The Economic Impact of China's Outward Foreign Direct Investment on the Belt and Road Initiative Countries — Based on the Mediating Effect of Employment

Chengjiao Li and Biyun Yang

Abstract—It is widely believed that strengthening globalization is very important and the Belt and Road Initiative (BRI) proposed by China is one of the ways to realize it. The outward foreign direct investment (OFDI) from China is one core area in BRI. This paper selects panel data of 79 countries along BRI from 2009 to 2018 to analyze the impacts of China's OFDI on the GDP of these countries, and to analyze the mediating effect of employment. Considering that the economic conditions of different countries vary greatly, this paper divides 79 countries into three subsamples according to their economic conditions, and then analyze them respectively. The results show that: (1) China's OFDI has a statistically significant positive impact on the GDP of the selected countries, and the employment also has a significant positive mediating effect. (2) In terms of the subsamples, the least developed countries statistically significant benefited from China's OFDI, and employment also played a statistically significant positive intermediary role. However, GDP of developed countries is negative affected but not statistically significant, so employment did not play an intermediary role; GDP of the rest of the countries is positive but not statistically significant affected, so employment also didn't play an intermediary role.

Index Terms—The belt and road initiative (BRI), outward foreign direct investment (OFDI), economy, employment.

I. INTRODUCTION

The Belt and Road Initiative proposed by China has created a lot of connections between China and other counties. According to the Ministry of Commerce of China, China had set up OFDI enterprises in 188 countries (regions), and these enterprises employed 2266 thousand foreign employees by the end of 2019. The stock and the flow of OFDI of China ranked the third and the second among the world respectively in 2019. Since there has been a lot of investment and these connections is likely to be more and more in the future, it's meaningful to have a deeper understanding of the effects of the OFDI from China.

Some literature has studied the impacts of OFDI on economy and employment. It is believed that the outward foreign direct investment (OFDI) can promote economic and employment of a country to some extent [1]-[7], but it also has potential negative effects, especially the possible crowding out or negative spillover effect on employment

[8]-[12]. Second, the influence of foreign direct investment has individual differences or regional differences [1], [4], [6], [11].

The contributions of this paper are: first, the host countries are taken as the research object for empirical research instead of the investment country, and the employment of the host countries is studied as the intermediary. Second, studying the influence path of OFDI can reveal its mechanism. Since foreign investment can directly bring jobs to the host countries and labor input is one of the important factors that affect output, improving the employment might be one path of OFDI to show its influence and this potential mediating effect is analyzed in this article. In addition, the selected data are from 2009 to 2018 of 79 countries that signed the Belt and Road cooperation document, which covers most participating countries. Fourth, countries and regions are divided into three subsamples (developed countries, the least developed countries and the rest countries) to study whether the impacts of OFDI have individual differences.

II. LITERATURE REVIEW

A. The Impacts of OFDI on the Economy

Most researches show that OFDI has a positive impact on the economy of the host countries. Hayat (2019) analyzes 104 countries and applies GMM model and find that OFDI inflows increase economic growth in the low and middle-income countries [1].

Sirag *et al.* (2018) collect annual data from 1970 to 2014 in Sudan and use cointegration tests to analyze. The results show that ODFI and financial development both have a statistically significant positive effect on the economic growth and OFDI could be beneficial to economy through enhancing financial development [2]. Kui-yin, and LIN (2004) find that FDI has spillover effects on innovation activities in China such as skilled labor turnovers and demonstration effects and the effect is beneficial the most for minor innovation [3]. Zhang (2017) generates the similar finding that FDI is beneficial to the productivity and efficiency in China, and this effect is unevenly distributed in different provinces [4]. FDI also has a continuous impact on GDP through accepting new knowledge and technology (Hansen and Rand, 2006) [5].

However, some researches show that OFDI is not always helpful to the development of host countries. Agosin and Machado (2005) find that OFDI is not always beneficial to domestic investment and economic policies is an important

factor to influence the effect [8]. Berrill *et al.* (2020) claim that when OFDI inflows, labor finishing tertiary education in that country is more likely to enter enterprises instead of starting up business because entering enterprises is safer [13].

B. The Impacts of OFDI on the Employment

OFDI is usually found to have positive impacts on the employment of the host country. Rong *et al.* (2020) analyze China's employment and OFDI from 1900 to 2015 through the GMM model and find that employment in China is significantly positive influenced by OFDI employment creation effect and employment transfer effect. They also find that the stricter regulations, the less likely for OFDI to improve employment [6].

However, some researchers suggest that OFDI has more complex effects on the employment. Zhao (1998) find that OFDI decreases the negotiated wage all the time and decreases union employment and the competitive wage if employment is more important than wages or is equally important in the eyes of union [9]. De Backer and Sleuwaegen (2003) suggest that OFDI crowds out domestic entrepreneurs through the product and labor, but OFDI could also bring new technology and knowledge to domestic entrepreneurs which might moderate negative effects [10]. Kurtović *et al.* (2021) find that even though OFDI crowds in the domestic investment of some countries such as Estonia and the Russia, it crowds out that of Poland and the Slovenia [11]. Eckel (2003) also find FDI has both an employment-depressing effect and an employment-enhancing effect [12].

C. The Relationship between Economy and Employment

Chen (2014) adopts VAR model to analyze data from 1987 to 2012 in Taiwan and finds that the increase of GDP results in the immediate increase of employment and lag-1 period [7]. The World Bank (1997) estimates that growth in the quantity and quality of the labor force could account for 17% of China's GDP growth since 1978 [14].

Most articles study the effect of economic growth on employment, rather than the effect of employment on the economic growth. However, OFDI can help a country to obtain capital and technology directly, skipping the step of improving the domestic economic and using domestic capital to invest. This paper explores the impacts of employment on the economy.

III. METHODOLOGY AND DATA

A. Hypothesis Development

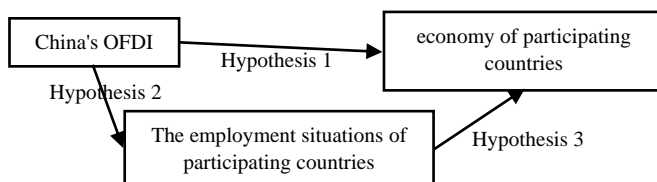Based on the literature review, four hypotheses are proposed (Fig. 1):

Fig. 1. The relationship pf targeted variables.

Hypothesis 1: China's OFDI has a positive impact on the economic growth in countries of the Belt and Road. **Hypothesis 2**: China's OFDI has a positive impact on employment in countries of the Belt and Road. **Hypothesis 3**: Employment status plays an intermediary role in the economic impacts of China's OFDI in countries along the Belt and Road. **Hypothesis 4**: In countries and regions with different levels of development, China's OFDI has different effects on their economic growth and employment shows different mediating effects.

B. Sample Selection and Processing

1) Sample selection

79 countries along the Belt and Road Initiative are selected, and the data are from 2009 to 2018.

Hypothesis 1 explained variable: GDP of 79 participating countries (data from the World Bank database).

Hypothesis 2 explained variable (mediating variable): unemployment rate of these countries (unep) (data from the World Bank database).

Core explanatory variable: the stock of China's OFDI in these countries (data from the statistical bulletin of China's outward foreign direct investment in each year).

Control variables: in macroeconomics, the production function suggests that the total output (GDP in this paper) is determined by technical level, labor input (unemployment rate in this paper), capital input (OFDI in this paper) and other factors. In this paper, the technical level refers to fixed broadband subscription (bb) and the other factor refers to agricultural added value (percentage of GDP) (arg) because resource abundance is believed to has an important impact on a country's economy (data from the World Bank database) [15].

Hypothesis 4: The 79 countries are divided into three subsamples based on economic conditions, which are the least developed countries (subsample 1), developed countries (subsample 2), and the rest countries (subsample 3). Then hypothesis 1, 2 and 3 are tested respectively. The classification rules are comprehensive sources from the World Bank, IMF, UN development program, and CIA.

2) Sample processing

To reduce the absolute value of the data, make the data more stable, and eliminate the possible problems of multicollinearity and heteroscedasticity, this paper first takes logarithms of all variables (e.g., lngdp).

To avoid spurious regression and ensure the validity of the results, four unit root tests are conducted to test the stationarity, which are Levin, Lin & Chu T *, Im, Pesaran and Shin W-stat, ADF and PP. The results shows that lnarg and lnbb passes three tests (significance lower than 1%), which can be regarded as stationary. Lngdp, lnofdi, and lnunep passes all tests (significance lower than 1%). Therefore, all sequences are stable.

C. Descriptive Statistics

TABLE I: DESCRIPTIVE STATISTICS

Variable	Mean	Median	Max	Min	Observation
lngdp	15.8045	15.8527	19.2523	10.9763	651
lnofdi	10.6604	10.6931	15.4268	1.60944	651
lnarg	1.88203	2.21075	4.00551	-3.69454	651
lnbb	0.41019	1.06660	3.72803	-10.1093	651
lnunep	1.55028	1.68269	3.31295	-1.96611	651

After dropping the missing data, the descriptive statistics are shown in Table I. In addition, Table II shows the correlation between variables and their absolute values are far less than 1, so there is weak or even no multicollinearity between variables.

<div align="center">TABLE II: CORREALATION</div>

Variable	lngdp	lnofdi	lnarg	lnbb	lnunep
lngdp	1	0.22068708	-0.11591607	0.41025290	0.08740263
lnofdi	0.2206871	1	-0.10956696	0.09288183	-0.18847097
lnarg	-0.115916	-0.1095670	1	-0.45664812	-0.04212331
lnbb	0.4102529	0.09288183	-0.45664812	1	0.14359515
lnunep	0.0874026	-0.18847097	-0.04212331	0.14359515	1

D. Models

Hypothesis 1:

$$\ln gdp_{it} = \beta_0 + \beta_m \ln T_{mt} + v_i + u_t + \varepsilon_{it} \qquad (1)$$

$$\ln gdp_{it} = \beta_0 + \beta_1 \ln ofdi_{it} + \beta_m \ln T_{mt} + v_i + u_t + \varepsilon_{it} \qquad (2)$$

where T_{mt} is the m control variables in time t; gdp_{it} is the gdp of country i in time t; t = 2009,2010, …, 2018; v_i is the individual effect, u_t is the time effect, ε_{it} is the random error.

Equation (1) is to test the effectiveness of control variables when not considering the effects of OFDI. Equation (2) is to test the effects of the main variable lnofdi.

Hypothesis 2:

$$\ln unep_{it} = \beta_0 + \beta_i \ln ofdi_{it} + v_i + u_t + \varepsilon_{it} \qquad (3)$$

Hypothesis 3:

$$\ln gdp_{it} = \beta_0 + \beta_1 \ln ofdi_{it} + \beta_2 \ln \ln unep_{it} + \beta_m \ln T_{mt} + v_i + u_t + \varepsilon_{it} \qquad (4)$$

After setting the equations, likelihood ratio test is conducted to determine whether these equations should use the pooled models or the fixed effects models. If the results are significant, then Hausman test is conducted to determine whether the models should be fixed effects models or random effects models. The results show that all the four models should use the individual fixed effects models.

IV. EMPIRICAL ANALYSIS

A. The Economic Impact of China's OFDI on Countries Participating the Belt and Road Initiative

Results of (1) and (2) are shown in Table III. The R square is as high as 0.9907 in (1), indicating that the selected control variables are effective. In (2), all variables and the model are significant at the 1% level and the R square increases from 0.9907 to 0.9918, indicating that the explanatory variable lnofdi is effective. Meanwhile, the coefficient of lnofdi is positive, which means that the OFDI has a positive effect on GDP. Therefore, hypothesis 1 is proved that China's OFDI has a positive impact on the economy of the host countries.

Since the span of data is 10 years, these data may have internal connections in different years. D.W. Test is conducted to verify the autocorrelation in (2). The D.W.

value is 0.68, which means this model has positive autocorrelation according to D.W. table. In addition, as the conditions of these different countries are various, heteroscedasticity may exist among the data.

GMM model can play a role to fix heteroscedasticity and autocorrelation, and the first-order lag of lnofdi (represents as lnofdi(-1)) is added to change (2) into a dynamic panel model.

According to J-Statistics value and Arellano-Bond test results (Table III), (2) (GMM) passes the overidentification test and there is no second-order autocorrelation problem, so the selected instrumental variable is effective. The results also shows that lnofdi is significant at the 1% level and the coefficient is positive, which verifies hypothesis 1 again.

<div align="center">TABLE III: THE RESULTS OF (1), (2) AND (2) (GMM)</div>

Variable	(1)	(2)	(2) (GMM)
lngdp(-1)			0.549515***
lnofdi		0.070663***	0.009645***
lnbb	0.106753***	0.063821***	0.001892
lnarg	-0.335398***	-0.330042***	-0.486737***
C	16.35004***	15.61145***	
R-squared	0.990752	0.991882	
Prob(F-statistic)	0	0	
Durbin-Watson stat	0.623731	0.686268	
AR(2)			0.1246
Prob(J-statistic)			0.312564

***, **, and * represent 1%, 5% and 10% significance levels respectively

B. The Impact of China's OFDI on Employment in Countries along the Belt and Road Initiative

$$\ln unep_{it} = 1.775335 - 0.018889 \ln ofdi_{it} + v_i + \varepsilon_{it} \qquad (5)$$

<div align="center">(p = 0)　　　　(p = 0.0095)</div>

<div align="center">R-squared = 0.9518, prob(F-statistic) = 0.</div>

Equation (5) shows the results of (3). The p-values of variables and the model are significant at the 1% level, and the R square reaches 0.95, indicating that lnofdi has a certain influence on lnunep. In addition, the coefficient of lnofdi is negative, so when China increases direct investment in the host countries, the unemployment rate of the host country will decrease. Therefore, hypothesis 2 is proved that China's OFDI has a significantly positive impact on the employment of the host country.

C. The Mediating Effect

Table IV shows that the coefficient of lnofdi increases significantly compared with when without the intermediary variable lnunep in (2), so considering the intermediary variable lnunep enhances the impact of OFDI on GDP. However, lnunep isn't significant at 10% level. To improve the model, GMM model is used for regression.

The results (Table IV) shows that the (4) GMM model doesn't have second-order autocorrelation problems and passes the overidentification test, indicating that the instrumental variable is effective. Among them, lnofdi is significant at the 1% level and the coefficient is positive, so OFDI has a significantly positive effect on GDP. Lnunep is significant at the 1% level and the coefficient is negative, which means that increasing employment significantly

contributes to GDP development. The mediating effect is 0.22%, accounting for 32% of the total effects. Therefore, hypothesis 3 is verified successfully that employment plays a significant mediating role in the impacts of OFDI on the economic growth of the host countries.

TABLE IV: THE RESULTS OF (4) AND (4) (GMM)

Variable	(4)	(4) (GMM)
lngdp(-1)		0.489857***
lnofdi	0.070684***	0.004723***
lnarg	-0.330163***	-0.330841***
lnbb	0.063916***	0.018836***
lnunep	0.004707	-0.118747***
C	15.6041***	
R-squared	0.991882	
Prob(F-statistic)	0	
AR(2)		0.103
Prob(J-statistic)		0.24061

***, **, and * represent 1%, 5% and 10% significance levels respectively

D. The Analyses of Subsamples

First, the correlation values within each subsample are far less than 1 so the correlation between variables is weak and the possibility of multicollinearity is low.

TABLE V: THE RESULTS OF SUBSAMPLES IN (2)

Variable	Subsample 1	Subsample 2	Subsample 3	Subsample 1(GLS)	Subsample 2(GLS)	Subsample 3(GLS)
lngdp(-1)				-0.436165***	-0.251681***	0.307787***
lnofdi	-0.011703	-0.003602	0.011509	0.044417***	-0.004711	0.000671
lnofdi(-1)				0.0605***	-0.00959	
lnofdi(-2)						-0.015599
lnofdi(-3)						-0.016096
lnarg	0.022948	-0.007472	-0.278445***	-0.049493	-0.130922***	-0.260083***
lnarg(-1)				-0.099132*	-0.137418***	
lnbb	0.018632	0.084056	0.002976	0.005681	0.020539	-0.010309
C	-0.008503	-0.0000787	0.020662***	-0.010705***	-0.003943***	0.008972**
R-squared	0.013217	0.006695	0.061589	0.732846	0.522137	0.197681
Prob(F-statistic)	0.736129	0.839163	0.00002	0	0	0
Durbin-Watson stat	2.22716	2.73293	1.285754	2.295203	2.106514	2.090246

***, **, and * represent 1%, 5% and 10% significance levels respectively

Among the three types of countries, the least developed countries receive significant benefits from China's OFDI, whereas GDP of the developed countries is not significantly hindered. The economy of other countries is positively affected by OFDI but not significantly.

TABLE VI: THE RESULTS OF (3) AND (4) FOR SUBSAMPLE 1

Variable	lnunep (3) (GLS)	lngdp (4) (GLS)
lngdp(-1)		-0.241069***
lnofdi	-0.013915*	0.055313***
lnofdi(-1)	-0.004951	0.09088***
lnbb(-1)		-0.012647
lnunep		-0.315499***
lnunep(-1)	0.21675***	0.110483
C	-0.002221	-0.00633
R-squared	0.313669	0.708632
Prob(F-statistic)	0	0

***, **, and * represent 1%, 5% and 10% significance levels respectively

As OFDI in subsamples 2 and 3 has no significant effect

Second, the stationarity is tested respectively. The results show that subsample 1 and 2 should be processed by second-order difference, and subsample 3 should be processed by first-order difference. The results of cointegration test show that each subsample is significant at the 1% level, so the relationship is stable between variables.

Third, the results of F test and Hausman test show that for subsample 1, 2, and 3, (2) should use pooled model, pooled model, and individual random effects model respectively.

The results of (2) (Table V) show that most variables and models are not significant. According to D.W. test, there are no autocorrelation, negative autocorrelation, and positive autocorrelation at the 5% significant level in the three subsamples. In addition, the data with multiple cross sections may be heteroscedastic.

GLS model is used to fix the autocorrelation and heteroscedasticity problems. In addition, the lagged variables of some variables are added to the models to reflect time lag effects. The results of GLS models (Table V) show that the three subsample models are significant at the 1% level, and the results of D.W. are significant at the 5% level, so there is no autocorrelation in models.

on GDP, there is no need to analyze the mediating effects in the two subsamples. The results of (3) and (4) for subsample 1 (Table VI) show that the models are acceptable. The mediating variable lnunep is significant at the 1% level and the coefficient is negative, which means that employment factors play a positive mediating role in the economic impact of OFDI on the least developed countries. The mediating effect of sample 1 is 0.44%, accounting for 9% of the total effect.

To sum up, hypothesis 4 is proved that in countries and regions with different levels of development, China's OFDI has different effects on economic growth and employment in host countries, and different mediating effects.

V. CONCLUSION

China's OFDI in countries along the Belt and Road Initiative has a significant positive effect on the economy of these countries, and has a significant effect on improving

their employment rate, so strengthening investment cooperation with China is beneficial to the development of these countries.

In terms of the mediating effect, employment has a significant mediating effect on the economic impact of China's OFDI on the host countries.

When considering subsamples, different conclusions can be drawn. China's OFDI has a significant and positive impact on the economy of the least developed countries, and employment also plays a significant positive mediating role. For developed countries, OFDI has a negative effect but not significant, whereas for the rest countries, OFDI has a positive effect but not significant. Therefore, employment doesn't play a mediating role in the economic impact of OFDI on the two types of countries.

The results show that the least developed countries could rely more on external power to develop. These countries have development potential, but lack original capital. Foreign capital can make up for the lack of domestic capital and is of great help to their development. Besides, some of the least developed countries have problems like food shortage, the local rainfall deficiencies, and uneven distribution of water resources. China's advanced agricultural techniques and special grain seeds can help these countries to solve these problems. Solving grain problems also releases labor into the development of other industries. Therefore, the least developed countries could strengthen their cooperation with China.

For developed countries, more attention could be paid to cooperation other than economy. Apart from direct investment, cooperation in science and technology could be strengthened, such as joint research groups and cooperation forums. China develops some advanced technology these years, including communication technology, high-speed rail, aerospace technology and so on. Exchanging the latest progress in research can promote scientific and technological development and would be beneficial to the whole human beings.

The cooperation with China and the rest countries can synthesize the above two situations.

The shortcomings of this paper are: first, different countries participate in the Belt and Road Initiative at different times and show a gradual trend of strengthening cooperation. It is difficult to define the exact time that countries begin to be affected by the Belt and Road Initiative. Some countries have been actively involved in the Belt and Road Initiative and achieved a series of early harvests, but they haven't formally signed cooperation documents with China until 2019, such as Jamaica. Therefore, even if this paper only studies the data from 2009 to 2018, it still includes the countries signing the cooperation documents for the first time in 2019. Secondly, the study of employment in this paper only focuses on the quantity, not the quality of employment.

CONFLICT OF INTEREST

The author declares no conflict of interest.

AUTHOR CONTRIBUTIONS

REFERENCES

[1] A. Hayat, "Foreign direct investments, institutional quality, and economic growth," *The Journal of International Trade & Economic Development*, vol. 28, no. 5, Jan. 2019.

[2] A. Sirag, S. SidAhmed, and H. S. Ali, "Financial development, FDI and economic growth: Evidence from Sudan," *International Journal of Social Economics*, vol. 45, no. 8, pp. 1236-1249, August 2018.

[3] C. Kui-yin and P. Lin, "Spillover effects of FDI on innovation in China: Evidence from the provincial data," *China Economic Review*, vol. 15, no. 1, pp. 25-44, 2004.

[4] L. Zhang, "The knowledge spillover effects of FDI on the productivity and efficiency of research activities in China," *China Economic Review*, vol. 42, pp. 1-14, February 2017.

[5] H. Hansen and J. Rand, "On the causal links between FDI and growth in developing countries," *The World Economy*, vol. 29, no. 1, pp. 21-41, January 2006.

[6] S. Rong, Liu, K. S. Huang, and Q. Zhang, "FDI, labor market flexibility and employment in China," *China Economic Review*, vol. 61, June 2020.

[7] C. C. Chen, "Entrepreneurship, economic growth and employment: A case study in Taiwan," *Hitotsubashi Journal of Economics*, vol. 55, no. 1, pp. 71-88, June 2014.

[8] M. R. Agosin and R. Machado, "Foreign investment in developing countries: Does it crowd in domestic investment?" *Oxford Development Studies*, vol. 33, no. 2, pp. 149-162, 2005.

[9] L. Zhao, "The impact of foreign direct investment on wages and employment," *Oxford Economic Papers*, vol. 50, no. 2, pp. 284–301, April 1998.

[10] K. Backer and L. Sleuwaegen, "Does foreign direct investment crowd out domestic entrepreneurship?" *Review of Industrial Organization*, vol. 22, pp. 67–84, February 2003.

[11] S. Kurtović, N. Maxhuni, N. Maxhuni, B. Halili, and B. Krasniqi, "Does outward foreign direct investment crowd in or crowd out domestic investment in central, east and southeast Europe countries? An asymmetric approach," *Economic Change and Restructuring*, September 2021.

[12] C. Eckel, "Fragmentation, efficiency-seeking FDI, and employment," *Review of International Economics*, vol. 11, no. 2, pp. 317-331, May 2003.

[13] J. Berrill, M. O'Hagan-Luff, and A. Stel, "The moderating role of education in the relationship between FDI and entrepreneurial activity," *Small Bus. Econ.*, vol. 54, pp. 1041–1059, April 2020.

[14] V. Nehru, A. Kraay, and Y. Xiaoqing, *China 2020: Development Challenges in the New Century*, Washington, D.C.: World Bank Group, 1997.

[15] A. A. Lashitew and E. Werker, "Do natural resources help or hinder development? Resource abundance, dependence, and the role of institutions," *Resource and Energy Economics*, vol. 61, p. 101183, August 2020.

Chengjiao Li was born in Chongqing, China, in 1998. She graduated from Guangdong University of Foreign Studies (Guangdong province, China) in 2020 with a bachelor's degree in finance (investment and management). Now she is a master student whose major is business analysis and decision sciences at University of Leeds (Leeds, UK). Her interests are international economics and the application of machine learning in financial areas.

Biyun Yang holds a PhD in economics. Now she is a professor and masters supervisor at Guangdong University of Foreign Studies and visiting scholar at University of Westminster.