

Article

# Can International Students in China Affect Chinese OFDI—Empirical Analysis Based on Provincial Panel Data

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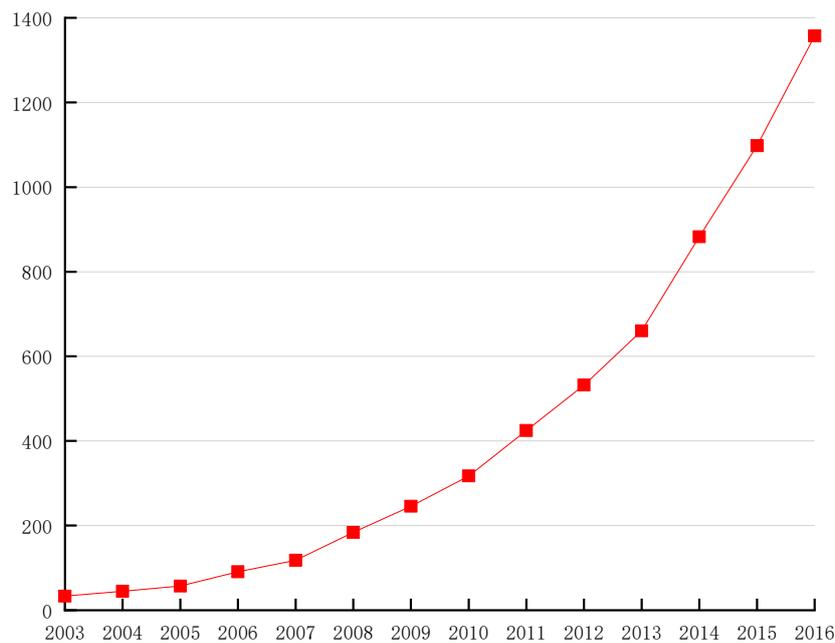
**Abstract:** The present study employs panel data of 29 provinces and municipalities in mainland China from 2003 to 2016 to empirically investigate the influence of international students on China’s outward FDI. The results show that international students in China can significantly promote outward FDI in various Chinese provinces. Moreover, we observe a substitution effect with export scale and wage level, that is, attracting international students can offset the negative impact of insufficient export scale and low wages on regional OFDI (outward foreign direct investment). From a regional perspective, the growth in international students’ inflows in China has a significant positive impact on OFDI of provinces along “the 21st Century Maritime Silk Road”, but has no significant impact on the provinces along “the Silk Road Economic Belt”. The above conclusions not only elaborate the regional distribution mechanism of OFDI in China, but also provide a reference for each province to formulate more favorable policies to attract foreign talent to effectively implement the strategy of “going global”.

**Keywords:** international students in China; outward FDI; export scale; wage level; “The Belt and Road”

**JEL Classification:** F21; F22

## 1. Introduction

China has gradually become an important global investor with the implementation of its “Going Global” strategy and “Belt and Road” initiatives. China’s OFDI (outward foreign direct investment) has been proliferating since 2003, and now China has become the second largest OFDI country following the United States. Figure 1 illustrates that China’s OFDI maintains the continuous growth tendency as the OFDI stock increased from \$33.2 billion in 2003 to \$1357.39 billion in 2016, an increase of nearly 41 times. Likewise, in order to enhance global competitiveness and resource allocation capabilities, more and more Chinese enterprises are now “going global” and pursuing enterprise development through OFDI. By the end of 2016, 24,400 domestic investors had set up 37,200 OFDI enterprises in 190 countries (regions). However, as the Chinese provincial enterprises actively entering overseas markets, the problem of insufficient international talent reserve has gradually emerged. International students in China are very familiar with the overseas markets and have a certain understanding of Chinese culture. They can serve as a link between Chinese enterprises and overseas markets. Their international exposure and strong cross-cultural communication ability can promote China’s OFDI and play a vital role in the “going global” strategy of Chinese enterprises. Therefore, for China, attracting international students is a new way to strengthen its OFDI. The relationship between the inflows of foreign talent and the promotion of outward foreign direct investment has also become a new research topic.

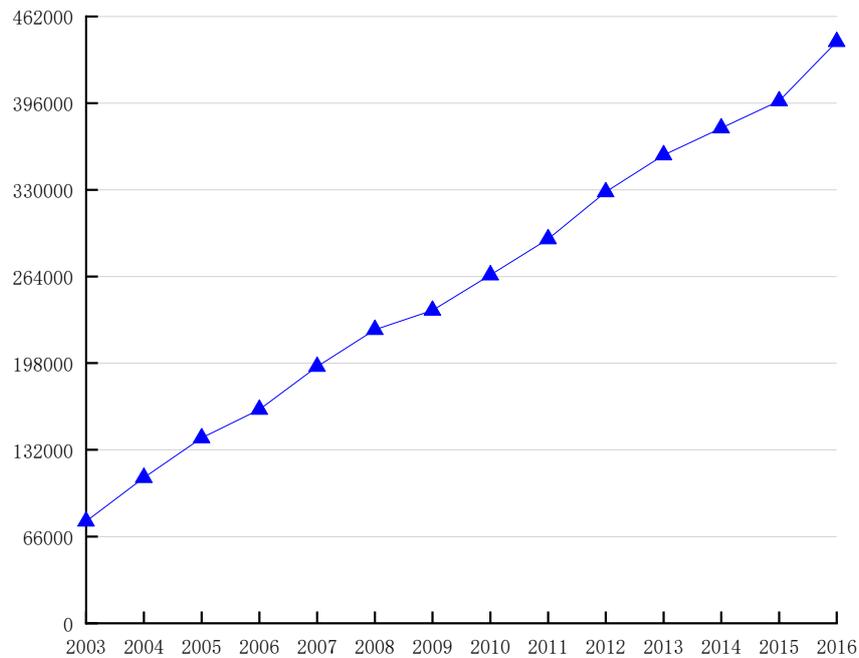


**Figure 1.** China's OFDI in billion USD. Source: Statistical bulletin of China's outward foreign direct investment (OFDI).

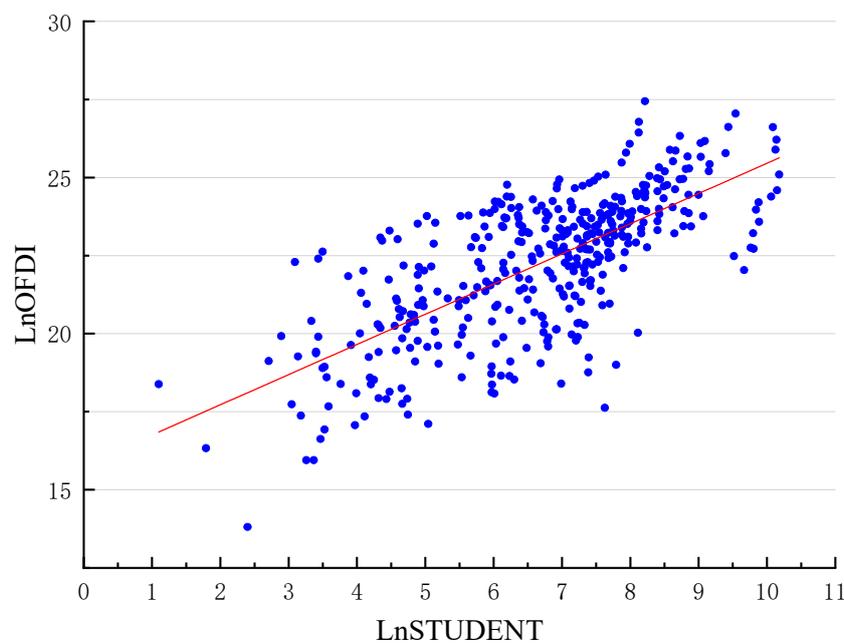
Most of the previous studies on the influencing factors of OFDI were based on Dunning's eclectic theory of international production to analyze the association between macro-level factors and OFDI. Notwithstanding, the significance of international talent has been largely overlooked in the existing studies on OFDI. The conventional international trade theory holds that labor is immobile across national borders. With the deepening of economic integration, the transnational talents with new technological know-how, ideas, and greater creativity are gradually breaking this traditional proposition (Gu and Qiu 2017b). The contribution of international talent flow to economy, politics, society and culture has been widely recognized. For China, the rapid development of education has attracted a large number of overseas students and is becoming one of the essential means to deepen cultural and educational exchanges with other countries. According to the statistics of the Ministry of Education of PRC, the total number of international students in China has observed a long-term growth trend, rising from 77,700 in 2003 to 442,800 in 2016 (Figure 2). China has become the third-largest destination country of studying abroad in the world and the largest destination country of studying abroad in Asia. In recent two years, there has been a phenomenal growth in the flow of international talents, and the regional competition to attract top talents has become increasingly fierce. This has led to a "talent war" among Chinese provinces. Beijing, Shanghai, Guangdong and some other places have put forward a series of "new talent policies" and increased the quota for foreign professionals, which provides strong intellectual support for local economic and trade exchanges and cooperation.

Currently, scholars mainly discussed the impact of international population flow on trade or the impact of international population flow on FDI. Examples include, but are not limited to, Gould (1994); Head and Ries (1998); Rauch (2001); Combes et al. (2005); Kugler and Rapoport (2007); White and Tadesse (2008); Javorcik et al. (2011); Gheasi and Nijkamp (2017). They generally report a beneficial impact of international population flow on trade and FDI. However, as an essential part of international talent, whether international students promote a country's OFDI has not been explored yet. Therefore, it is imperative to empirically ascertain whether international students influence the OFDI of a country. In the context of China, several studies have been conducted on international students in recent years, but most of the existing literature focuses on the current situation of overseas students or the problems in the development of international education in China and related policies. While others mainly analyze the relationship between OFDI and macro-economic

factors. However, Figures 1 and 2 demonstrate that there are some similarities in the growth trends of these two variables. Thus, we conjecture that there is an inherent association between international students in China and OFDI. The scatter plot in Figure 3 fits the curve on the relationship between the development scale of Chinese provinces and international students in China, as well as the scale of OFDI in the region. Hence, it provides preliminarily evidence in support of our hypothesis. The scatter diagram in Figure 3 inclines to the upper right, which confirms that there is a positive relationship between international students and OFDI.



**Figure 2.** Number of international students in China. Source: Ministry of Education of PRC (People's Republic of China).



**Figure 3.** The relationship between international students and OFDI (Outward Foreign Direct Investment).

Therefore, in this article, we take China as a case study to see whether international students in China will have an impact on OFDI in China. On the one hand, we can make up for the deficiencies

in the existing fields, clarify the impact mechanism of international students on OFDI, and provide reliable empirical support for it. On the other hand, it helps China's provinces and municipalities to make effective talent introduction policies, and it is also of great significance for the successful implementation of China's "going global" strategy.

The rest of the paper is organized as follows. In Section 2, we present a brief of literature review and analyze the impact mechanism of international students on OFDI, which is empirically examined in the analysis Section. Thereafter, Section 3 entails data and methodology, while Section 4 reports the empirical results and discussion. Finally, Section 5 concludes the paper with some policy implications.

## 2. Literature Review and The Impact Mechanism of International Students on Chinese OFDI

### 2.1. Literature Review

Currently, most studies on the influencing factors of China's OFDI from the perspective of the home country are based on Dunning's eclectic paradigm of international production. Qiu and Wang (2008) argue that the key motives of China's OFDI can be categorized into market-seeking, efficiency-seeking, and resource-seeking. The export scale, energy demand, and labor costs are the crucial factors which affect China's OFDI. Chen (2014) also draw a similar conclusion that Chinese enterprises invest overseas to reduce costs, seek resources, and explore new markets. Qiu and Yang (2015) studied Chinese State-owned listed companies and found that State-owned enterprises have dual motivations in OFDI. In addition to economic motivation, they are more concerned with the search for natural resources. However, Dunning's Eclectic theory of international production fails to fully explain the factors affecting the OFDI of emerging economies, therefore, in recent years more and more scholars turn to the system theory to explore the factors affecting China's OFDI. The institutional view holds that the external institutional environment of an enterprise is an important parameter affecting its behavior. Such institutional forces include formal systems (such as political, legal, economic and social) and informal systems (such as culture and customs). Buckley et al. (2007) analyzed the decisive role of institutional factors, such as government support for enterprises, national credit policy, and cultural similarity on OFDI. There are findings indicate that the institution factors help explain the OFDI in Chinese companies. By analyzing panel data of OFDI of China's provincial administrative regions from 2003 to 2009, Chen et al. (2012) argued that there were regional differences in the impact of government resource allocation capacity on OFDI of enterprises. Empirical studies by Zheng and Liu (2012) reveal that the level of marketization and governments' support affect China's OFDI. The above literature provides a rich theoretical basis for understanding the motivation of China's OFDI. However, it is equally important to ascertain whether cross-border population flow plays any role in the country or region's foreign economic and trade cooperation.

Most studies assert that international population flow can promote the development of a country's trade and the inflow of FDI. As for foreign trade, Gould (1994) was the first to demonstrate the trade-creating effect of the inflow of migrants in theory and practice. He believes that the transnational flow of talents can transmit the product information to home-country, thus, affecting the host country's import and export trade. The results show that both U.S. exports and imports are positively correlated with the number of immigrants in the United States' partner countries. Head and Ries (1998) and Wagner et al. (2002) reached a similar conclusion when examining Canadian data. Rauch (2001) argues that migrants can overcome various informal trade barriers in international trade through social networks, especially by reducing the information cost to promote trade and change the structure of exports. Combes et al. (2005) argue that most consumers have a "local propensity to consume" and the influx of talent across borders reinforces this tendency. Thus, it helps to enhance trade in goods and services across countries. Meanwhile, immigrants can also promote export trade by moderating trade barriers created by cultural distance (White and Tadesse 2008). Based on panel data of Chinese provinces, Wei and Chen (2015); Wei and Yuan (2017) concluded that international talent inflows promote import and export trade by acquiring transaction information and reducing transaction costs.

However, the degree of this promotion effect varies from region to region and across various modes of trade.

As for the introduction of foreign capital, [Gu and Qiu \(2017a\)](#) used the panel data of China's provinces from 2006 to 2013 and found that international talent inflows have positively contributed towards the improvement of regional FDI level. Moreover, this practice can affect the location distribution of FDI by improving the business environment and the level of geographical agglomeration of enterprises. [Flisi and Murat \(2011\)](#) found that concerning the UK, France and Germany, the links of immigrants prompt bilateral FDI. Particularly, the increase in skilled migrants has contributed to the growth of FDI. [Aubry et al. \(2016\)](#) studied the relationship between trade, migration and FDI in the context of enterprise heterogeneity and found that migration, especially skilled migration, had a positive impact on trade and FDI, but a more significant impact on FDI. [Gheasi and Nijkamp \(2017\)](#) contend that international migration promotes capital flows in capital recipient countries and has a positive and significant long-term impact on FDI. At the same time, among the immigrants with higher education, the relationship between FDI and migration is more pronounced ([Kugler and Rapoport 2007](#); [Javorcik et al. 2011](#)).

In short, the aforementioned literature reveals several studies conducted to examine the impact of international talent inflows on a country's trade and FDI. However, there is a dearth of literature on the special group of international students. Nonetheless, fewer of these studies focus on the impact of international students on OFDI. [Gao et al. \(2013\)](#) suggest that China's OFDI and international talent inflows show a trend of synchronous growth. [Gu and Qiu \(2017b\)](#) argue that there is a significant positive relationship between the development of China's overseas education and China's OFDI. However, the aforementioned studies are based on national-level data, and there is no such study which analyzes the issue using the provincial-level data. Besides, there is a lack of empirical evidence on the impact mechanism of this perceived association.

In order to make up for the lack of empirical research in this field, this paper use panel data of 29 provinces and municipalities in mainland China from 2003 to 2016 to analyze the impact of international students' inflows on growth in China's OFDI. In addition, this paper clarifies the impact mechanism of international students on China's OFDI and provides relevant policy options on how China can better attract and retain international students.

## 2.2. The Impact Mechanism of International Students on Chinese OFDI

Findings of the extant literature suggest that international students in China can promote the growth of OFDI in China's provinces through information transfer, human capital accumulation and labor cost acceleration.

International students in China can make up for the lack of understanding of foreign markets in different regions, thus, reduce the risk of enterprises' outward foreign investment. [Yang et al. \(2012\)](#) assert that the main bottleneck of outward foreign investment is that enterprises cannot correctly judge the market conditions, investment environment, customs regulations, and partners of capital recipient countries. On the other hand, Chinese enterprises are not familiar with the operating rules and legal system of international investment. The inflow of international students helps to alleviate these problems. International students can better grasp the information about overseas markets and have a language advantage. They can not only assist enterprises to make up for the information asymmetry in the unfamiliar business environment ([Head and Ries 1998](#)), but also help reduce the risks and uncertainties related to overseas business operations ([Wang 2007](#)). Based on this, international students who stay in China after graduation are more likely to work for Chinese enterprises that conduct business with the host country in order to maximize their employability. This trend serves as a bridge to increase bilateral trust and promote bilateral cooperation, reduce transaction costs and default risks. Moreover, international students can pass on private information about the host country markets and potential competitors to Chinese investment firms, hence, eliminating all kinds of uncertainty in the overseas investment process.

International students in China can promote the accumulation of human resources in various regions, thereby improving the capability of enterprises to invest abroad. When firms make direct investment abroad, they may confront the high level of uncertainty in such markets because of limited availability of human resources, such as the lack of transnational talents with international experience or research and development capabilities. Likewise, transnational enterprises in developing countries may encounter greater risk (Yuan and Pangarkar 2010). The introduction of foreign talents in China can bring forth technology spillover effect. The local labor force continuously learns from overseas talents through “learning by doing”, absorbs and masters advanced R&D and technological competencies, thereby improving the quality of the overall labor force (Gu and Qiu 2017b).

Besides, international students in China can drive up the wage level in different regions, thus, increasing the willingness of enterprises to invest abroad. International students with broad international vision and strong cross-cultural communication skills are an irreplaceable part of high-end human resources. Therefore, induction of international students into Chinese enterprises may lead to an increase in the cost of employment, thereby raising the local average wage level. Zheng (2017) found that rising wages will force enterprises to search foreign markets, hence, increase their willingness to invest abroad.

### 3. Methodology

#### 3.1. The Setting of the Econometric Model

Considering the structure of study data, panel regression models are employed to analyze the proposed relationship. Panel data model can be divided into three types: Mixed effect model, fixed effect model and random effect model. Therefore, the selection of the model is carried out in two steps. Firstly, the F statistic is used to figure out whether the individual effect exists or not. If the  $p$ -value of F statistic is less than 10%, it shows that a significant individual effect does exist, and the mixed effect model will not be appropriate. Secondly, the Hausman test is applied to choose between the fixed effect model and random effect model. If the  $p$ -value of Hausman test is significantly less than 10%, this indicates that the null hypothesis of “a random effect model is appropriate” should be strongly rejected; therefore, fixed effect model will be appropriate. In our case, the Hausman test with  $p$ -value 0.0085 and F statistic with  $p$  value 0.0000. The results reveal fixed effects as a suitable model in our case.

Moreover, the Variance Inflation Factor (VIF) of each Variance in the model is less than 10, and the mean value of VIF is 2.38. Therefore, there is no serious multi-collinearity issue in the model. Meanwhile, the estimation results of Ordinary Least Square (OLS) specification are not affected by the endogeneity problem. Given that the  $p$ -value of 0.554 was obtained by Davidson-MacKinnon test, which is similar to the (Durbin-Wu-) Hausman statistic. Furthermore, to ensure robustness, we take logarithms for all variables in order to reduce the effect of heteroscedasticity on the empirical outcomes. The proposed model specification is as follows:

$$\ln OFDI_{it} = \beta_0 + \beta_1 \ln STUDENT_{it} + \beta_2 \ln WAGE_{it} + \beta_3 \ln RD_{it} + \beta_4 \ln EC_{it} + \beta_5 \ln NAL_{it} + \beta_6 \ln EX_{it} + \lambda_i + \mu_t + \varepsilon_{it} \quad (1)$$

where  $i$  and  $t$  represent provincial regions and time period,  $\lambda_i$  is the fixed effect of the province,  $\mu_t$  is the fixed effect of time,  $\varepsilon_{it}$  is the random perturbation term.

Table 1 entails the correlation between variables. From the correlation matrix, we can conclude that there is a high degree of association between the variables. Nevertheless, OFDI has a very strong association with the export scale, numbers of student and local wages, and all the coefficients are above 0.70. Besides, it is found that there is a negative correlation with the level of nationalization and OFDI, which indicate that government control in a specific province is not conducive to the growth in OFDI.

Table 1. Correlation matrix.

	LnOFDI	LnSTUDENT	LnWAGE	LnEC	LnRD	LnNAL	LnEX
LnOFDI	1.000						
LnSTUDENT	0.704 ***	1.000					
LnWAGE	0.807 ***	0.536 ***	1.000				
LnEC	0.577 ***	0.576 ***	0.522 ***	1.000			
LnRD	0.625 ***	0.454 ***	0.325 ***	0.439 ***	1.000		
LnNAL	−0.615 ***	−0.456 ***	−0.466 ***	−0.338 ***	−0.534 ***	1.000	
LnEX	0.738 ***	0.760 ***	0.465 ***	0.473 ***	0.671 ***	−0.620 ***	1.000

Notes: \*\*\* Correlation is significant at the 0.01 level.

### 3.2. Variable Description

#### 1. Dependent variable

OFDI stock is the explained variable as a proxy to the scale of the outward foreign direct investment (OFDI) of Chinese provinces and cities.

#### 2. Core independent variable

The number of international graduates in provinces of China during the study period is taken as the core explained variable in the paper.

#### 3. Control variables

Dunning summarizes four main investment types: Resource-oriented investment, market-oriented investment, efficiency-oriented investment and strategic asset-oriented investment. In line with relevant studies, control variables applied in the paper are shown as below:

*Provincial labor cost (WAGE):* The labor cost can affect the intention of enterprises for OFDI. In relatively advanced eastern coastal areas in China, many labor-intensive enterprises which are losing the cost advantage are investing in establishing factories overseas. Therefore, considering the effects of the labor cost on OFDI intention of enterprises in provinces, the local labor cost is measured using the average wage of urban employees.

*R&D level of provinces (RD):* As embodied by the eclectic theory of international production of Dunning, one of the conditions of OFDI of enterprises is the ownership advantage, while strong R&D capacity may form the ownership advantage of an enterprise. Cohen and Levinthal (1990) also point out that the R&D capacity can be used to measure an enterprise's absorbing capacity. If an enterprise's OFDI aims at obtaining strategic assets, the enterprise with a low R&D capacity may reduce OFDI for a weak absorbing capacity. Therefore, the local R&D level is represented by R&D investment of the corresponding province to measure its effects on local OFDI.

*Energy demands of each province (EC):* Resource-oriented OFDI is mainly carried out for the purpose of accessing resources. There are obvious differences in resource distribution in Eastern China, Western China, and Central China. If the demand of one province for resources is far more than supply, it will stimulate local enterprises to obtain resources through outward investments. Total energy consumption is used to represent the motivation for seeking resources through outward investment in this paper.

*The degree of trade openness of provinces (EX):* A plethora of literature have shown that there is a complementary relation or substitution effect between commodity flows and capital flows. Considering that the regional export scale can reflect the local trade openness and the OFDI scale in places which have a higher degree of trade openness, the export scale of a province is taken as a proxy to represent the degree of trade openness.

*The nationalization level of provinces (NAL):* State-owned enterprises as the main "going out" party have always been the driving force of OFDI in China. According to 2017 Statistical Bulletin of China's outward foreign direct investment, OFDI stock of China's state-owned enterprises was as high as

81% in 2006, and as this number has been decreasing in recent years, it was still 49.1% in 2017. It shows that State-owned enterprises dominate provincial OFDI. The proportion of provincial fixed asset investments in aggregate fixed asset investment of China is taken as the index to measure the nationalization level of provinces.

The specific variable information is shown in Table 2.

**Table 2.** Variable information and data sources.

Variable Type	Name of Variable	Abbreviation of Variable	Standard of Measurement	Data Sources
Dependent variable	outward foreign direct investment	OFDI	CNY	The Statistical Bulletin of China's Outward Foreign Direct Investment (2003–2016)
Core independent variable	number of graduates of international students	STUDENT	per person	Educational Statistics Yearbook of China (2003–2016)
Control variables	energy consumption	EC	ten thousand tons of standard coal	China Statistical Yearbook on Science and Technology (2003–2016)
	research and development investment	RD	CNY	China Energy Statistical Yearbook (2003–2016)
	local labor cost	WAGE	CNY	Chinese Statistical Yearbook (2003–2016)
	nationalization level of provinces	NAL	provincial fixed asset investment/fixed asset investment of the whole society	
	export scale	EX	CNY	

### 3.3. Data and Sources

Since there is a dearth of reported data on Tibet and Guizhou, these provinces are not included in the empirical analysis. Meanwhile, referring to the practice of [Chen \(2014\)](#), OFDI data of Xinjiang Production and Construction Corporation is included in Xinjiang Uygur Autonomous Region. So, the final sample of this paper consists of data (2003–2016) of 29 provinces, municipalities and autonomous regions on the Chinese Mainland. Wherein, data of export scale and the average wage of urban employees was obtained from the *Chinese Statistical Yearbook*. Data about R & D investment and the total energy consumption of provinces was extracted from *China Statistical Yearbook on Science and Technology* and *China Energy Statistical Yearbook*. Data on the number of graduates of international students in the provinces of China are from *Educational Statistics Yearbook of China*. Data about OFDI stock of provinces was taken from *The Statistical Bulletin of China's Outward Foreign Direct Investment*. The amount was converted into Renminbi based on the exchange rate of the corresponding year.

### 3.4. Descriptive Statistics for Variables

This paper includes the data of 29 provinces, municipalities, autonomous regions and takes logarithms of all the variables. As shown in Table 3 (supplementary data of Table 2), the logarithmic maximum and minimum values for the interpreted variable OFDI stock are 13.809 and 27.445, respectively, the standard deviation is 2.255, which shows that the scale of foreign investment varies substantially from province to city, and there is the problem of uneven regional distribution. The difference in the number of students who came to China as the core explanatory variable is also significant across various regions with a standard deviation of 1.64. Besides, a more intuitive geographic distribution of international students can be observed in Figures 4 and 5, which also entails the number of students and growth trends in different provinces. As with the control variables,

there are considerable regional differences between R&D input and export scale. However, the regional differences in wage level, energy consumption, and nationalization level are relatively small.

Table 3. Descriptive statistics of variables.

Variable	Obs	Mean	Std.Dev.	Min	Max
LnOFDI	406	22.215	2.255	13.809	27.445
LnSTUDENT	406	6.648	1.642	1.099	10.18
LnWAGE	406	10.349	0.553	9.248	11.695
LnEC	406	18.372	0.75	15.738	19.779
LnRD	406	20.298	2.226	14.812	30.476
LnNAL	406	-1.22	0.37	-2.169	-0.497
LnEX	406	25.303	1.65	21.266	29.019

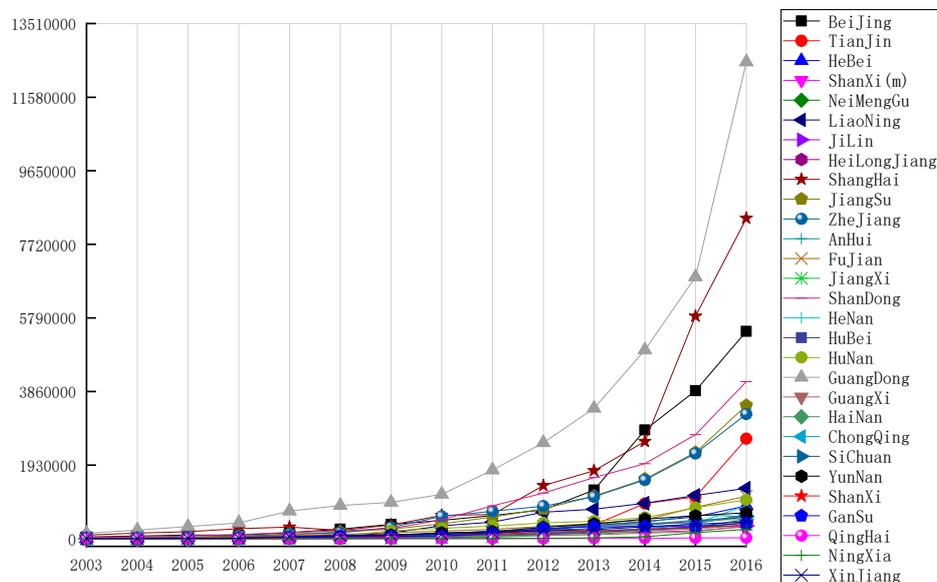


Figure 4. The number of 29 provinces' OFDI (in ten thousand of dollar). Source: Statistical bulletin of China's outward foreign direct investment.

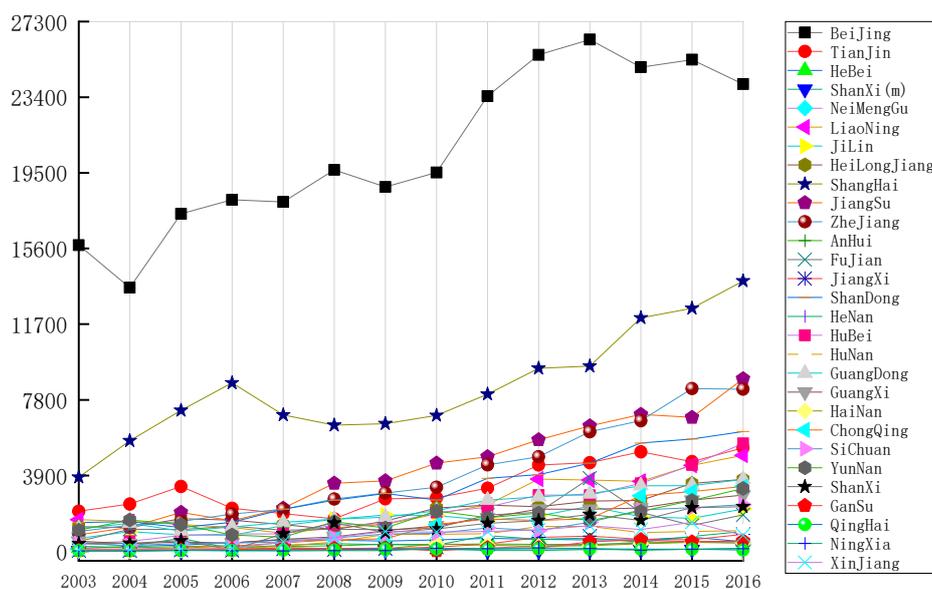


Figure 5. Number of international students in 29 provinces of China. Source: Educational Statistics Yearbook of China.

## 4. Results and Discussion

### 4.1. Benchmark Regression Analysis

Table 4 shows the empirical results of the impact of international students' inflows on OFDI of Chinese provinces. From model 1 to model 6, core explanatory variables and control variables were added by stepwise regression. From Table 4, it is apparent that the sign of the regression coefficient of the number of international students in China is positive. Significance statistic reveals that the number of international students has a positive impact on China's provincial OFDI at 1% significance level. Regression results of model 6 show that for every 1% increase in the number of international students in China, the scale of OFDI in various provinces increases by 0.2%.

**Table 4.** The impact of international students on OFDI in Chinese provinces: Panel fixed effect regressions.

Variable	LnOFDI (Total Sample)					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
LnSTUDENT	0.298 *** (0.064)	0.272 *** (0.063)	0.223 *** (0.064)	0.229 *** (0.064)	0.025 *** (0.064)	0.200 *** (0.065)
LnWAGE		1.494 *** (0.535)	1.115 * (0.569)	1.145 ** (0.569)	1.011 * (0.565)	0.957 * (0.560)
LnEC			1.263 *** (0.439)	1.278 *** (0.439)	1.457 *** (0.422)	1.368 *** (0.412)
LnRD				0.073 * (0.043)	0.073 * (0.042)	0.082 * (0.042)
LnNAL					−0.611 *** (0.209)	−0.597 *** (0.212)
LnEX						0.170 * (0.091)
CONS	17.259 *** (0.386)	3.331 (5.066)	−15.269 * (7.949)	−17.326 ** (8.025)	−19.843 ** (7.788)	−21.915 *** (7.640)
Province fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.950	0.951	0.953	0.953	0.955	0.955
Hausman test						17.228 ***
F statistic						26.540 ***
OBS	406	406	406	406	406	406

Notes: \*, \*\* and \*\*\* mean significant at 10%, 5% and 1% respectively; The standard error is in parentheses. OBS represents the number of samples.

In terms of control variables, it can be seen from Table 4 that the regression coefficients of control variables are significant. The coefficients of labor cost are significantly positive, demonstrating the resource-oriented investment motives of China's provincial OFDI to seek lower labor cost abroad. The regression coefficient of energy demand is significantly positive, revealing that China's provincial outward foreign direct investment has the motivation to seek natural resources. The richer the natural resources of the host country, the more actively China's provinces tend to invest in that country. The coefficients of R&D level are positive and significant, representing that stronger R&D capacity will increase the enterprise's OFDI in provinces, which is motivated by the strategic asset-oriented investment. The positive coefficient of the degree of openness, shows it has a complementary relation to China's provincial OFDI. It shows that the higher degree of openness, larger will be the OFDI scale of provinces. The improvement of the above factors is conducive to the expansion of OFDI scale

of Chinese provinces. Contrary to the previous conjecture, the level of nationalization is negatively associated with the scale of OFDI. It means that the higher the level of nationalization, the more unfavorable it is for the provincial enterprises to carry out OFDI.

## 4.2. Robustness Testing

### 4.2.1. Robustness Test Based on Different Measurement Indicators

In order to test the robustness of results, the number of international students in China in each province is taken as the core explanatory variable in the benchmark regression. The data comes from *Yearbook of Chinese Education Statistics*. According to the results of Table 4, although different indicator is used to measure the scale of international students in China, the regression coefficient only changes slightly and remains significant, which proves the robustness of the empirical results in this paper.

### 4.2.2. Robustness Test Based on Two-Stage Least Squares Method

To some extent, the level of regional OFDI can reflect the degree of provincial opening up and economic development, which may affect the choice of destination for international students. That is to say: There may be serious endogeneity issue between the scale of international students in China and the level of OFDI, which may lead to biased and inconsistent estimates.

In order to solve the influence of endogeneity on the estimation results, the paper refers to the methodology of [Wei and Yuan \(2017\)](#). They chose the number of colleges and universities in each province and the number of full-time teachers in each province as instrumental variables, and estimate them by two-stage least square regression. As the primary purpose of international students in China is to study, the education level of each province inevitably has a certain impact on their plan of study abroad. Therefore, the provincial level of education has a strong association with the core explanatory variable. Hence, the provincial level of education meets the criteria of an instrumental variable in this study.

Since the validity of instrumental variables directly affects the consistency of estimation and inference, this paper uses the following three statistical tests to judge whether the instrumental variables are reasonable. First, the “LM statistic” is used to test whether the instrumental variables are related to the core explanatory variables. From Table 5, it can be observed that the  $p$ -value of LM statistic is 0, and the value of the non-identification test is significant; Second, the “F statistic” is used to test whether there are weak instrumental variables. From Table 5, it is clear that the minimum value of F statistic is 24.787, which is larger than the critical value of the Stock-Yogo test. Hence, the instrumental variable test is passed. Third, the “Hansen J test” is employed to check whether all instrumental variables are exogenous. Table 5 indicates that the  $p$ -value of the Hansen J test is larger than 0.1, and the assumption that all instrumental variables are exogenous is accepted. The Durbin-Wu-Hausman statistic is employed to test the endogeneity. The  $p$ -value reflects that there is no endogeneity issue in our model. In conclusion, the instrumental variables used in this paper are appropriate.

After controlling the endogeneity problem of the core explanatory variables, it can be seen that the effect of international students in China on the promotion of OFDI of each Chinese province is still significant. In addition, the robustness test results of the two-stage least square method are basically consistent with the benchmark regression results, which shows that the results of this study are robust.

**Table 5.** Robustness Test: Replacing Core Explanatory Variables with IV-2SLS.

Variable	LnOFDI	
	Provinces (Number of Students)	Provinces (IV-2SLS)
LnSTUDENT	0.441 *** (0.109)	0.179 ** (0.085)
LnWAGE	0.913 * (0.549)	2.206 *** (0.113)
LnEC	1.160 *** (0.399)	0.665 *** (0.108)
LnRD	0.078 * (0.041)	0.009(0.027)
LnNAL	−0.554 *** (0.212)	−0.366 ** (0.158)
LnEX	0.159 * (0.088)	0.270 *** (0.070)
CONS	−20.702 *** (7.303)	−21.476 *** (1.770)
Kleibergen-Papp rk LM statistic		39.641 *** [0.0000]
Kleibergen-Papp rk Wald F statistic		24.787
Hansen J statistic ( <i>p</i> -value)		[0.1229]
Durbin-Wu-Hausman ( <i>p</i> -value)		[0.9848]
R <sup>2</sup>	0.957	0.855
OBS	406	406

Notes: \*, \*\* and \*\*\* mean significant at 10%, 5%, and 1%, respectively; The standard error is in parentheses; The *p*-Value is in the bracket; OBS represents the number of samples.

### 4.3. Further Discussion

#### 4.3.1. Analysis of Impact Mechanisms

Although the above results indicate that international students in China have a positive influence on the OFDI of each province, it is important to examine the impact mechanism of the former on the latter. In line with the above theoretical discussion, the interaction item between international students in China and export scale, R&D investment, and labor cost were introduced in the benchmark regression model to empirically dissect these three mechanisms.

In Table 6, the results indicated that coefficients of interaction items between international students in China and export scale, as well as that between international students in China and labor cost were negative and significant. However, the coefficient between international students in China and R&D investment was insignificant. This demonstrates that there was a substitution effect between international students in China and export scale and between international students in China and labor cost. However, no such effect was observed between the inflow of international students and the R&D levels (Wang et al. 2014). These outcomes imply that attracting international students in China can make up for the lack of information, due to insufficient export capacity in less developed provinces to a certain extent. Moreover, it can also offset the inhibiting effect of extremely low wage levels on enterprises' OFDI willingness to a certain degree, but it cannot eliminate the negative effects of the low level of R&D on the regional OFDI.

**Table 6.** The impact mechanism of international students in China on OFDI.

Variable	LnOFDI		
	Mechanism 1 (Export-Scale Interaction)	Mechanism 2 (R&D Input Interaction)	Mechanism 3 (Labor Cost Interaction)
LnSTUDENT	1.668 *** (0.623)	0.320 * (0.178)	1.075 ** (0.517)
LnWAGE	0.391 (0.583)	0.931 * (0.560)	1.211 * (0.625)
LnEC	1.144 *** (0.412)	1.294 *** (0.432)	1.098 ** (0.461)
LnRD	0.080 ** (0.040)	0.134 * (0.078)	0.090 ** (0.040)
LnNAL	−0.624 *** (0.205)	−0.596 *** (0.212)	−0.605 *** (0.210)
LnEX	0.604 *** (0.177)	0.171 * (0.091)	0.173 * (0.089)
LnSTUDENT×LnEX	−0.062 ** (0.025)		
LnSTUDENT×LnRD		−0.006 (0.008)	
LnSTUDENT×LnWAGE			−0.090 * (0.051)
CONS	−23.043 *** (7.458)	−21.339 *** (7.706)	−19.998 *** (7.614)
Province fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
R <sup>2</sup>	0.956	0.955	0.956
OBS	406	406	406

Notes: \*, \*\* and \*\*\* mean significant at 10%, 5%, and 1%, respectively; The standard error is in parentheses; OBS represents the number of samples.

Put differently; if inland provinces in central and western China with relatively weak export capacity, due to geographical location factors cannot receive sufficient overseas market information from foreign trade, they can make up for the information insufficiency and promote OFDI by attracting more international students. Besides, provinces with enterprises' weak investment willingness because of low wage level can attract international students to study and work in such locations by offering preferential policies. Hence, this practice can resolve the dearth of high-level talents and stimulate local enterprises to explore overseas markets.

#### 4.3.2. Analysis Based on the Perspective of the Belt and Road Initiative

The “five connectivities” (policy coordination, facilities connectivity, unimpeded trade, financial integration and people-to-people bonds) are main contents of the construction of “the Belt and Road”. Whereas, in terms of people-to-people bonds, international students in China play a crucial role to establish a link between China and their home countries. For this purpose, Chinese Government sets up “the Belt and Road Scholarship” and provides 10,000 government scholarships to international students from countries along “the Belt and Road” each year, aiming to promote educational exchanges and cooperation among China and these countries. Thus, lay a solid foundation for people-to-people connectivity and social basis for regional cooperation.

Therefore, the present research further delves into whether international students in China affect the OFDI of provinces along “the Belt and Road”. In Table 7, the regression results indicate that international students in China has no significant effect on the OFDI of provinces along “the Silk Road Economic Belt”, but has a more pronounced effect on provinces along “the 21st-Century Maritime Silk Road”, namely, a 1% increase in international students in China can increase 0.423% in OFDI of provinces and cities along “the Belt and Road”.

**Table 7.** Impact of international students on OFDI in provinces along the Belt and Road.

Variable	LnOFDI	
	“The Belt” Provinces along the Line	“The Road” Provinces along the Line
LnSTUDENT	0.202 (0.099)	0.423 *** (0.140)
LnWAGE	−0.063 (1.289)	1.984 ** (0.921)
LnRD	0.116 * (0.069)	−0.071 (0.181)
LnEC	0.046 (0.601)	0.918 (1.043)
LnNAL	0.577 (0.406)	−2.134 *** (0.523)
LnEX	0.265 ** (0.144)	1.677 ** (0.647)
CONS	10.024 (12.047)	−61.967 *** (19.348)
Province fixed effect	Yes	Yes
Year fixed effect	Yes	Yes
R <sup>2</sup>	0.953	0.966
OBS	168	70

Notes: \*, \*\* and \*\*\* mean significant at 10%, 5%, and 1%, respectively; The standard error is in parentheses. OBS represents the number of samples.

## 5. Conclusions

Based on the empirical investigation on panel data of 29 provinces in China from 2003 to 2016, this study reveals that international students in China have a significant positive impact on OFDI of Chinese provinces. From the perspective of the impact mechanism, there was a substitution effect between international students in China and export scale, as well as that between international students and wage level of all provinces. This implies that provinces which have insufficient exports capacity and low wage level can reduce investment risk of local enterprises and improve enterprises’ investment willingness through attracting international students. From the regional perspective, international students in China have a favorable impact on OFDI of provinces along “the 21st-Century Maritime Silk Road” and has no significant impact on provinces along “the Silk Road Economic Belt”.

Based on the above findings, the present paper proposed the following recommendations:

Firstly, the Chinese government shall develop a more favorable policy for international students in China. Besides the Chinese Government Scholarship, the government shall relax the restrictions on employment and immigration of overseas students to attract more international students. Center for China and Globalization (CCG)’s research shows that regulations for overseas talents are numerous and complex; the process of going abroad, applying for a visa, applying for a green card and applying for naturalization has not been formed; there is no smooth channel for employment of international students

in China (Wang 2018). Compared to China, Europe and America have opened up their education system, visa for study abroad and work visa, which has attracted plenty of international students.

Secondly, underdeveloped provinces shall attach considerable importance to attract overseas students to promote OFDI. At present, OFDI regional distribution is markedly uneven in China. In some provinces, insufficient overseas market information and lack of high-level talents have reduced overseas investment willingness and investment capability of local enterprises. To address such issues, these provinces shall understand the value of the inflow of international students. Besides, to facilitate the adaptation into local conditions, the government shall create an enabling environment to attract international students and realize great-leap-forward in the growth of OFDI. Especially, provinces which are bordering with other countries can attract more international students owing to their unique geography to promote regional economic and trade cooperation.

Finally, provinces along the “21st Century Maritime Silk Road” shall take the opportunity to enhance international communication. The “Belt and Road Initiative” has created valuable opportunities for talents of regions and countries along the “The Belt and Road”. Based on location advantage and favorable policies, these provinces can attract lots of foreign talent and strengthen foreign investment cooperation by offering a conducive learning environment and favorable working conditions. In the provinces along the “The Belt and Road”, the fewer number of overseas students are enrolled in Fujian and Hainan; however, there is a sizeable room for expanding the growth of international students in such regions.

However, the study is not without limitations which may warrant further research. Firstly, our paper chooses provincial-level panel data during 2003–2016. Future studies can explore this phenomenon in a longer time span. Secondly, the OFDI can be subdivided into different industries corresponding to students studying in various majors in China. However, this needs the support of employment data, which may be the bottleneck for this kind of research. The employment data of international students studying in provinces is not easily available, and the reported period of the data may not be long enough. Thirdly, based on the availability of such data, it will be interesting to investigate whether cultural proximity affects the choice of overseas students to study in a particular province.

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