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The impact of One Belt and One Road Initiative on the diversification of export products from countries along the Belt and Road to China

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Abstract: *With the further deepening of the international division of labor and the further extension of the global value chain, the diversification of export products from countries around the world has been further enhanced. "The impact of the initiative on the diversification of China's export products has important practical significance. Firstly, this paper introduces the Herfindal-Hirschman index (HHI) to measure the diversification of export products, and analyzes the current situation of the diversification of export products from countries along the Belt and Road to China based on the data from 2010 to 2019; Secondly, this paper matched CEPII data, United Nations data, World Bank WDI data and the data of the "Belt and Road" cooperation agreement signed with China to form the sample data of 63 countries from 2009 to 2019. Based on the pseudo-natural experiment framework, the dual difference model is used to test the relationship between the participation of countries along the Belt and Road Initiative and the diversification of their exports to China. The research perspective is focused on participating countries and non-participating countries, and a comparative analysis is conducted to explore whether joining the Belt and Road Initiative is conducive to improving the diversification level of export products from countries along the Belt and Road initiative to China compared with countries not participating in the Belt and Road Initiative; Finally, based on the qualitative analysis and empirical analysis above, this paper puts forward a series of countermeasures and suggestions, such as focusing on exporting domestic competitive products, reforming the exchange rate management system and promoting the development of cross-border e-commerce.*

Keywords: *Export product diversification; HHI; Theil; One Belt and One Road*

1. Introduction

The Belt and Road Initiative proposed by China is of great significance to the trade development of countries along the routes, and many researchers have studied this issue. At present, the understanding of this policy mainly focuses on how to achieve China's own development. In fact, the promotion of the Belt and Road Initiative should be a process that complements the economic development of neighboring countries and conforms to the interests of most countries. The Belt and Road Initiative should not be a train driven by a single Chinese locomotive. It should be a traditional train with power in every carriage [1].

The "Belt and Road" initiative can not only drive neighboring countries to maintain domestic macroeconomic stability and promote their own economic development, but also promote the development of foreign trade in countries along the route and achieve stable growth of foreign trade [2]. The belt and Road Initiative will reshape the world trade pattern [3]. In the past, we focused too much on China. What is the impact of this initiative on the diversification of exports from countries along the Belt and Road to China? What is the impact of this initiative on the existence of different products exported to China by participating countries and non-participating countries along the Routes? And what is the impact of this initiative on the diversification of China's export products from regions of countries along the Belt and Road? To solve the above problems will not only help China to continue to promote the Belt and Road Initiative and call on other countries to join in the belt and Road cooperation, but also have very important practical significance.

At present, there are a lot of researches on the Belt and Road Initiative. In the early stage of the Initiative, most of them are qualitative researches, studying the background and significance of the initiative and putting forward some relevant countermeasures and suggestions, which mainly focus on

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theoretical analysis rather than empirical research [4][5][6][7]. Subsequently, empirical studies on the Belt and Road Initiative began to appear in the research of the Belt and Road Initiative [8][9][10].

Later studies have emphasized the performance of the belt and Road Initiative, which can be divided into two types: one is pre-prediction, for example, CGE and other models are used for analysis and prediction [11][12]. One is a natural experiment framework, taking the Belt and Road Initiative as a critical point to analyze the impact of some factors affecting the Belt and Road Initiative on economic and trade cooperation between China and countries along the Route, basically using the differential method [13][14].

The research on export product diversification can be summarized into the following three aspects: the calculation method of export product diversification; explore the influencing factors of export product diversification and study the relationship between export product diversification and economic growth. There are many calculation methods of export product diversification, but there is no unified standard to calculate export product diversification at present. The measurement of this index can probably be summed up in the following four methods. The first method is direct counting. Download the data from UNCOMTRADE data according to the classification standard of HS6 bit code, and classify and summarize the products, so as to obtain the number of export types of each product [15][16]. The second method is the concentration index of export products. For this method, there are two common indicators to measure, namely The Herfindal-Hirschman index (HHI) and Theil entropy index [17][18]. This method is no longer limited to considering only the proportion of export products, but more reflects the proportion distribution of export products [19].

Many scholars have discussed the factors that influence the diversification of export products by theoretical and empirical analysis, such as exchange rate [20], financial development [21][22], etc. Based on Melitz analysis framework, Huang Xianhai and Zhou Junzi[23] used panel data and trade gravity model to conduct empirical research and found that the driving effect of export product diversification on China's export is increasing every year.

Diversified trade structure can effectively avoid the deterioration of the terms of trade [24]. However, most of the current studies on export diversification focus on a single country, and few scholars study the influencing factors of export diversification from the perspective of multi-country large sample data. Based on the data of 60 countries in the past 20 years, Parteka and Tamberi found the promotion effect of the total population of a country on export diversification [25].

But there are still some problems worthy of further discussion, such as put forward the "area" initiative since 2013, most scholars put research perspectives in China, the research on the impact of the initiative on China trade study, few scholars from along the country's point of view, to explore whether the initiative will promote the participating countries along the impact on China's export product diversification. In addition, there are few studies on the impact of a certain policy on export diversification, so the research objective of this paper is proposed.

There is no clear definition of product diversification. Broad and Weinstein argue that product diversity can refer to the number of product categories that a country exports [26]. Combined with the existing literature, this paper measures the diversification of export products mainly to see the proportion distribution of export products.

2. Evaluation index of export product diversification

Now about the export product diversification without clear measurement method, some scholars put the export market diversification is summarized as the increase of export products, and some scholars expanded export product diversification to horizontal diversity and vertical diversification of export products, the definition of this extension to diversify exports not only confined to the increase of export products, It is also reflected in the proportion of different products in exports. This paper mainly introduces the Herfindahl-Hirschman index (HHI) that can reflect the concentration degree of export products (Cadot et al.,2011).

We can use the Herfindahl index as a measure index, and its calculation formula is as follows:

$$HHI = \sum_{k=1}^{n} S_i^2 \quad (1)$$

Where, S_i represents the proportion of the KTH product exported by an exporting country to region i in the total export products exported by an exporting country to region i. $0 < HHI < 1$. The higher the HHI index is, the lower the diversification degree of the country's export products to region i; otherwise,

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the diversification degree of the country's export products to region i is high.

The diversification of export products from countries along the Belt and Road to China is estimated by using The Herfindah-Hirschman index (HHI). Through the above calculation, we can clearly see how the diversification level of export products from countries along the Belt and Road has changed since China put forward the Belt and Road Initiative. In addition, from the figure, we can see the influence of the belt and Road cooperation agreements signed between countries along the route and China on the diversification level of export products from countries along the route to China.

On the whole, since 2017, the concentration degree of export products from countries along the belt and Road, such as Myanmar, Bhutan and Azerbaijan, has been increasing, indicating that the diversification degree of export products from these countries to China is relatively low. This may be because with the continuous promotion of China's "Belt and Road" initiative, countries along the route have started closer economic and trade cooperation with China, focusing on exporting their own competitive products to seek a higher level of cooperation. However, a few countries, such as Timor-Leste, Brunei and Maldives, have seen a high level of diversification in their export products to China since 2017, which means the concentration of their export products to China is decreasing. In recent years, Timor-Leste has taken a series of measures in foreign trade to expand its exports, which reached 252 million US dollars in 2020, of which 0.01 million us dollars were exported to China. The main export products include coffee, timber, rubber, coconut and other cash crops. However, with the further development of bilateral cooperation, Timor-Leste and other countries will also focus on exporting products with their own comparative advantages, which will reduce the diversification level of their export products to China.

3. Model construction and data description

3.1 Model construction

The research purpose of this paper is to explore whether the participation of countries along the Belt and Road in the "Belt and Road" is conducive to the diversification of export products from countries along the belt and Road to China compared with non-participating countries. Its essence belongs to policy effect identification. Since the time when countries along the Belt and Road joined the "Belt and Road" Initiative was not consistent, multi-period DID was used in this paper to estimate the model. Multi-stage DID is used for the estimation of the model. Before the estimation, we need to set up the experimental group and the control group. Countries that have implemented policies are assigned to the experimental group and its value is 1; countries that have not implemented policies are assigned to the control group and its value is 0. In addition, we need to set before and after the experiment. Before the implementation of the policy, we set the value as 0, and after the implementation of the policy, we set the value as 1. Treati is a virtual variable of the treatment group, and Postit is a virtual variable of the treatment period. In multi-period DID, the effect of treati*Postit was equivalent to the multiple difference term (DID). It means that individual i is being processed in phase t. Therefore, the multi-phase DID model can be set as follows:

$$div_{it} = \partial_0 + \theta DID_{it} + \beta X_{it} + \mu_i + \gamma_t \quad (2)$$

The subscript i indicates the countries along the Belt and Road, and the subscript t indicates the year. The effect of policy treatment is DIDit. As for whether a country along the Belt and Road has joined the Belt and Road Initiative, the criterion given in this paper is whether the country has signed cooperation documents and memoranda with China.

In order to control for other variables that may affect the diversification of exports from countries along the Belt and Road to China, year and individual fixed effects are added to the model. In addition, control variables Xit, such as a country's resource endowment (Lnat), exchange rate and secure Internet server per million people (Internet PC), are added into the model to control the influence of some individual factors that change over time.

This paper takes 63 countries along the Belt and Road as samples for analysis, so this paper makes statistics on the response of 63 countries along the Belt and Road to the "Belt and Road". From 2014 to 2018, new countries will join the "Belt and Road" Initiative every year. By 2018, A total of 46 countries have joined the Belt and Road Initiative.

Firstly, based on the samples of 63 countries along the Belt and Road, this paper takes the year when countries along the Belt and Road participate in the "Belt and Road" as the year of policy

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implementation to construct a multi-period DID model. DIDit refers to the policy processing effect. When country i has signed the memorandum or cooperation document in year t, the value of this item is 1. When country i does not sign the cooperation agreement or memorandum in year t, the value is 0.

3.2 Data Source and Description

According to the Belt and Road Data analysis platform of Peking University, there are 64 countries along the Belt and Road, excluding China. Due to the absence of most data on Palestine, the final number of countries used in this paper is 63.

Explained variable: Export product concentration index (HHI). At present, there are many methods to measure the diversification of export products. This paper uses the processing method of Shen Guobing [27] for reference and uses HHI index to measure the influence of countries along the line on The diversification of China's export products. The specific calculation formula is shown in Formula (1), where Si represents the proportion of the KTH product exported by an exporting country to region I in the total amount of export products exported by an exporting country to region I. $0 < HII < 1$, the higher THE HII index is, the higher the concentration degree of the country's export product categories will be; otherwise, the diversification degree of the country's export product categories will be high.

Control variables: Referring to existing literatures, this paper selects three control variables at the national level, namely, resource endowment (Lnat), exchange rate and secure Internet server per million people (InternetPC). Resource endowment (Lnat), exchange rate, and Secure Internet server per million (InternetPC) are all from the World Bank database.

4. Empirical results and analysis

4.1 Baseline regression

4.1.1 Baseline regression analysis

Based on the model set above, this paper empirically tests the impact of joining the Belt and Road Initiative on the diversification of Export products from countries along the Belt and Road compared with non-participating countries, and the estimated results are shown in Table 1. Control variables are added in columns (1) - (4) to control the influence of national factors changing over time in countries along the belt and Road. As can be seen from the table, the result of the DIFFERENTIAL difference estimation item is positive, indicating that the Belt and Road Initiative will significantly increase the concentration of export products from participating countries to China compared with non-participating countries.

Table 1: Impact of the Belt and Road Initiative on export diversification of countries along the belt and Road

	(1) lHHI	(2) lHHI	(3) lHHI
D_i	0.135*	0.173*	0.142*
	(1.899)	(2.186)	(1.913)
lnat	0.071*	0.069	0.069
	(1.982)	(1.532)	(1.552)
exchange		-0.000	-0.000
		(-0.873)	(-0.300)
internetpc			-0.000
			(-0.732)
Year effects	Yes	Yes	Yes
Individual effects	Yes	Yes	Yes
N	674	576	518
R^2	0.893	0.890	0.907

Notes: ***, ∗ ∗ and ∗ indicate the significance level at 1% and 5% and 10% respectively. Standard error values are shown in parentheses.

4.1.2 Parallel trend test

DID is most commonly used in policy evaluation, and it needs to compare the differences before

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and after processing to achieve the processing effect. In the empirical analysis in this chapter, we compare the differences between countries along the Belt and Road before and after joining the Belt and Road Initiative and countries along the Belt and Road without joining the Belt and Road Initiative. It should be pointed out in particular that in order to use DID to estimate the model, the premise that needs to be satisfied is the common trend. That is, before the policy is implemented, the treatment group and the control group need to have the same trend of change. If this assumption is satisfied, it is reasonable to use DID method. There are three methods of parallel trend test, which are trend chart of explained variables, parallel trend test of residual mean and event study, and the event study method is mainly reported in this paper. The results visually present the parallel trend test results of the event study method. In 2013 China put forward "area" initiative, the first 3 period of treatment effect coefficient fluctuations near zero, that before the "area" initiative puts forward along the country's exports to China market concentration index and without too much change, but after the "area" initiative proposed, compared with "area" initiative put forward before, We can see that estimates of the effect coefficient of treatment start to be significant, suggesting that the policy is working.

4.2 Placebo test

Generally, there are two methods to conduct placebo test, one is to simulate the location of policy impact and the other is to simulate the year of policy impact. This paper adopts the method of simulating the year of policy impact. In the multi-stage DID, because each country joined the belt and Road Initiative at different times, it is necessary to randomly select a year from 2009 to 2019 for 63 countries as the policy time. In order to increase the randomness of the results, the time of 63 countries joining the BELT and Road Initiative was brought forward by 4 years respectively, so as to further test that the improvement of export diversification of countries along the Belt and Road to China is related to their joining the Belt and Road Initiative.

The empirical results show that there is no significant relationship between the diversification of export products from countries along the Belt and Road and their participation in the Belt and Road Initiative if 63 countries join the Initiative four years ahead of time. That is, it can be proved that the change in the trend of the treatment group and the control group after the policy intervention point is caused by this policy, rather than other policies in the same period, which further proves the robustness of the conclusion.

Table 2: Placebo test

	(1) lHHI	(2) lHHI	(3) lHHI	(4) lHHI	(5) lHHI
D_i	-0.008	0.037	0.053	0.025	0.024
	(-0.185)	(0.925)	(0.957)	(0.519)	(0.480)
lnat		0.080**	0.082*	0.079*	0.074
		(2.432)	(1.902)	(1.866)	(1.686)
exchange			-0.000	-0.000	-0.000
			(-0.942)	(-0.365)	(-0.435)
internetpc				-0.000	-0.000
				(-0.471)	(-0.334)
lgdp					0.080
					(0.586)
Year effects	Yes	Yes	Yes	Yes	Yes
Individual effects	Yes	Yes	Yes	Yes	Yes
N	693	674	576	518	515
R^2	0.887	0.892	0.889	0.906	0.906

Notes: ***, ∗ ∗ and ∗ indicate the significance level at 1% and 5% and 10% respectively. Standard error values are shown in parentheses.

5. Conclusions and Recommendations

5.1 Conclusion

The multiple difference method was used to carry out baseline regression, It can be found that,

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compared with non-participating countries along the Belt and Road, joining the Belt and Road Initiative is conducive to increasing the concentration of exports from countries along the belt and Road to China. To introduce elements of resources endowment, exchange rate and secure Internet servers per one million people control variable regression model can be found that the results remained significant, shows that countries along the "area" initiative to promote bilateral trade with China, but also to promote according to the actual situation of domestic exports of countries along the domestic comparative advantage products, achieve higher returns.

Therefore, based on the above conclusions, we call on countries along the Belt and Road to join the Belt and Road Initiative to achieve win-win cooperation. In view of the above conclusions, the following countermeasures and suggestions are proposed，Perhaps these suggestions can promote the development of countries along the Belt and Road.

5.2 Recommendations

Countries export their competitive products in accordance with the principle of comparative advantage. Countries along the Belt and Road should further strengthen communication on economic policies and have a better understanding of the price level and trade costs of relevant products at home and abroad. Understand the competitive products of the country, and actively seek cooperation with foreign countries on competitive products, so as to focus on exporting competitive products of the country, achieve economies of scale, and obtain higher profits.

Reform the exchange rate management system. For both China and countries along the belt and Road, the fluctuation of exchange rate will have a certain impact on the foreign trade of all countries, making it impossible for the foreign trade of all countries to develop stably. Therefore, it is very necessary for each country to establish a sound exchange rate management system. Countries can adopt the form of floating exchange rate. In this way, countries can control exchange rate to a certain extent and prevent the impact of exchange rate fluctuations on the foreign trade development of countries along the belt and Road. There is also a need to properly guard against financial risks and provide more flexible safeguards for currency exchange rates.

We will promote the development of cross-border e-commerce. From along the country's point of view, the development of electricity can promote along the country to export more products in China, traditional trade conditions may lack economies of scale, with the continuous development of cross-border electricity, along the state of China's export products are on the rise, along the state can under the condition of economy of scale to expand production, Therefore, it will be conducive to diversifying the export products of countries along the Belt and Road to China. From China's perspective, in recent years, China has been increasing its import of products. For example, we hold import fairs every year. China should also hold more import fairs every year to provide channels and platforms for importing more products.

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