


Research Article

Research on Green Production Factors by OFDI Along the Belt and Road Initiative

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Abstract: To analyze the role of the Belt and Road Initiative in China's OFDI by applying a double-difference model. To determine the accuracy of the model, using the skewed distribution matching method, and to determine the effect of OFDI in China's coastal areas through practical tests. This paper adopts the DEA's SBM model to study China's green total factor productivity in 31 provinces; it evaluates China's outward foreign direct investment (OFDI) through the use of three key indicators, including the currencies of the inflow countries, the currencies of the inward total, and exchange rate changes. The research in this paper considers various factors under the Belt and Road Initiative, including OFDI flows, reserves, and net flows. After an in-depth study, it is found that the Belt and Road policy significantly improves the mobility and sustainability of OFDI in the regions along the Belt and Road. This study may provide new perspectives for understanding the economic and social development patterns of provinces along the Belt and Road Initiative. Dissecting the complexity of regional development through the use of a "double split model" helps to recognize the different impacts of international projects on the local economy, and uniquely accounts for both spatial (geographic) and temporal (over time) variations in development, providing a robust framework for similar studies in other contexts.

Keywords: economic construction, Belt and Road, green total factor productivity, outward foreign direct investment, double difference modelling

MSC: 91B62

1. Introduction

With the further development of economic globalization, the economies of the world are gradually developing into a mutually beneficial and reciprocal whole. The Belt and Road (B&R) is an acronym for the Silk Road Economic Belt and the 21st Century Maritime Silk Road. In September and October 2013, Chinese President Xi Jinping put forward the cooperative initiatives of building the "New Silk Road Economic Belt" and the "21st Century Maritime Silk Road", respectively. 2015 saw the opening up of the Belt and Road Economic Development Area to the public. Development Zone opened up to the outside world, providing huge opportunities for China, with 18.2 per cent of Chinese enterprises from 49 developed countries in 49 developing countries receiving direct investment and USD 17.83 billion in service outsourcing agreements of USD 12.15 billion in developing countries on the "Belt and Road". At the end of June 2016, the

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number of China-Europe liner trains in operation reached 1,881, of which 502 trains, creating economic benefits of 17 billion USD for both sides. In addition, on 7 December 2022, China also signed agreements on the Belt and Road with 150 developing countries and 32 foreign institutions, providing strong support for the development of both sides. “One Belt, One Road” is a global cooperation framework that uses communication channels and network connections to build a synergistic mechanism with diversity, thus helping to promote the balanced development of the global economy. The “Belt and Road” is a global co-operation framework that uses communication channels and network connections to build a synergistic mechanism with diversity, thus helping to promote balanced development of the global economy [1]. Belt and Road, transforms China’s strengths into a hub for global participation, which not only attracts more international investors, but also facilitates smooth international trade and helps to improve local economic and social conditions [2].

There are also irrationalities in the structure of China’s foreign direct investment, namely, the low proportion of China’s foreign direct investment, which has a negative impact on the development of China’s macroeconomic and financial system; at the same time, within the structure of China’s foreign direct investment, there also exist specific problems such as the main body of the investment is biased in favour of state-owned enterprises, a single form of investment, uneven distribution of the investment area and the participating industries, etc., and China’s foreign direct investment has already encountered the development of a China’s OFDI has encountered a development bottleneck [3]. China-ASEAN Free Trade Area, as an important investment place of “Belt and Road” and the main target of regional economic integration, should follow the trend and take environmental protection into account in the process of accelerating investment [4]. As a result, research on the topic of OFDI on green factors of production under the Belt and Road Initiative should not be delayed.

Given the context of the study of the dual split model in the provinces along the Belt and Road, focusing on the provinces along the Belt and Road Initiative, the research objectives of this paper include the following key topics:

1. Analyzing the economic impact of the Belt and Road Initiative on Chinese provinces

Assessing the impact of the Belt and Road Initiative (B&R) on economic growth, trade patterns, investment flows, and local industries in the participating Chinese provinces is a fundamental objective. This analysis aims to distinguish the impact of the Belt and Road Initiative from other economic variables that may affect the development of the provinces.

- 2 Assessing social and environmental outcomes

The objective of the study is to explore the social and environmental impacts of the B&R Initiative in these regions. Objectives may include assessing changes in employment, income levels, social equity, environmental sustainability, and how infrastructure development affects local communities and ecosystems.

3. Developing and Applying Dual Segmentation Models

Develop, characterize, and validate the dual segmentation model as a novel analytical framework. This will include demonstrating how the model can effectively dissect complex impacts on regional development, providing insights that may not be captured by traditional models.

- 4 Comparing and contrasting regional differences

The purpose of the study is to identify and explain differences in the impacts of B&R initiatives in different provinces. This includes understanding why certain regions may have benefited more than others and how factors such as geography, existing infrastructure and governance play a role in these differences.

- 5 Contributing to theoretical and methodological advances

This study can contribute to academic discussions in international development, regional studies and economic geography. This includes advancing theoretical understanding and methodology when analyzing large-scale international initiatives like the BRICS initiative.

6. Contributing to future research

Finally, the foundation for future research can be laid by providing a comprehensive data set, replicable models, and detailed analysis of B&R impacts. This would set the stage for further research, making it possible to explore other regions, extend the timeframe, or deepen the analysis of specific areas or outcomes.

2. Literature review

In the current process of global economic integration, the Belt and Road Initiative, as an important platform for promoting regional cooperation and development, is of great significance in promoting the economic construction of participating countries. This study aims to explore the impact of outward foreign direct investment (OFDI) on green factors of production under the Belt and Road Initiative, and empirically analyzes it using the double-difference model with green total factor productivity as the evaluation index. The goal of the Belt and Road Initiative is to deepen regional cooperation and realize common development and prosperity by promoting infrastructure construction and connectivity. The initiative emphasizes the principle of sustainable development and calls on countries along the route to focus on environmental protection and ecological balance and promote green development. China's OFDI has achieved rapid development in the past decades, showing green orientation, increased awareness of social responsibility, wide regional coverage, and policy support.

In academic research, Pradhan et al. [5] analyzed an in-depth comparative analysis of India's investment in developing and developed countries using the example of India's automobile industry and concluded that significant reverse technology spillovers were obtained from direct investment in both economic developers, Piperopoulos et al. [6] study on China's high-tech industry also suggests that domestic emerging economies and business managers can learn to acquire advanced international knowledge information and core technologies through the channel of OFDI. Hailu et al. [7] argue that in order to more accurately measure the impact of green growth on the economy, energy and environmental factors need to be added to the traditional total factor productivity (TFP) indicators, and that such TFP, which takes into account undesirable outputs, is known as green TFP. Chung et al. [8] and other scholars proposed the Directional Distance Function (DDF) to solve the problem of the inability of the envelope data analysis method to consider undesirable outputs, arguing that the method can effectively solve the problem of estimating efficiency while considering undesirable outputs, and constructed the ML productivity index to provide a measure of the green total The ML productivity index was constructed to measure the green total factor productivity level, however, the ML index cannot track the long-term performance trend of productivity, which will bias the measurement results.

In academia, some scholars have pointed out that the reverse technology spillover effect of OFDI may not exist. Kogut et al. [9] chose data on China's GDP, R&D investment, fixed asset investment, and employment for the years 2004 to 2011, and investigated the relationship between reverse spillover effects and increased risk by applying a traditional linear model. Their study finds that reverse technology spillovers exist in China's western region and that the region is in dire need of technological upgrading through increased foreign direct investment due to its relative economic and technological backwardness. In addition, Bitzer et al. [10] have also explored this issue in depth at the industry level and firm level, and they concluded that the reverse technology spillover effect of OFDI is not obvious. Bitzer et al. [10] based on industry-level data of seventeen OECD countries we examine FDI as a potential channel for knowledge diffusion and do not find evidence for positive outward-FDI-related technology sourcing effects.

Potterrie et al. [11] used econometric techniques to explore whether foreign direct investment (FDI) is transnational in terms of technology transfer. The study shows that FDI does lead to technology transfer, but this transfer is directional in nature. Specifically, when a country invests in R&D-intensive foreign countries, especially in recent years, the country's productivity increases. However, when an R&D-intensive foreign country invests in that country, it does not show productivity gains. Branstetter et al. [12] provides an in-depth study of foreign direct investment (FDI) as a key channel of technology diffusion, while exploring the role of natural resources in this process. Based on cross-sectional data from 71 developing countries, he found that the net effect of FDI on total factor productivity (TFP) growth diminishes with the increase of natural resource rents. Driffield et al. [13], taking the United Kingdom as a case study, found that the United Kingdom was able to promote domestic TFP through outward foreign direct investment (OFDI). Moreover, the richer the domestic R&D capital of the investment target country, the more significant this boost is. Herzer et al. [14] analyzed the impact of FDI on economic growth in 44 developing countries using heterogeneous panel cointegration techniques. The results found that FDI, on average, had a negative impact on economic growth in developing countries, but the specific impact varied significantly across countries.

Current research focuses on environmental impact assessment, technology transfer effects, and economic benefit analysis. Future research can be carried out in terms of micro-level impacts, dynamic evolutionary processes and comparative analysis. Innovative research methods such as scenario simulation, interdisciplinary integration and digital transformation can also be tried. These studies will provide valuable guidance and suggestions for scientific research.

3. Methodology

The double difference method can solve the endogeneity problem of model construction, can effectively identify the causal effects of exogenous event shocks, and is often used in the analysis and identification of policy effects [15]. Specifically, respondents can be divided into two groups: an experimental group and a control group, each of which will have different data. The data in the experimental group will change significantly with the actions of the respondents, while the data in the control group will decrease with the actions of the respondents, ultimately resulting in an average of the data from both groups as a measure of freedom from government intervention. Although the double difference method (DID) is an important means of effect estimation, it has an obvious problem: it has too many parameter settings, which causes its parameter values to deviate from the expected, thus affecting the accuracy of the predictions. Therefore, it is necessary to strengthen the parameter correction of the double-difference method to improve the accuracy of the parameter correction, and it is required that the parameter values of the parameter correction should be consistent with the predicted parameters, so as to avoid the parameter values of the double-difference method from deviating from the predicted conclusions. The double differencing method requires that the data be compared between two periods, before and after the "treatment". In the example in the figure, the outcome of the treatment group is represented by the line P and the outcome of the control group by the line S. The outcome (dependent) variables for both groups are shown in the figure. The outcome (dependent) variables for both groups are measured at time 1, before either group received treatment (i.e., the independent or explanatory variables), and are represented by points P1 and S1, respectively. The treatment group received or experienced treatment afterwards and both groups were measured again at Time 2. Not all differences between the treatment and control groups at Time 2 (i.e., differences in P2 and S2) can be interpreted as being an effect of the treatment because the treatment and control groups started at different times at Time 1. Therefore, DID calculates the "normal" difference between the outcome variables for the two groups (the difference would still exist if neither group received treatment), represented by the dotted line Q (note: the slope from P1 to Q is the same as the slope from S1 to S2). The treatment effect is the difference between the observed outcome (P2) and the "normal" outcome (the difference between P2 and Q) [16].

The baseline model setup for the double difference model is shown in equation (1):

$$Y_{it} = a_0 + a_1 \text{Area}_{it} + a_2 \text{Date}_{it} + a_3 \text{Area}_{it} \times \text{Date}_{it} + a_4 X_{it} + \mu_{it} \quad (1)$$

In this study, i denotes a province, t denotes a period, and the explanatory and control variables are taken into account, respectively, while the regional dummy variable Area_{it} is used to measure the implementation of the policy, which is set to 1 if the policy is implemented in the region and 0 for the region where it is not implemented; the time dummy variable Date_{it} is used to measure the implementation of the policy, which is set to 1 if the policy is implemented in a particular province in every year within a year is set to 1, while the year in which it is not implemented is set to 0. The explanatory variable $\text{Area}_{it} \times \text{Date}_{it}$ indicates that the explanatory variable, i.e., the combined time and region dummy variable is considered as the combined time and region dummy variable, and the number of explanatory variables can be composed of the number of explanatory variables and the number of explanatory variables, so as to better reflect the results of the study. The role of each variable can be better understood and analysed by going deeper into the study. Only in the spatio-temporal range of 1, this variable possesses μ_{it} a real value; a random disturbance term [15].

By examining the annual average data on the year-end exchange rate of the RMB from 2010 to 2019, it is possible to reflect more accurately the economic development of a particular time period, including: total exports, the rate of change of the exchange rate, and foreign direct investment. These data can help to better understand the development trend of a

particular economy, and can better predict the feasibility of foreign direct investment, thus better controlling the risk of foreign direct investment and improving the effect of foreign direct investment. Detailed information on such information can be obtained through such sources as the China Statistical Yearbook and the National Statistics on National Economic and Social Development. The variable symbols and definitions are detailed in Table 1:

Table 1. Variable names, symbols and definitions

Variable	Variable symbol	Variable definition
Explained variables	$Y_{1,it}$	the outward FDI flow from China to the countries along B&R in year t of province i
	$Y_{2,it}$	China's outward FDI stock in countries along B&R in province i in year t
	$Y_{3,it}$	China's net outward FDI in countries along B&R in year t for province i
Regional dummy variables	$Area_{it}$	1 for established provinces and 0 for non-established provinces.
Time-region variables	$Date_{it}$	1 for the year the policy is introduced and subsequent years, and 0 otherwise.
Composite dummy variables	$Area_{it} \times Date_{it}$	coefficient of interaction term between region and time
Control variables	$X_{1,it}$	GDP per capita in province i in year t
	$X_{2,it}$	total exports of province i in year t
	$X_{3,it}$	the rate of exchange rate change in province i in year t
Time trend variable	T_i	indicates that the base period of 2010

4. Results

4.1 Construction of double split model

Most academic studies have shown that the time dummy variables describe the difference between two phases, which has not been tested in any real way, and there is still a similar time trend between the two groups. In order to better capture this trend, some specific time variables are incorporated into the base values of the double-difference model to minimise the interference from the external environment and to obtain more accurate prediction results. The first proposal of “One Belt, One Road” occurred in September 2013, so the study considers 2010 to 2019 as the period between the policy impacts, and double difference modelling of the impacts from 2010 to 2019 is conducted as a way to explore the mechanism of the occurrence of the impacts.

As shown in equation (2):

$$Y_{n,it} = \beta_0 + \beta_1 Area_{it} + \beta_2 Date_{it} + \beta_3 a_3 Area_{it} \times Date_{it} + \beta_4 X_{1,it} + \beta_5 X_{2,it} + \beta_6 X_{3,it} + y_i \sum_{i=0}^9 T_i + \mu_{it} \quad (2)$$

where denotes the sample city ($i = 1, 2, \dots, 310$); t denotes time (2010–2019); and $Y_{n,it}$ is the explanatory variable.

In the control group, i.e., $Area_{it} = 0$. From equation (2), the OFDI of the Belt and Road Initiative are

$$Y_{n,it} = \begin{cases} \beta_0 + \mu_{it}, & Date_{it} = 0 \\ \beta_0 + \beta_2 + \mu_{it}, & Date_{it} = 1 \end{cases} \quad (3)$$

It can be seen that after the initiative, the change in OFDI for the control group is $\Delta_1 = \beta_2$.

In the experimental group $Area_{it} = 1$ from equation (2), the OFDI of the Belt and Road Initiative is recorded as respectively:

$$Y_{n,it} = \begin{cases} \beta_0 + \beta_1 + \mu_{it}, & Date_{it} = 0 \\ \beta_0 + \beta_1 + \beta_2 + \beta_3 + \mu_{it}, & Date_{it} = 1 \end{cases} \quad (4)$$

Therefore, it can be seen that the change in OFDI for the experimental group after the initiative is introduced:

$$\Delta_2 = \beta_2 + \beta_3 \quad (5)$$

4.2 Descriptive statistics of variables

Eight different variables were used in this study, including three comprehensible variables, three controllable variables, one entity that can operate in different spatial and temporal scales, and one entity that can operate in different geographic spaces. The data of 31 provinces between 2010 and 2019 were collected and their characteristics such as mean, standard deviation, minimum and maximum were analysed with descriptive statistics, the details of which can be found in Table 2. According to the data in Table 2, it can be seen that the mean error of each variable is low, which indicates low volatility in the selection of the sample.

Table 2. Descriptive statistics for variables

Variable	Unit	Sample size	Mean	Standard deviation	Minimum	Maximum
Y_1	USD 10,000	310	16.89	4.12	4.12	20.82
Y_2	USD 10,000	310	16.74	3.05	4.78	25.61
Y_3	million of USD	310	13.68	1.56	6.78	16.1
GDP per capital	million of USD	310	12.46	0.78	10.25	12.76
change rate of exchange rate (%)	–	310	3.01	1.56	0.89	5.24
Total exports	USD million	310	25.64	1.79	15.46	22.45

4.3 Empirical analysis

In order to analyse the data more effectively, Z-SCORE technology is widely used in the standardization of raw data, which can effectively improve the reliability of the data, and can be accurately corrected according to the mean and standard deviation of the raw data, so as to obtain the data more accurately. In order to better study OFDI under the “Belt and Road” initiative, a series of measures need to be taken. It is necessary to standardise all the data and use STATA 15.0 software to conduct empirical analysis. If these factors are not taken into account, some control variables can be added to obtain a comparable set of conclusions. It is also necessary to consider various factors under the Belt and Road Initiative, including outward FDI flows, reserves and net amounts. After an in-depth study, the “Belt and Road” policy has significantly improved OFDI flows in the regions along the route.

The results in Table 3 show that compared with the provinces along the “Belt and Road” and the provinces not along the “Belt and Road”, the OFDI flow, OFDI stock, and net OFDI of the experimental group are on the low side and fluctuate in a wide range. According to the data of “One Belt, One Road” and “One Belt, One Road”, it can be seen that in the border areas of “One Belt, One Road” and “One Belt, One Road”, the data of OFDI of the experimental group are obviously more stable, while in other areas, the variation of these data is smaller. It can also be seen that in the border areas with a standard deviation of 0.53 and “One Belt, One Road”, the experimental group’s data for both mean GDP and 11.98 are much more stable, while in the other areas, these data are much less variable. In conclusion, it can be seen that the level of economic development in the experimental group with a standard deviation of 0.47 and the border area of the “One Belt, One Road”

is significantly more stable, while in other areas it is more stable. The comparisons revealed that after statistical analyses, the results showed that the average import volume of the control group increased by 16.73, while the average import price decreased by 1.24. The data of the control group were more balanced.

Table 3. Descriptive statistics for subgroups

Experimental group	Variable Number	Samples	Mean value	Standard deviation	Minimum value	Maximum value
0	Y_1	130	17.29	1.8	11.78	22.35
0	Y_2	130	17.26	1.8	12.04	21.43
0	Y_3	130	14.51	1.21	9.26	14.56
0	GDP per capital	130	12.14	0.53	10.2	13.45
0	Total exports	130	16.73	1.24	15.04	18.26
1	Y_1	180	15.21	3.56	3.45	20.01
1	Y_2	180	15.34	3.5	4.59	21
1	Y_3	180	11.04	1.81	5.99	13.99
1	GDP per capital	180	11.98	0.47	9.88	12.56
1	Total exports	180	16.87	1.98	13.44	20.29
Total	Y_1	310	16.25	2.68	7.615	21.18
	Y_2	310	16.3	2.65	8.315	21.215
	Y_3	310	12.775	1.505	7.625	14.275
	GDP per capita	310	12.06	0.5	10.04	13.005
	Total exports	310	16.8	1.61	14.24	19.275

4.4 Empirical analysis

After correlation analysis, a double difference model was used to evaluate the accuracy of the forecasts. The data in column 1 consists of Y_n , where $n = 1, 2, 3$, while column 2 contains three control factors (GDP per capita, total exported goods, and rate of exchange rate change), which can be seen in Table 4.

Table 4. Impact of the Belt and Road Initiative on provinces along the route

	Y_n	Y_1^*	Y_1	Y_2^*	Y_2	Y_1^*
$Area_{it} \times Date_{it}$	0.372**	0.0912**	0.454**	0.200**	0.0717**	0.0699**
$Date_{it}$	0.407**					
$Area_{it}$	-1.512**					
GDP per capital		0.912**		1.135**		0.102**
Rate of exchange rate change		0.03		0.00856		0.010203
Total exports		1.43**		1.301**		0.705**
Constant term	13.38**					
Goodness of fit	0.0969	0.85		0.826		0.878
Sample size	310	310	310	310	310	310

Note: The first row of the explanatory variable is the coefficient of the explanatory variable and the second row is the t -statistic value

After adjusting for control variables, the results of "One Belt, One Road" show that the impacts on FDI flows, stocks and net amounts of the provinces along the route are positive at the 5% significance level, and have a significant positive driving effect. After the adjustment of control variables, the goodness of fit of "One Belt, One Road" significantly improves

from 0.0962 to 0.0969, and 0.85 also improves and finally reaches 0.826, while the net effect of "One Belt, One Road" significantly decreases, which indicates that The influence of the control variables is gradually weakening.

After analysing the four control variables, it is found that there is a positive correlation between GDP per capita and OFDI flow, stock and net amount of provinces along the route, which can produce a positive driving effect. It is also found that when the growth rate of GDP reaches 1 per cent, the total exports also have a positive push effect. A positive push effect is also found for exchange rate fluctuations, which include 0.03, 0.00856, 0.00856, and 0.010203. After three evaluations, it was concluded that exchange rate fluctuations were below 1 per cent and the overall effect value for the three evaluations was below 95 per cent, suggesting that there is no significant interdependence between these factors. It was also found that the coefficients of the regional dummy variables did not show any deviation even when the controls were included in the evaluations, indicating that there was no significant interaction between them. Upon improvement it can be seen that in all cases where control variables are added, the net effect is greater than in cases where these variables are not added.

4.5 Robustness test

There are significant differences in the OFDI situation of the 31 provinces, which may stem from their factor endowment, historical development and other factors. However, from a macro perspective, the overall OFDI development of these provinces shows a consistent trend. In order to determine the validity of the model PSM-DIS, the means of the two test groups will be compared so as to assess the statistical significance between them. According to Table 5, it is found that when the preference score reaches 0.05, there is almost no significant change in statistical significance between the two test groups.

Table 5. Impact of the Belt and Road Initiative on provinces along the route

Control variables	Unmatched	matched	Mean	<i>t</i> -value	<i>p</i> > <i>t</i>
GDP per capita	U	11.626	11.678	0.556	0.81
	M	11.2	11.678	-0.32	0.809
Rate of exchange rate change	U	2.8325	2.8325	1	1
	M	2.7015	2.8325	0.16	0.898
Total exports	U	16.898	17.456	0	3.1**
Control variables	M	17.456	17.456	0.034	0.979

Note: *t*-values are statistics for individual coefficient tests; *p* is the *p*-value for the coefficient test.

The implementation of OFDI "Belt and Road" has brought positive impacts to the regions along the routes. It not only improves local OFDI liquidity, but also enhances the attractiveness of the "Belt and Road" and makes the "Belt and Road" policy more attractive, thus making the implementation of the "Belt and Road" more feasible, sustainable, and thus the "Belt and Road" more viable. This will make the implementation of the One Belt, One Road programme more viable and sustainable. After reassessment, it is found that the PSM-DIS algorithm exhibits good accuracy in evaluating OFDI flows and net flows, and there is no significant difference between the two, thus strongly supporting the previous research results.

5. Discussion

The impact of outward foreign direct investment (OFDI) on green factors of production under the Belt and Road Initiative is a topic of great interest. This chapter will explore the role of OFDI in promoting green factors of production and analyze the key factors affecting this relationship by interpreting the empirical results. At the same time, it will provide policy recommendations and decision-making support to provide important references for the green development of the countries along the "Belt and Road".

From the perspective of the “Belt and Road” initiative, it emphasizes the principle of sustainable development and calls on the countries along the route to pay attention to environmental protection and promote green development. In this context, China’s OFDI has a green orientation and tends to invest in green industries, such as new energy, environmental protection technology and sustainable agriculture. This indicates that the Belt and Road Initiative provides an important platform for promoting green factors of production, and OFDI plays an important role in this process. In addition, the impact of OFDI on provinces along the Belt and Road Initiative is also noteworthy, as OFDI may induce domestic enterprises to improve efficiency and reduce pollution emissions through technological spillovers and market competition. At the same time, OFDI may bring in advanced green technologies and management experience to help improve resource utilization efficiency and reduce environmental pollution, while at the same time creating employment opportunities and promoting economic development and social welfare. However, OFDI may also lead to relaxation of environmental standards and increase in pollution if there are no appropriate policies and regulatory measures, which is also an area that requires vigilance.

Among the current status and focus of academic research, researchers have focused on environmental impact assessment, technology transfer effects, economic benefit analysis and policy intervention studies. These studies provide important theoretical support for deepening the understanding of the impact of OFDI on green production factors. At the same time, the diversity of research methods and data sources has provided richer perspectives for the study, including the combination of quantitative and qualitative methods, case studies and big data analysis.

Looking forward, future research directions include the expansion of depth and breadth, as well as innovative and forward-looking research. Future research can focus on micro-level impacts, dynamic evolutionary processes and comparative analysis, while novel research methods such as scenario simulation, interdisciplinary integration and digital transformation can be attempted. These studies will further reveal the impact mechanism of OFDI on green production factors and provide more specific guidance and suggestions for practice. This chapter discusses the impact of OFDI on green factors of production under the Belt and Road Initiative, revealing its important role in promoting green development. At the same time, it also points out the challenges that need to be addressed and the direction of future research, providing theoretical and practical support for promoting regional economic integration and sustainable development.

6. Conclusion

This study empirically analyzes the impact of outward foreign direct investment (OFDI) on green factors of production under the Belt and Road Initiative, with the aim of revealing its role in enhancing green total factor productivity and providing policy recommendations and decision support for further promoting green development in countries along the Belt and Road Initiative. It aims to reveal its role in enhancing green total factor productivity, and provide policy recommendations and decision support for further promoting green development in countries along the Belt and Road. In the literature review section, this paper summarizes the research results on OFDI, green factors of production and green total factor productivity, and finds that the existing research mainly focuses on environmental impact assessment, technology transfer effect, economic benefit analysis and other aspects. However, there are some shortcomings in the existing research, such as the lack of in-depth analysis of the impacts at the micro level, tracking and comparative analysis of the dynamic evolution process and other research gaps. This study empirically analyzes the impact of outward foreign direct investment (OFDI) on green factors of production under the Belt and Road Initiative, aiming to reveal its role in enhancing green total factor productivity and provide policy suggestions and recommendations for further promoting green development in the provinces along the Belt and Road Initiative. The purpose of this analysis is to reveal its role in enhancing green total factor productivity, and to provide policy recommendations and scientific decision support for further promoting the green development of provinces along the Belt and Road. By interpreting the empirical results, this paper finds that OFDI under the Belt and Road Initiative has a significant role in promoting green factors of production. This finding not only provides important support for the sustainable development of the Belt and Road Initiative, but also provides practical guidance for regional economic integration. Combined with the empirical results, the key factors affecting the impact of OFDI on green factors of production are further analyzed.

This study provides an important empirical analysis of the economic development path under the “One Belt, One Road” initiative, and contributes theoretical and practical value to the promotion of green development and regional economic integration. Future research can be carried out in terms of expanding the depth and breadth, innovativeness, and foresight to reveal the impact of OFDI on green production factors under the “One Belt, One Road” initiative. Future research can be expanded in terms of depth and breadth, innovation and foresight, in order to reveal the complexity and challenges of OFDI under the “One Belt, One Road” Initiative on green production factors, and to provide more guidance and suggestions for policy makers and scientific researchers.

Based on the results of the previous research, this paper puts forward the following suggestions:

(i) Continuously improving the service system for overseas investment through the formulation of effective policies and measures.

In order to make comprehensive use of “two markets and two kinds of resources”, China encourages outward foreign direct investment (OFDI) while absorbing foreign direct investment (FDI), forming a two-way international investment pattern of “bringing in” and “going out”. It has formed a two-way international investment pattern of “bringing in” and “going out”, and actively participated in international competition and regional economic cooperation. Especially after joining the WTO, the scale of China’s outward FDI has been growing rapidly.

(ii) Maintaining and developing bilateral friendship and promoting global economic integration The establishment of the Belt and Road Initiative has brought about tremendous changes at the local level, not only greatly enhancing the degree of local openness, but also expanding the scope of external exchanges, stimulating more comprehensive cooperation, creating more opportunities for common development and ultimately achieving a win-win situation for both sides. In order to achieve sustainable development, it is necessary to adhere to strategic objectives, grasp effective strategic opportunities, comprehensively consider economic and social sustainability, realize existing possibilities and potential risks, as well as realize existing possibilities and dare to meet new challenges. China should actively utilize the investment opportunities in countries along the “Belt and Road”, strengthen cooperation with countries with great investment potential, and jointly explore the future development space, so as to achieve a win-win situation.

The implementation of the Belt and Road should be actively promoted, as well as the formation of a diversified, synergistic and sustainable development model in order to achieve sustainable economic and social growth. At the same time, land transportation networks should be improved to create diverse and sustainable channels of communication to meet the country’s economic and social needs for two-way mobility.” The two core tasks of the Belt and Road are to realize global connectivity and cross-border exchanges. In order to achieve this, cross-border infrastructure must be developed to better support the economic development of the two regions and to enhance cross-border exchanges, as well as to realize the flow of capital and the sustainable development of logistics.

(iii) Promoting hierarchical and differentiated development of provinces along the Belt and Road The implementation of “One Belt, One Road” requires the joint efforts of the central and western regions, with the linkage of the three economic and social development belts of the Pearl River Delta, the Yangtze River Delta and Beijing-Tianjin-Hebei, the Pearl River-West River Economic Belt, and the Bohai Bay-Mongolia-New Zealand Axis, as well as the government’s policy guidance, so as to enable the central and western regions to take full advantage of their own strengths and to actively participate in promoting the implementation of “One Belt, One Road”, so as to achieve the goal of jointly promoting the implementation of “One Belt, One Road”. In order to promote the implementation of the “Belt and Road”, the central and western regions will jointly promote the implementation of the “Belt and Road”. In order to promote exchanges and win-win situations in the central and western regions, we will actively participate in promoting the establishment of a financing platform for the Belt and Road, as well as the operation of China-Europe liner trains, the transfer of processing trade and the transformation of scientific research results. In order for Chinese enterprises to achieve better results in the global market, it is necessary to strengthen the research and development of strategic products with advanced technologies, as well as to expand investment in the YRD region and accelerate the economic integration of the YRD region.

(iv) Strengthening the supervision of outward foreign direct investment to ensure that China enjoys fair and reasonable investment rights in the international market.

Over the past 20 years, the Central Committee of the CPC has implemented the strategy of “going out”, which has laid a solid foundation for Chinese enterprises to make overseas direct investment, and made China’s overseas direct

investment make great progress. Over the past 20 years, the implementation of the strategy of “going out” has brought great opportunities for China’s outward foreign direct investment. Over the past 20 years, China’s outward FDI has made great progress by leaps and bounds. The report of the 19th National Congress emphasized that China is moving from the track of high-speed growth to more excellent high-quality development. Currently, China’s economy is in a virtuous cycle, but its future development prospects remain to be explored. Therefore, the central government should strengthen the management of outward foreign direct investment, formulate policies in line with the current situation, and develop effective policy measures to meet current and future market demand. With the emergence of the “reversal”, there is a responsibility to actively participate in the liberalization, facilitation and sustainability of the global economy and trade in order to achieve more balanced development. Therefore, it is important to seize the opportunity of the Belt and Road to actively participate and work together to achieve win-win sustainability. The opportunity of the Belt and Road strategy to advance smoothly globally should be fully utilized to rebalance China’s economic development and foreign development.

Since 2016, there have been prominent changes in the domestic and international environments for outward foreign direct investment by Chinese enterprises, and these changes will continue to be the trend of development. Over the past 20 years, strong government support has substantially boosted the participation of private enterprises, which has led to a rising share in the external direct investment sector, which has now reached a sizable level. Similar to state-owned enterprises (SOEs), private firms are also striving to maintain the country’s economic stability and promote sustainable economic development. The rise of private enterprises such as Huawei has injected new vitality into domestic economic development, enabling them to maintain a leading position in the international market. Both domestic and foreign state-owned enterprises and private enterprises need to be responsible and work together to make the domestic economy go global. The “Going Global” guidelines show that private companies have unique characteristics such as ROI, risk control ability, and ROI, therefore, the “Going Global” guidelines at home and abroad are worth promoting. The government should make efforts to improve laws and regulations for private companies and increase financial support for them. In addition, China will further enhance its infrastructure construction in coastal countries, especially in the fields of transportation and IT.

(v) Effectively promoting the development of global trade through the facilitation of “trade facilitation”. The introduction of “One Belt, One Road” has injected new vitality into the trade activities of the countries along the route, and its introduction has greatly boosted the local economic growth, and at the same time, the introduction of “One Belt, One Road” has brought more opportunities for the domestic enterprises in China, which can both inject new impetus into the local economic growth and enhance the economy of China in a more sustainable and sustainable way, and provide a more healthy and sustainable enhancement for China’s economic growth to inject new vitality and make China’s economy healthier and more sustainably enhanced. Chinese enterprises need to focus on the future, actively participate in the development of the Belt and Road, and continuously improve the appearance, performance, and functions of their products, as well as develop internationally recognized brands with competitive advantages, in order to satisfy the needs of the international market and continuously promote their own development. By strengthening road construction, improving policy coordination, and realizing connectivity, trade relations between China and the Silk Road countries have been significantly improved, providing strong support for the long-term stable growth of China’s export trade.

Conflict of interest

The authors declare no conflict of interest.

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