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Study on the Emission Reduction Effect of China's OFDI in Countries along the Belt and Road

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Abstract: With extreme weather events occurring more frequently around the world, urgent action on climate change is becoming increasingly urgent. In the countries along the "Belt and Road", many adopt extensive development methods and face increasing pressure on carbon emissions. This paper explores the impact of China's outward direct investment (OFDI) on carbon dioxide (CO2) emissions from 108 countries along the route that have joined China's Belt and Road Initiative, reported by Xinhua News Agency, from 2005 to 2020. The findings show that China's OFDI helps reduce carbon emissions in host countries, strongly refuting the claim that China's OFDI poses an environmental threat. At the same time, OFDI has promoted the spread of environmental protection technology and industrial upgrading in countries along the route, especially in developing countries, which may bring the phenomenon of "pollution halo". Based on the results of the study, it is suggested that China and countries along the "Belt and Road" should carry out international environmental technology exchanges and cooperation, and strengthen green and low-carbon investment in these countries. These cooperation measures will help push countries along the Belt and road towards a more sustainable development path and jointly address the challenge of global climate change.

Keywords: Foreign direct investment, Carbon emissions, The Belt and Road Initiative, Pollution halo hypothesis, Pollution paradise hypothesis.

1. Introduction

In recent years, although there has been a trend of "anti-globalization" at the international level, which attempts to weaken each other's connections through economic "decoupling" between countries, the interdependence and cooperation trends of the global economy remain strong. China will further expand its opening up to the outside world during the "14th Five-Year Plan"[1]and is committed to building a higher-level open economic system. China remains committed to actively engaging in global economic governance, fostering a new paradigm of openness that is broader, more inclusive, and mutually advantageous. As China's economy expands rapidly and its openness to the world deepens, the pace of Chinese enterprises' foreign direct investments is intensifying, positioning them as a significant player in global competition and collaboration.

However, as China's investment grows, it also faces the challenge of rapidly increasing carbon emissions. At present, China has become the world's largest carbon emitter. In September 2020,

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during the general debate of the 75th United Nations General Assembly, General Secretary Xi Jinping made a significant announcement regarding China's environmental commitments. He stated that China would enhance its nationally determined contributions by implementing more robust policies and initiatives. The country aims to peak carbon dioxide emissions before 2030 and is determined to achieve carbon neutrality by 2060[2].China is sparing no effort to plan and implement a series of plans, aiming to join hands with the international community to respond. Global climate challenge. However, on the international stage, misunderstandings and doubts about China's motivations for overseas investment still exist. Concerns surrounding China's overseas investments have somewhat impeded their progress, posing threats to investment security and heightening potential risks associated with direct investments abroad. Consequently, it is crucial to investigate the influence of China's outward foreign direct investment (OFDI) on the carbon emissions of host countries. Such exploration is essential for advancing the sustainable development of China's foreign investment initiatives.

2. Literature Review

The interplay between foreign direct investment (FDI) and carbon emissions has attracted considerable attention in academic research. Some researchers argue that FDI can help mitigate rising carbon emissions, exhibiting what is termed a "pollution halo" effect. For instance, Chu Dongmei and Wu Wei examined the influence of China's "Belt and Road Initiative" investments on climate risks in participating countries, focusing on how these investments can alleviate climate-related challenges. They pointed out that OFDI can reduce carbon emission intensity by promoting technology transfer and industrial upgrading, thereby reducing climate risk[3]. Liu Chao, Wu Chun, and Li Zenggang used panel data regression analysis to reveal the mechanism by which OFDI reduces carbon emissions by promoting energy structure optimization and technological progress, and identified that OFDI has a suppressive effect on carbon emissions in the countries along the Belt and Road route[4]. Meanwhile, Chen Yali analyzed data on FDI and carbon emissions from industrial enterprises across 30 provinces in China between 2013 and 2020. The findings indicated no significant variation in the impact of manufacturing FDI on carbon emissions, with only minor changes observed in certain coefficients[5], suggesting the absence of a "pollution haven" effect in China. Additionally, using a spatial Durbin model, Zhai Chaoying and Huang Ruoyun investigated the spatial spillover effects of China's FDI on carbon emissions. Their results demonstrated that Chinese foreign investments significantly reduce carbon emissions in host countries, and Chinese investment is an environmentally friendly investment[1].

Conversely, some researchers have found that OFDI can contribute to increased carbon emissions and support the "pollution haven" hypothesis. For instance, Joseph et al. analyzed data from 1995 to 2015 and highlighted that the inflow of FDI into countries participating in the Belt and Road Initiative exacerbated environmental pollution[6]. Similarly, Sapkota and Bastola examined time series data from 14 Latin American nations between 1980 and 2010, concluding that the pollution haven hypothesis holds true for this region[7]. Furthermore, Zhao Jun and Wang Xiaochen investigated panel data from 2003 to 2019 concerning China and Belt and Road countries, focusing on the threshold effects of financial development on the relationship between OFDI and carbon emissions. Their findings indicated that the potential for financial development in these countries has not yet been fully realized in terms of promoting carbon emission reduction[2].

Mahadevan et al. conducted a study using data from 64 countries along the Belt and Road Initiative between 2003 and 2014. Their analysis revealed that China's FDI exerts a complex influence on pollution levels in these nations. Specifically, they identified a "pollution halo" effect in low-income Belt and Road countries, while a "pollution refuge" phenomenon was observed in higher-income Belt and Road countries[8].

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Other researchers have argued that FDI does not significantly affect carbon emissions. Li Zihao's research found that from 1995 to 2011, the influence of foreign direct investment (FDI) on carbon emissions in Chinese provinces and municipalities with medium per capita income was found to be negligible [9]. Additionally, Zhang et al. analyzed data from 52 countries involved in the "Belt and Road" initiative spanning from 1993 to 2018 and found that foreign direct investment inflows were positively correlated with consumption-based carbon emissions but not significantly[10].

Generally speaking, there are shortcomings in current research results in the field of research on the relationship between China's OFDI and carbon emissions in countries along the "Belt and Road". Therefore, this article will rely on the latest OFDI data from China to countries along the "Belt and Road" to conduct an in-depth analysis of the potential impact of this investment behavior on the carbon emissions of countries at different stages of development, aiming to build a green and low-carbon "Belt and Road" initiative policy. Provide strong data support and theoretical reference.

3. Theoretical Analysis

International Investment and Environmental Protection Theory: This theory focuses on the interaction between international investment activities and environmental protection. International investment helps improve the environmental quality of host countries by introducing more advanced technologies, promoting industrial upgrading, and improving environmental standards. However, inappropriate investment may bring risks of environmental pollution and over-exploitation of resources.

Pollution halo and pollution paradise hypotheses: These two hypotheses mainly focus on the two different impacts of international investment on the environment. The pollution halo hypothesis believes that the environmental protection means and methods used by multinational companies in the process of foreign investment will have a demonstration effect in the investment target country, thereby improving the host country[11]. In contrast, the pollution paradise hypothesis suggests that firms in pollution-intensive sectors often choose to invest and operate in countries or regions where environmental standards are less stringent, thereby avoiding strict environmental protection policies[12].

These theories provide an important theoretical framework for analyzing how China's outward foreign direct investment (OFDI) influences the emission reduction initiatives of countries involved in the Belt and Road Initiative. They reveal the complex relationship between international investment and environmental protection, highlighting possible challenges and opportunities. These theories not only help understand past investment practices, but also provide valuable insights for future investment decisions. This article will employ these theories to evaluate the impact of China's outward foreign direct investment (OFDI) on the emission reduction efforts of Belt and Road countries. The analysis will concentrate on three key aspects: first, assessing whether China's OFDI significantly affects carbon emissions in these nations; second, examining the extent to which China's OFDI facilitates the transfer of environmental protection technologies and promotes industrial upgrading; and third, investigating the existence of the "pollution halo" hypothesis among countries with varying levels of development.

4. Research Design

4.1. Variable Definition And Data Source

4.1.1. Explained Variable: Carbon Emissions (CO2)

Total CO2 emissions (total metric tons)

As an important indicator to measure the carbon emission level of a country or region, the total amount of carbon dioxide emissions intuitively reflects the country's overall carbon emissions. This

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indicator not only helps to gain a deeper understanding of a country or region's carbon emissions, but also reveals the specific effects of economic activities on the environment. In the fields of environmental economics and climate change research, total carbon dioxide emissions are widely used as an explanatory variable to evaluate the actual impact of various policies, measures or economic activities on carbon emissions. Therefore, this article chooses total carbon dioxide emissions as the explained variable, and the data comes from the World Bank database (World Development Indicators).

4.1.2. Explanatory Variable: OFDI

China's foreign direct investment stock (10,000 US dollars)

OFDI plays a key role in the transnational movement of production factors like capital and technology. It significantly influences the host country's industrial structure, technological level, energy consumption and other aspects, thereby affecting its carbon emission level. Thus, examining the connection between OFDI and carbon emissions will provide a deeper insight into how economic activities relate to the environment. China's OFDI mainly includes stock data and flow data. However, due to China's reverse investment behavior, there are lots of negative numbers in China's OFDI flow data. Therefore, this article uses China's OFDI stock for research.

4.1.3. Control Variable

To investigate the effect of OFDI on carbon emissions and minimize potential estimation errors from omitted variables, this study incorporates several control variables relevant to the context, as detailed in Table 1.

Table 1: Variables, measures, and data sources.

	Variable	Measure Data	Source
Explained variable	Carbon emission	The total carbon dioxide emissions of the host countries along the "Belt and Road", the value is taken as the logarithm (lnCO2)	World Development Indicators(2005-2020)
Explanatory variables	China's foreign direct investment stock	China's stock of OFDI in host countries along the "One Belt, One Road" initiative, the value is logarithmic (lnOFDI)	China's Overseas Direct Investment Statistical Bulletin(2005-2020)
Control variables	GDP per capita	The per capita GDP of the host countries along the "Belt and Road", the value is taken as the logarithm (lnpGDP)	World Development Indicators(2005-2020)

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Table 1: (continued)

	Population density	The number of people per square meter of land area in the host countries along the "Belt and Road", the value is taken as the logarithm (lnpOPD)	World Development Indicators(2005-2020)
	Urbanization rate	The proportion of urban population in host countries along the "Belt and Road" to the total population, the value is logarithmic (lnUrbn)	World Development Indicators(2005-2020)
	Industrial structure	The proportion of industrial added value of host countries along the "Belt and Road" to GDP, the value is taken as a logarithm (lnStr)	World Development Indicators(2005-2020)
	Energy consumption structure	Energy usage of host countries along the "One Belt and One Road" (per capita kilogram of oil equivalent), the value is taken as the logarithm (lnpE)	World Development Indicators(2005-2020)
	Trade openness	Trade openness of host countries along the Belt and Road, measured as a simple average of tax rates applied to all products (Tra)	World Development Indicators(2005-2020)

Data source: World Development Indicators (WDI), China's Overseas Direct Investment Statistical Bulletin

Gross domestic product per capita (pGDP)

Per capita GDP serves as a vital measure for assessing a country's or region's economic development. Generally, there is a relationship between economic development and carbon emissions. By controlling for this variable, we can more effectively analyze the impact of foreign direct investment on carbon emissions, reducing the influence of economic development levels.

Population Density (pOPD)

Population density has a direct effect on energy consumption and carbon emissions. In densely populated areas, lifestyle choices and energy use patterns can differ significantly, influencing overall emissions. Including population density as a control variable allows for a more precise evaluation of the effects of foreign direct investment.

Urbanization rate (Urbn)

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The urbanization process is tightly linked to energy consumption and carbon emissions. As urbanization levels increase, lifestyles and consumption patterns will change, affecting carbon emissions. Controlling this variable can help clarify the distinct impact of FDI on carbon emissions across various stages of urban development.

Industrial Structure (Str)

Varying proportions of industrial added value in GDP (i.e., industrial structure) lead to notable differences in energy consumption and carbon emission intensity. By controlling this variable, we can explore the carbon emission characteristics of different industries in the development process and their response to foreign direct investment.

Energy consumption structure (pE)

Different energy sources have very different carbon emission factors, so adjusting the structure is a crucial method for lowering carbon emissions. Incorporating energy consumption structure into the analytical framework helps to more comprehensively understand how foreign direct investment affects carbon emissions by changing the way energy is used.

Trade openness (Tra)

International trade activities are often accompanied by an increase in logistics and transportation, which indirectly affects carbon emissions. At the same time, an open economic system is more likely to attract foreign direct investment. Therefore, using tax rate as an indicator of trade openness can provide a new perspective for this study, and further distinguish the independent effects of international trade and FDI on carbon emissions.

4.2. Build Model

Utilizing relevant data from Belt and Road countries spanning 2005 to 2020, this paper develops a quantitative model to investigate how China's OFDI affects carbon emissions in these nations. When selecting samples, this paper excludes 30 countries with serious data missing from the 138 countries that have joined China's Belt and Road Initiative reported by Xinhua News Agency in 2023, and finally uses 108 countries as samples for research.

This paper develops an empirical quantitative model to assess the influence of OFDI on carbon emissions as follows:

$$\ln CO2_{it} = \beta 0 + \beta 1 \ln OFDI_{it} + \beta 2 \ln pGDP_{it} + \beta 3 \ln pOPD_{it} + \beta 4 \ln Urbn_{it} + \beta 5 \ln Str_{it} + \beta 6 Tra_{it} + \beta 7 \ln pE_{it} + \varepsilon \quad (1)$$

Where i represents the country, t represents the year, ln represents the natural logarithm of the variable; β0 is the constant term, β1, β2...β7 represent the regression parameters corresponding to each variable, and ε is the random interference term.

4.3. Descriptive Statistics of Variables

In order to reduce data volatility and eliminate heteroscedasticity, this paper uses logarithmic processing for all variables except per capita carbon dioxide emissions and trade openness before statistical analysis. The descriptive statistical results of all variables discussed in this paper are presented in Table 2.

Table 2: Descriptive statistics of all variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
lnOFDI	1712	8.997232	2.657551	0	15.6049

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Table 2: (continued).

$lnCO_2$	1728	9.557311	2.111335	4.120662	14.34825
ln pGDP	1728	8.587059	1.248596	5.075654	11.72544
ln pOPD	1728	4.21079	1.317724	0.4985982	8.982923
ln Urbn	1728	3.969189	0.4284723	2.753661	4.60517
ln Str	1726	3.24775	0.46314	1.617269	4.462103
Tra	1728	7.825673	5.280571	-14.74	28.45
ln pE	1719	7.004007	1.242985	2.024855	9.923508

Data source: World Development Indicators(WDI), China's Outward Direct Investment Statistical Bulletin

According to the data in Table 2, it can be clearly observed that the distribution and characteristics of different variables among the 108 countries along the "Belt and Road" show significant differences. The mean value of OFDI is relatively high, about 9.0 (on the natural log scale), indicating that the sample countries generally have high OFDI levels. However, the standard deviation also reaches 2.7, which reveals that there are large differences in OFDI between different countries, and some countries may have a higher degree of internationalization and a wider overseas investment layout. The average levels of per capita gross domestic product (pGDP), urbanization rate (Urbn), and industrial structure (Str) are 8.6, 4.0, and 3.2 respectively (on the natural log scale). The changes in these indicators are relatively small, showing that The sample countries have certain commonalities in these aspects. However, trade openness (Tra) shows significant differences among countries, with a standard deviation as high as 5.3 and values ranging from negative values to higher positive values. This reflects the huge differences in the participation of different countries in international trade. Some countries actively integrate into the global economic system and promote trade and capital flows by adopting more open policies, while other countries are relatively closed and restrict Participation in external economic activities. Statistics on total carbon dioxide emissions (CO_2) and population density (pOPD) reveal significant differences in environmental protection and population distribution among the sample countries. The mean value of the energy consumption structure (pE) is 7.0 (on the natural log scale) and the standard deviation is 1.2, showing that there is a certain diversity in the energy consumption structure among the sample countries. Although there are differences, these differences are relatively small, reflecting some common trends or preferences in energy use, leaning towards a specific energy type or structure.

5. Empirical result analysis

5.1. Reference Regression

This paper uses total carbon dioxide emissions as the explained variable and adopts model (1) to explore the impact of China's OFDI in countries along the Belt and Road on their carbon emissions, while controlling for year and country differences. According to the Hausman test, the double fixed effects model is superior to the random effects model[13], so the double fixed effects model is selected to analyze the results of the benchmark regression. The results of the benchmark regression are presented in Table 3.

Table 3: Benchmark regression results.

	(1)	(2)
	fe	re
VARIABLES	$lnCO_2$	$lnCO_2$
lnOFDI	-0.019***	-0.013***

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Table 3: (continued).

	(-4.33)	(-2.86)
lnpGDP	0.258***	0.217***
	(12.58)	(10.16)
lnpOPD	1.027***	0.727***
	(18.76)	(14.63)
lnStr	0.299***	0.328***
	(11.85)	(12.31)
lnpE	0.137***	0.151***
	(7.82)	(8.15)
lnUrbn	0.822***	1.044***
	(6.81)	(8.79)
Tra	-0.004*	-0.004*
	(-1.89)	(-1.70)
Constant	-1.913***	-1.484***
	(-3.99)	(-3.03)
Observations	1,701	1,701
R-squared	0.549	
Number of countrycode	108	108
r2_a	0.512	.
F	86.88	.

Note: ***, ** and * represent the significance levels of 1%, 5% and 10% respectively; the values in brackets are t values.
Data source: World Development Indicators(WDI), China's Outward Direct Investment Statistical Bulletin

As indicated in Table 3, the coefficient for OFDI is significantly negative at the 1% level, showing a value of -0.019 (in the fixed effects model), indicating that an increase of one unit of foreign direct investment will correspondingly reduce carbon dioxide emissions by 0.019 units. This is a significant result. China's OFDI in "Belt and Road" countries contributes to a reduction in the nation's carbon emissions. This aligns with China's commitment to green and sustainable development in the "Belt and Road Initiative," as well as its efforts to help countries along the route address climate challenges together. It is a strong refutation of the "environmental threat theory" of China's FDI.

Additionally, there are some situations worthy of attention in the control variables. Both GDP per capita and population density have a notable positive effect on carbon dioxide emissions, and both pass statistical tests, which reflects the close connection between economic activities and greenhouse gas emissions. As economic growth and per capita income rise, energy demand and consumption typically increase, leading to rising CO2 emissions. This finding underscores the difficulty of balancing economic growth with environmental conservation.

The industrial structure, energy consumption pattern, and rate of urbanization all positively influence carbon dioxide emissions. Specifically, the industrial structure significantly affects emissions, with a coefficient of 0.299, suggesting that a rising industrial proportion typically leads to higher energy use and increased emissions. This is because industrial activities usually require a large amount of energy support and the emissions during their production processes are relatively high. The positive impact of energy consumption structure (coefficient is 0.137) is also in line with expectations. More energy consumption often means more fuel burning, thereby leading to higher carbon emissions. The urbanization rate has a notable positive effect on carbon dioxide emissions, with a coefficient of 0.822, indicating a clear connection between urban growth and greenhouse gas

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emissions. As urbanization accelerates, energy consumption and emissions in areas such as buildings, transportation and infrastructure have increased, putting pressure on the environment.

However, unlike the above variables, trade openness negatively affects carbon dioxide emissions, indicated by a coefficient of -0.004. This result shows that high tax rates will stimulate energy efficiency improvements and clean technology innovation, and are supported by government environmental protection policies, thereby reducing carbon dioxide emissions. These mechanisms work together to make high tax rates play a key role in lowering carbon dioxide emissions.

5.2. Robustness Test

Here, this paper will use per capita carbon dioxide emissions (pCO2) to replace the explained variable total carbon dioxide emissions (CO2) to complete the robustness test. The findings are presented in Table 4.

Table 4: Robustness test results.

	(1)
	n1
VARIABLES	pCO_2
lnOFDI	-0.1863***
	(0.0447)
lnpGDP	0.9691***
	(0.2350)
lnpOPD	-3.2834*
	(1.6680)
lnStr	0.1445
	(0.2785)
lnpE	0.8215**
	(0.3220)
lnUrbn	4.0829**
	(1.8117)
Tra	-0.0264*
	(0.0148)
Constant	-10.2416*
	(5.6071)
Observations	1,701
Number of countrycode	108
R-squared	0.303
Indus FE	YES
Year FE	YES

Note: ***, ** and * represent the significance levels of 1%, 5% and 10% respectively; the values in brackets are robust standard errors.
Data source: World Development Indicators(WDI), China's Outward Direct Investment Statistical Bulletin

The results indicate that the direction of the regression coefficients for each variable aligns with the benchmark regression findings, demonstrating that the empirical test results in this paper are robust.

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5.3. Heterogeneity Test

Here, this paper divides the countries along the Belt and Road into developed countries and developing countries for group regression and completes the heterogeneity test. The findings are displayed in Table 5.

Table 5: Heterogeneity test results.

VARIABLES	(1) developing $lnCO_2$	(2) developed $lnCO_2$
lnOFDI	-0.0187**	-0.0095
	(0.0076)	(0.0134)
lnpGDP	0.0964	0.2322***
	(0.0848)	(0.0640)
lnpOPD	0.8200***	0.8655***
	(0.2788)	(0.1373)
lnStr	0.2565	0.2985***
	(0.2054)	(0.0871)
lnpE	0.5457***	0.1147*
	(0.1084)	(0.0633)
lnUrbn	0.1826	0.6865
	(0.4328)	(0.4291)
Tra	-0.0040	-0.0026
	(0.0081)	(0.0035)
Constant	-0.1678	-0.3762
	(2.2332)	(1.6506)
Observations	382	1,319
R-squared	0.597	0.588
Number of countrycode	24	84
Indus FE	YES	YES
Year FE	YES	YES

Note: ***, ** and * represent the significance levels of 1%, 5% and 10% respectively; the values in brackets are the standard errors of the estimated coefficients.
Data source: World Development Indicators(WDI), China's Outward Direct Investment Statistical Bulletin

Based on the data in Table 5, the influence of OFDI in developing countries on total carbon dioxide emissions (lnCO2) shows a significant negative effect (-0.0187) at the 5% significance level. This indicates that foreign direct investment tends to introduce cleaner and energy-saving production technologies and management models in developing countries, thereby reducing carbon dioxide emissions. On the contrary, in developed countries, the influence of foreign direct investment on carbon dioxide emissions is not significant, which may be because developed countries have already achieved relatively high achievements in environmental regulations, technological innovation, and energy management.

For other control variables, the impact of urbanization rate and trade openness has a minimal impact on carbon dioxide emissions at different levels of development countries. However, GDP per capita significantly affects carbon dioxide emissions in developed countries, which may be related to the larger scale of production and consumption activities in developed countries, leading to increased energy consumption and emissions. In developing countries, due to factors such as industrial structure and policy support, the impact of per capita GDP on emissions is not obvious. Population density

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significantly affects CO2 emissions in both types of countries, which may be related to increased energy demand and emissions resulting from concentrated populations. In terms of industrial structure, indicators measured by industrial proportion have a significant impact in developed countries. This may be because the industrial structure of developed countries is more diversified, including more clean and low-carbon industries. In developing countries, because the industrial structure is relatively simple, mainly composed of high-emission industries, the influence of the industrial sector on carbon dioxide emissions is negligible. In addition, in developing countries, the composition of energy consumption has a greater effect on carbon dioxide emissions. This may be due to the fact that developing countries rely more on traditional high-carbon energy, leading to a more significant influence of the energy consumption structure on emissions. Conversely, developed countries are more diversified and cleaner in their energy consumption structure, so their impact is not as significant as that of developing countries.

6. Conclusion

6.1. China's OFDI Helps Reduce Carbon Emissions in Host Countries

Regarding the effect of China's OFDI on carbon emissions in Belt and Road countries, empirical findings indicate that China's investments lead to a decrease in carbon emissions in these host nations. The result is a strong rebuttal to the "environmental threat theory" of China's FDI, and demonstrates China's determination to adhere to the idea of sustainable and eco-friendly development within the Belt and Road Initiative. With the purpose of further consolidate this achievement, the Chinese government should continue to advance the development of an environmentally friendly Belt and Road, encourage enterprises to adopt more environmentally friendly technologies and standards in overseas investment, and encourage the sustainable growth of partner nations. In the context of cooperation, China should strengthen cooperation with international organizations and host governments, jointly formulate and promote environmental standards, and further improve the level of global environmental governance.

6.2. China's OFDI Has Brought about the Transfer of Environmental Protection Technology and Industrial Upgrading

The findings demonstrate that China's OFDI has promoted the dissemination of environmental protection technologies and industrial upgrading in nations adjacent to the Belt and Road. The implementation of technology and management by China's overseas investment has brought cleaner and energy-saving production methods to these countries, helping to reduce carbon emissions. Foreign direct investment in developing countries also shows a negative effect, further supporting this result that OFDI may tend to introduce more environmentally friendly production technologies and management models. In order to further strengthen this trend, the Chinese government can formulate corresponding policies to encourage and support enterprises to actively transfer environmental protection technologies and experiences to nations along the Belt and Road in OFDI. The government can also promote international exchanges and cooperation in environmental protection technologies and support enterprises to take part in the development and execution of global policies environmental protection standards to improve further cooperation and advancement in the field of environmental protection.

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6.3. Foreign Direct Investment in Developing Countries May Produce a "Pollution Halo" Hypothesis

Research results show that in developing countries, carbon emissions are negatively influenced by foreign direct investment, and this influence is more pronounced than in developed countries. This shows that FDI can help underdeveloped nations introduce cleaner and more energy-saving production technologies and management methods, thereby effectively reducing carbon emission levels. This also supports the "pollution halo" hypothesis to some degree. In order to effectively utilize foreign investment and avoid possible negative impacts, developing countries need to strengthen screening and guidance when attracting investment and give priority to the development of environmentally friendly, low-carbon and sustainable industries. At the same time, host countries must strengthen the development and execution of environmental conservation laws to ensure that foreign investments comply with local environmental standards and prevent the occurrence of "pollution havens".

These research results provide an important reference for understanding the actual effect of China's OFDI on decreasing emissions in nations, and also establish a dependable foundation for future policy formulation. In the context of globalization, countries need to work together to promote global environmental sustainable development by sharing environmental protection technologies and optimizing industrial structures.

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