalie, Fabry and Sylvain, Zeghni (2002). Foreign Direct Investment in Russia:How The Investment Climate Matters[J].Communist and Post Communist Studies,35:289-303.

Pradhan ,J. P. (2002). FDI Spillovers and Local Productivity Growth: Evidence from Indian Pharmaceutical Industry[J].Artha Vijnana, 44(3-4):317－332.

Solow, A. (1956). Contribution to the Theory of Economic Growth[J]. Quarterly Journal of Economic, 70 (1):65-94.

Volker, Bornschier, etc. (1978). Cross National Evidence of the Effects of Foreign Investment and Aid on Economic Growth and Inequality: A Survey of Findings and a Reanalysis[J]. The American Journal of Sociology, 84(3):651-683.

Vernon, R. (1966). International Investment and Inter- national Trade in the Product Cycle[J]. Quarterly Journal of Economics, 80(2):190-207