

Article

Empirical Study on the Impact of COVID-19 on International Student Enrollment for Higher Education in China

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Abstract: International students' mobility was not spared in terms of the negative impact of COVID-19 on higher education. The majority of prior research on COVID-19 and international higher education has employed a qualitative research design. Few of the studies have employed a quantitative research approach. Our study, therefore, in an attempt to fill in the literature gap, explores the impact of COVID-19 on international students' enrollment in China using a quantitative approach. Using cross-sectional data for thirty-one provinces, municipalities and autonomous regions on the Chinese mainland, the study utilized Dynamic Ordinary Least Squares for the long-run relationship analysis. Our findings revealed that an inverse and statistically significant relationship exists between total confirmed cases and international students enrolled. Similarly, a negative relationship was found between total deaths and the number of international students enrolled for the 2020/2021 academic year. On the contrary, a positive and statistically significant relationship was found between total recoveries and the number of enrolled international students at higher education. Our findings add up to existing literature on COVID-19 and international higher education.

Keywords: COVID-19; enrollment; higher education; international students; China



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1. Introduction

Due to globalization and digitalization in the 21st century, the demand for knowledge and professional skills, as well as knowledge exchange at higher education institutions, have increased significantly [1,2]. International higher education has entered a new deepening stage of globalized development in line with the global knowledge society. The global characteristics of higher education have become increasingly prominent because they enable young graduates to become citizens of the world and not restricted to one's home country alone. Most of the world's colleges and universities have implemented projects, programs, and diversification strategies to promote internationalization [3]. The concept and strategy of international higher education is to promote the integration of higher education into global development. Most tertiary institutions have adopted strategies to promote international higher education globally [4,5].

In China, the internationalization of higher education does not have a long history when compared to developed economies, such as the United Kingdom (UK), Australia, the United States of America (USA), Japan, Russia, and Canada, to mention but a few. Notwithstanding the few years of international higher education in China, there has been a significant development in the trend. China is currently the first country globally in terms of international students' country of origin, while the USA is ranked first in terms of international students' country of destination [6].

The World Health Organization announced on the evening of 30 January 2020 that the new coronavirus pneumonia epidemic was listed as an "emergency public health event of international concern" (PHEIC), and the term "global pandemic" was used for the first

time [7]. The official name of the new coronavirus is COVID-19 [8]. As of 16 September 2020, the total number of confirmed cases globally stood at 30,014,981, with 944,484 deaths [9].

The COVID-19 pandemic that has impacted negatively on economies around the world has also affected education systems in both developed and developing countries. As of 20 June 2020, over 206 countries have implemented nationwide closures of all levels of schools, impacting over 1.84 billion students. Furthermore, nearly 60.2 million teachers are no longer in the classroom [10]. International students' mobility has been disrupted and will require diversification in the future, especially tertiary institutions that are heavily dependent on Chinese student enrollments. The new coronavirus has threatened several countries globally in attracting international students. With the current outbreak of the COVID-19 pandemic, many countries have closed their borders and employed strict immigration policies. This has affected international students' mobility. Most of studies related to COVID-19 and higher education used a qualitative research design [6,11,12]. Few of the studies on COVID-19 and higher education used a quantitative research design.

Following the negative impact that COVID-19 has caused to the different sectors of the economy, of which the education sector was not spared, it is essential to analyze the impact of COVID-19 on higher education empirically. This study seeks to analyze if the emergence of COVID-19 has any relationship with international students' enrollment in China for the 2020/2021 academic year. Considering three variables for COVID-19, namely, total confirmed cases, total deaths ratio, and the rate of recoveries, our study's specific objectives are to: (1) explore the relationship between confirmed COVID-19 cases and international student enrollment for the 2020/2021 academic year. (2) Analyze the effect of the COVID-19 death ratio on international students' enrollment in China for the 2020/2021 academic year. (3) Examine the impact of COVID-19 recovery rate on the number of international students enrolled in Chinese higher education institutions.

Since China is the second largest economy in the world after the United States of America, the impact of COVID-19 will not only affect the Chinese economy but the global economy at large. From the educational sector perspective, this research will enable policymakers to understand the effect of the global pandemic on higher education and recommend some policy implications to minimize the economic impact of COVID-19 to the Chinese economy and the global economy at large.

Using cross-sectional data for the thirty-one provinces on the Chinese mainland, the study employed Dynamic Ordinary Least Square (DOLS) to examine the effect of COVID-19 on international students enrolled for the 2020/2021 academic year. Stata version 15.0 and EViews version 13 statistical tools were used for the empirical analysis. Our findings revealed an inverse and statistically significant relationship between total confirmed cases and international students enrolled. Similarly, a negative relationship was found between total deaths and the number of international students enrolled for the 2020/2021 academic year. On the contrary, a positive and statistically significant relationship was found between total recoveries and the number of enrolled international students at higher education.

The spread of COVID-19 has slowed the speed of world economic development and international students' mobility for the 2020/2021 academic year. All higher-level institutions in China that enroll international students for fall intake could not enroll any freshmen from abroad except for online education. Since the educational sector contributes to the labor force and economy to some extent, the impact of COVID-19 had multiple effects on higher education, including international higher education. Therefore, exploring the impact of COVID-19 on international higher education enrollment in China will provide policy measures for government and stakeholders on how to minimize the negative impact and also measures to reduce future pandemic impact on international higher education.

Our study is divided into five sections. In the Section 1, a brief introduction was given. The Section 2 of our study reviewed literature related to COVID-19 and international higher education. The methodology for the study is discussed in the Section 3. The Section 4 presents the empirical findings from the study while the Section 5 summarizes and concludes the study.

2. Literature Review

2.1. Origin and Development of Global International Higher Education and Mobility

International higher education can be traced back to the ancient Greece period [13], through to the Middle Ages of Europe [14], the 16th-century reformation of Christianity [15], the rise of science and excellent discovery period [16] and finally to post-World War II (WWII) [17]. Among these stages, the post-World War II period has seen a significant improvement.

In 1974, through a consulting report, the Japanese government proposed the topic of “internationalized education era” [18]. After the Cold War in 1980, the internationalization of higher education began to move into a new political participation phase and multi-factor participation. In 1990, some developed and developing countries in North America, Western Europe, Australia, Africa, and Asia, initiated an unprecedented tide of international higher education [19]. In 1992 [20] it was revealed that internationalized higher education is the primary factor in developing international higher education globally. In 1995, the Organization for Economic Cooperation and Development (OECD) also reiterated the need for internationalized higher education [21]. In August of 2008, the Chinese-Foreign University President Forum also emphasized the need to improve international higher education in China [22]. In 2017, the United Kingdom officially launched the National Student Mobility Strategy, which aimed to expand the international market for higher education by promoting international mobility [23].

The world powers represented by the United States and the Soviet Union used the internationalization of higher education as a strategic tool in exporting their mainstream ideology and expand their international influence after WWII [24,25].

The formation of regional bodies as part of globalization after WWII brought several countries together within the various regional bodies. These regional bodies sought to develop the economies of member countries, including human capital. In promoting regional economic integration, education cooperation has been triggered to increase cross-border higher education. Multi-regional organizations such as Asia-Pacific Economic Cooperation (APEC), African Union (AU), North American Free Trade Areas (NAFTA) and the European Union (EU), are actively promoting education and cultural cooperation by launching students’ mobility projects [20]. Through regional integrations, countries came to attach great importance to the cultivation of technology, knowledge, and talents. This eventually led to universities competing in the talent market for overseas students and changed the core concept of higher education to global and cross-national education.

Cross-border mobility is not limited to simply spreading and pursuing knowledge, but to absorb the scientific and cultural achievements and education of other countries [26]. With the development of internationalization of education globally, more students leave their country of origin to foreign countries with the aim of getting a higher education.

International students’ mobility is broadly divided into vertical flow and horizontal flow [27]. According to [28], students’ vertical flow refers to students from poor areas and countries and what they think can provide better than their home country. Horizontal mobility refers to countries where students have similar economic development levels in education for both home and abroad [29]. The main driving forces for international students’ mobility have been economic driving force, and learning driving force, and [30,31] suggested that internationalized student mobility is the freedom to seek knowledge opportunities in order to improve living standards. International students’ mobility has experienced a rapid increase among all categories of migrants in the past decade due to the multi-dimensional benefits associated with it. International students’ mobility is used as a significant indicator of international higher education [32].

2.2. International Higher Education in China

The status of China’s internationalization of higher education started after the opening-up policy barely four decades ago. In 1998, Article 12 of the Higher Education Law put forward “the international encouragement and cooperation of the state to encourage and support the cause of higher education” [33] and entrusted the participation of universities in international

development into the system. Barely a decade after introducing international higher education law, the Chinese education reforms clearly emphasized expanding education openness and promoting internationalization cooperation in higher education. In 2016, under the Belt and Road Initiative, Opinions on Accelerating & Expanding the Opening-up of Education in the New Era was put forward by the Ministry of Education (MOE), People's Republic of China. The MOE emphasized that for Chinese universities to become world-class universities, internationalized higher education must be fully implemented [34]. China's commitment to international higher education has led to the high enrollment of foreign students in Chinese higher education institutions over the last five years [6].

From the 2011/2012 academic year to the 2015/2016 academic year, the growth rate of international students in China was almost the same as the growth rate in the United Kingdom [35]. China gradually became a new center of internationalized higher education and finally took over the UK in terms of international students' enrollment [36]. China recorded a significant growth rate for internationalized higher education in the 2016/2017 academic year [6], and since then the growth rate has been very encouraging. From the 2018/2019 academic year, China started recording a galloping growth rate while the USA recorded a creeping growth rate in terms of international students' enrollment. This has made China become the second preferred destination for internationalized education after the USA [6].

According to the Chinese Ministry of Education [34], 492,185 international students from 196 countries were enrolled to pursue their studies in 1004 higher education institutions in China's 31 provinces for the 2018 academic year. Out of the total enrollment, about 60% of the international students originated from Asia, predominantly by students from South Korea, Thailand, Pakistan, India, and Indonesia. A good number of students also came from Japan, Kazakhstan, Vietnam, Bangladesh, Mongolia, and Malaysia. Besides, international students from Africa contributed to about 16%, while students from Europe contributed to about 15%. Beijing, Shanghai, and Jiangsu provinces remained the top three provincial destinations for international students who pursue higher education in China [34].

The Chinese government and universities have conducted abundant work to adapt to international students, including optimizing international students' management regulations, improving the international teaching skills and environment, and providing scholarships for outstanding students. In terms of scholarships, the increase in the number of students who receive funding has been attributed to the high rate of foreign nationals studying in China [37,38]. The Chinese government provides several scholarship opportunities at both national and provincial levels to support international students. At the national level, the Chinese Scholarship Council (CSC) is the primary funding provided to international students. Each of the thirty-one provincial governments also provide funding to support international students. Aside from government scholarship at both the national and provincial levels, some universities and enterprises provide other forms of funding for international students to pursue higher education in China.

2.3. Theoretical Basis

Push–Pull Theory in International Students' Mobility

The push and pull theory is a widely accepted method in analyzing the factors affecting the international mobility of students. International students' flow is the result of the interaction of push and pull factors. The leading factors and direction of student flow are different. Hence, a systematic push–pull factor analysis framework can be used to better analyze which factors drive students to go abroad for studies, as well as what factors attract students to study in their specific home countries. In the study by [39], the authors noted that events that impact the global economy also influence students' decisions in the push–pull theory of international higher education. According to the push–pull theory, some factors, such as limited access to higher education in home countries [40], change of environment [41], and desire for foreign exposure [42], influence a student to study outside

their home countries for higher education. While factors, such as family, convenience, and cost, influence students to stay in their home country for higher education [43].

Different countries are affected by students' mobility through the push and pull factors. Using selected students from developing countries and their sociological reasons for choosing to study in the United States, the findings from [44] suggest that the main reason for choosing the USA as a destination of higher study is due to the trust they have in gaining quality education as compared to their home country education. Moreover, Ref. [43] believes that the motivation that influences the international flow of students to the United States includes the outflow country political environment, and the economic level of the inflowing country. The authors of [45] further elaborated that most international students are pulled to the United States due to the prestige and ranking of the universities in the States and funding opportunities, making the USA the most preferred destination of higher learning. Notwithstanding the pull factor that attracts more international students into the USA, Other studies opined that the chance of random shooting, the high cost of tuition, accompanied with less funding opportunities, are the push factors [46].

Regarding higher education in China, the specific factors covered by "force" or push in the study abroad push–pull theory include economic and political reasons [42]. The political stability in China for the past four decades have put trust and confidence in potential students to migrate to China for their higher education. Aside from political stability, economic achievements by China as the fastest growing economy in the world in 2019, and second best economy in the world in terms of GDP for the year 2019 [47], attracts students to pursue their higher education in China, thereby making China as the second preferred country of pursuing higher education globally. In the study by [48], the authors opined that the low cost of studying and staying in China as compared to other countries, such as the USA, Australia, the UK, attracts more foreign students to China. Moreover, Ref. [49] added that the many funding opportunities provided by both the central and local government is another major push factor in the push–pull theory of higher education mobility. Notwithstanding the push factor, language barrier has been one of the main factors that pull prospective students from studying in China [39]. Another major factor that attracts more international students to China is the development of double first-class universities, as well as first-class disciplines in some prestigious universities in China [48]. This undoubtedly contributed to China moving from the third preferred study destination to the second preferred study destination.

In a nutshell, the Chinese government has attached considerable importance to international students' inflow as a way of internationalization of higher education [47]. As more Chinese universities are ranked among top global universities, the competitive advantage that the United States used to enjoy by having more prestigious universities is gradually diminishing, thereby causing a pull factor for the United States and a push factor for China. In addition, another major push factor China is enjoying is the several funding packages that the Chinese government and universities offer to international students which attract more international students to pursue higher education in China. Moreover, the cost of studying in China as compared to studying in the United States is relatively cheap, thereby leading to another push factor for China. Lastly, political stability and economic growth of China over the last decade also attracts more foreign students to pursue higher education in China. However, the global pandemic of COVID-19 which has caused restrictions on international travels and the fear of contracting the virus has resulted in students' interest in pursuing higher education in their home countries, especially in countries with minimal risk levels.

2.4. COVID-19 and International Students' Mobility

The World Health Organization announced on the evening of 30 January 2020 that the new coronavirus pneumonia epidemic was listed as an "emergency public health event of international concern" (PHEIC), and the term "global pandemic" was used for the first time [7]. The evolution of the new coronavirus pneumonia into a "global pandemic" means

an increase in the severity of the epidemic as well as an increase in the difficulty of fighting the epidemic [50]. Between February and May 2020, many people were actively or passively quarantined and could not go out for daily transactions. As a result, a lot of work and daily routines were carried out via online mediums, including schooling. As the daily confirmed cases of the new coronavirus increased in Europe and North America, all the global study destinations had also been affected due to the lockdown and movement restrictions in such countries. Campus activities were suspended in the USA, UK, Canada, and Germany, just to mention a few.

Based on the theory of push–pull, Based on the theory of push–pull, studies by [3] found that funding provided by the Chinese government at both national and provincial levels attracts many international students to pursue higher education in China. The findings from [51] confirmed the position of scholarship being a motivation factor for international students to pursue higher education in China. Notwithstanding the push factors of international higher education in China, Ref. [52] revealed that the new coronavirus that has severely impacted society and the economy did not spare educational institutions globally. In the studies of [12,53], the authors emphasized how the new coronavirus has affected academic institutions to the point that some countries had still not resumed schools as of 31 August 2020, so classes were conducted online, and students made to submit assignments online. A survey conducted on international students' mobility revealed that 72% of respondents who are international students in the United States claimed that the pandemic has significantly affected their studies and they are likely to extend their study duration for one academic year [54]. All these point to the fact that COVID-19 has affected international students' mobility. Hence, pulling students from pursuing higher education in China.

The majority of prior research on COVID-19 and international higher education have used a descriptive and qualitative research approach [6,11,12]. In the study by [55], the authors emphasized the significant challenges COVID-19 has caused to global higher education. The study by [11] further explored how students are connected virtually but separated physically in an internationalized university during the COVID-19 pandemic in China.

International students' mobility was not spared in terms of the negative impact of COVID-19 on higher education. Since the coronavirus was spreading at a high rate with people's movement, restrictions on movement, including international students traveling from their country of origin to China, were equally restricted [52,56,57]. This has resulted in a lot of newly admitted students who have gained admission for the new academic year but are not within China to register for e-learning.

Even though COVID-19 has an impact on international students' enrollment, with the introduction of virtual learning for foreign students outside China, the impact of COVID-19 on international students' enrollment is expected to not be significant. Based on the above, the study sets the following hypotheses to examine if, despite the introduction of virtual learning, COVID-19 still has a significant impact on international students' enrollment.

Hypothesis 1 (H1). *An inverse relationship exists between total confirmed cases and international students enrolled in China for the 2020/2021 academic year.*

Hypothesis 2 (H2). *A negative relationship exists between COVID-19 deaths rate and the number of international students enrolled for the 2020/2021 academic year.*

Hypothesis 3 (H3). *A positive relationship exists between total recovery rate of COVID-19 and the number of international students at higher education institutions in China.*

3. Materials and Methods

3.1. Research Design

Our study used a quantitative research design for empirical analysis. Both primary and secondary data from all the thirty-one provinces on the Chinese mainland were used for the empirical analysis. The study used primary data for the dependent and independent variables while secondary data were extracted for the control variables. The three Special Administration Regions under China were excluded from the study.

Critical considerations were used in the selection of research variables for the study. Pursuing higher education for an academic year starts with an application to the higher learning institution. Chinese higher learning institutions open applications from February to June for the main intake in autumn [58]. Between February and May 2020, China was seriously hit by COVID-19 [59], which influenced potential international students' decisions to pursue higher education in China. In effect, there was a decrease in the number of international students enrolled, since the decision to study was affected by the high number of confirmed cases and deaths related to COVID-19 during the application period. In terms of COVID-19 variables, the authors considered the main indicators that were used to assess the severity of COVID-19 spread globally to be, namely, total confirmed cases, total death rate, and total recovery rate [59–61]. Four control variables were selected for the study: namely, the total population on provincial basis in China, the provincial gross domestic product (GDP), proportion of higher education offering degree programs, and the proportion of higher education offering vocational programs. The authors selected population as control variables because provinces with high populations have more higher education institutions than provinces with low populations. Due to the higher number of universities and colleges in such provinces, they tend to have more international students than provinces with less universities and colleges. In addition, the authors considered the number of higher institutions offering degree programs and vocational programs as part of the control variables. This is because higher instruction institutions that admit students from other countries are those that run degree programs and vocational programs. Other categories, such as adult education institutions, accept very few international students. Hence, it was not included in the control variables. Lastly, the economic growth of the country potentially impacts the budget for higher education institutions in the province. Hence, provincial economic growth was also used as a control variable.

The study used primary data from all the higher learning institutions that accept international students for international students' enrollment. The authors identified all the higher educational institutions that accept international students and collected the exact number of students enrolled for the 2020/2021 academic year. In addition, the authors gathered primary data on COVID-19 variables as of 30 September 2020 on a provincial basis. Furthermore, the authors extracted secondary data from the Chinese Ministry of Education website and the China Statistical Year Book for the control variables used. Secondary data on population and economic growth were extracted from the China Statistical Year Book database, while data on the number of higher educational institutions with their various categories were extracted from the Chinese Ministry of Education's website. The authors chose these secondary sources to retrieve reliable and accurate data since the Chinese Ministry of Education is the government institution responsible for higher education in China. Hence, their website provides accurate information related to higher education. Furthermore, the China Statistical Year Book provides accurate reports on population and economic growth of the various provinces on a yearly basis. Based on these reasons, these secondary sources were utilized to achieve a reliable and credible dataset for the empirical analysis.

Cross-sectional data were then used for the empirical analysis. Stata version 15.0 and EViews version 13 statistical tool were utilized for the empirical analysis because they perform a statistical analysis of the sample data to analyze the relations among variables in an empirical model [62–64].

3.2. Population and Sampling

In considering the study sample size, we chose China's mainland due to the relatively easy access to data. All the thirty-one provinces were used for the empirical study. The study could not find data about the Hong Kong Special Administration Region (SAR), the Macau SAR, and Taiwan Province; therefore, only the thirty-one provinces within the Chinese mainland were considered for the studies.

3.3. Model Specification

Since there are no empirical studies on the impact of COVID-19 on students' enrollment, the authors proposed a simple regression econometric model for the analysis. The seven assumptions of OLS models were all taken into consideration in working with this model. The model is given as:

$$ISE = \beta_0 + \beta_1 TC + \beta_2 TD + \beta_3 TR + \beta_4 PP + \beta_5 GDP + \beta_6 DEG + \beta_7 VOC + \varepsilon \quad (1)$$

where ISE represents International Student Enrollment, TC represents total confirmed cases of COVID-19, TD denotes total COVID-19 deaths, TR represents the percentage of COVID-19 recovery rate, PP denotes the total population on a provincial basis, and GDP denotes the real provincial gross domestic product. DEG denotes the number of higher education institutions that offer only degree programs on provincial basis, while VOC denotes the number of higher learning institutions that offer only vocational programs on a provincial basis. In the model, β_0 represents the constant, and ε denotes the error term.

The study employed Dynamic Ordinary Least Square (DOLS) to analyze the long-run relationship between COVID-19 and impact on international students enrolled for the 2020/2021 academic year, because it performs systematically better than both the fully modified OLS (FMOLS), and the canonical correlation of Ordinary Least Square (OLS) estimators [65]. In the study of [66], the authors found that the DOLS estimator solves endogeneity by adding the leads and lags, making it a better estimator than the OLS for a small sample. Furthermore, the parametric DOLS is mostly preferred to the non-parametric FMOLS in light of the fact that the latter forces extra necessities that all factors ought to be incorporated at a similar level [67].

3.4. Variables

The variables used in this study are classified into three categories namely; dependent variable, independent variables and control variables. Summary of the variables used in the study is presented in Table 1.

Table 1. Summary of study variables.

Category	Name of Variable	Symbol	Description	Data Source	Expected Sign
Dependent Variable	International Student Enrollment	ISE	The proportion of international students in a province to the total number of international students in China for 2020/2021 academic year.	Primary data gathered by the authors	
Independent Variables	Total Confirmed Cases	TC	Total number of people who have tested positive with COVID-19.	Primary data gathered by the authors as of 30 September 2020	-
	Total COVID-19 Deaths Ratio	TD	The proportion of COVID-19 related deaths to the total number of confirmed COVID-19 cases within the province.		-
	Total Recoveries of COVID-19 Ratio	TR	The proportion of the number of people who have recovered to the number of people who tested positive with COVID-19.		+

Table 1. Cont.

Category	Name of Variable	Symbol	Description	Data Source	Expected Sign
Control Variable	Population	PP	The proportion of the people residing in a particular province to the total population in China.	Extracted from the Chinese Statistical Year Book Database	+
	Gross Domestic Product	GDP	The real gross domestic product on provincial basis.		
	Degree	DEG	The proportion of higher education institutions that offer degree programs to the total number of higher education institutions in the province.	Extracted from the Chinese Ministry of Education Website on 30 September 2020	+
	Vocational	VOC	The proportion of higher education institutions that offer vocational programs to the total number of higher education institutions in the province.		+

3.5. Data Processing and Presentation

The authors first performed descriptive statistics to explore the nature of the data set. The Spearman correlation analysis was performed to know how the variables are related and whether the variables' pairs are statistically significant. To enable the author to choose an appropriate estimator for the long-run relationship between COVID-19 and international students' enrollment, stationarity test and cointegration analyses were performed. Based on establishing a long-run relationship from the cointegration analysis, multiple regression using Dynamic Ordinary Least Squares (DOLS) was performed. Finally, post-diagnostic tests, such as the multicollinearity test and heteroskedasticity test, were performed to affirm that the model meets the OLS's assumptions.

4. Findings and Analysis

4.1. Descriptive Statistics

Descriptive statistics are presented in Table 2 below. In terms of the dependent variable, international students enrolled for the 2020/2021 academic year in China on a provincial basis recorded an average of 2.89% out of the total enrollment of 187,030 international students in higher education. The least and highest recorded enrollment stood at 0.00% and 14.70% respectively. This indicates that all the thirty-one provinces recorded some international students, with the least province (Tibet) recording only eight international students and the highest province (Beijing) recording 30,699 international students. The wideness of the median from the mean indicates that the data are not distributed symmetrically. A standard deviation value of 3.38% was recorded, implying that the data are not largely dispersed from the mean.

Table 2. Descriptive statistics.

Statistics	ISE	TC	TD	TR	PP	GDP	DEG	VOC
Mean	2.8884	2748.19	0.0096	98.1929	3.1532	3276.07	34.6036	41.5293
Median	1.7300	390	0.0076	98.73	2.71	2511.50	34.5865	42.8571
Maximum	14.7	68,139	0.0662	100	7.95	11,076.09	57.1429	65.4545
Minimum	0	1	0	93.38	0.23	190.2700	2.6166	0.9101
Std. Dev.	3.3768	12,144.14	0.0127	1.6711	2.0272	2641.67	10.3889	15.4098
Skewness	2.009	5.28	3.1392	−1.1411	0.6501	1.4394	−0.7192	−0.797
Kurtosis	6.8351	28.96	14.0545	3.6939	2.6687	4.8700	4.9518	3.3261
Obs.	31	31	31	31	31	31	31	31

With reference to the explanatory variables, the total confirmed cases as of 15 September 2020 recorded an average of 2748 confirmed cases of COVID-19 with the least province recording total cases of 75 and the highest province recording a total confirmed case number of 68,139. With the median far from the mean, it can be concluded that the data are asymmetrically distributed. In addition, the high standard deviation value implies that there is a high disperse of the data from the mean.

The total deaths proportion to total cases confirmed (TD) show a mean of 0.96% with a standard deviation of 1.27% and maximum and minimum values of 6.62% of confirmed cases and 0.00%, respectively. This means that the death rate in these provinces is relatively low. Some provinces did not record any death cases, which indicates that the preventive measures put in place were very useful. The low standard deviation value implies that the data are not widely dispersed from the mean.

Regarding the recovery rate, the results revealed an average of 98.19% of confirmed cases had recovered, which is very encouraging. The maximum and minimum recovery rate stood at 100% and 93.38%, respectively. This further affirms that the preventive measures that policymakers and the Chinese government put in place as a response to the COVID-19 pandemic yielded the expected results. The closeness of the median to the mean affirms that the data are symmetrically distributed.

In terms of the control variable, the population revealed that the province with a high proportion of China's total population stood at 7.95% of the total population, with the least province recording 0.23% of China's total population. The average percentage of population by province was found to be 3.15% of the total population. The closeness of the mean and median indicates an asymmetrical distribution of the data set. For DEG and VOC, the closeness of the mean from the median shows that data are symmetrically distributed.

In terms of skewness, with the exception of the total recovery, the dependent and independent variables recorded positive values above 1, indicating that the variables are highly skewed. TR results revealed a negative value above 1, which also indicates the results are highly skewed. With reference to the kurtosis, with the exception of the PP, all the other variables recorded values above 3, indicating that their distributions are greater than the normal distribution. However, the results for PP revealed that the distribution is lower than that of a normal distribution for the population.

4.2. Spearman Correlation Matrix Analysis

The Spearman correlation matrix in Table 3 provides an understanding into which of the independent and control variables were identified with the explained variable. According to Table 3, the correlation matrix shows the connection between all sets of informative factors utilized in the relapse model. It uncovers that there is a combination of feeble and normal relationships among the investigation factors. TR and TD recorded the highest correlation of absolute 0.6827, while VOC and PP recorded the least absolute correlation of 0.0393. The entire Spearman correlation analysis coefficients were below absolute 0.7, which demonstrates that multicollinearity does not exist among the study variables.

Table 3. Spearman correlation matrix.

Variables	ISE	TC	TD	TR	PP	GDP	DEG	VOC
ISE	1.0000							
TC	0.5118 ***	1.0000						
TD	0.2198	0.1061	1.0000					
TR	−0.5030 ***	−0.1832	−0.6827 ***	1.0000				
PP	0.3785 **	0.6263 ***	0.1174	−0.2449	1.0000			
GDP	0.5930 *	−0.5112	0.6720	0.6141	0.4277	1.0000		
DEG	0.0827	−0.2144	−0.0295	−0.1069	0.0603	0.3383	1.0000	
VOC	−0.4912 ***	−0.1918	−0.2657	0.2614	−0.0393	0.2206	0.2206	1.0000

*** = 1%, ** = 5%, and * = 10% significance level.

4.3. Stationarity Test

Results from the Augmented Dickey–Fuller test as shown in Table 4 below revealed that all the study variables, except PP for constant, were statistically significant at the 1% level. PP were statistically significant at 5% level. With reference to trend and constant, all the study variables were statistically significant at the 1% level. Since all the study variables are significant, it implies that the study variables are integrated at level. Hence, further statistical analysis can be performed to show the relationship between COVID-19 and international students enrolled in the 2020/2021 academic year in China.

Table 4. Augmented Dickey–Fuller unit root test.

Variables	Level	
	Constant	Trend and Constant
ISE	−4.7688 ***	−5.4207 ***
TC	−5.4654 ***	−5.3670 ***
TD	−6.0533 ***	−5.9585 ***
TR	−4.8929 ***	−6.6042 ***
PP	−3.0564 **	−4.7073 ***
GDP	−6.8539 ***	−6.5021 ***
DEG	−5.3594 ***	−5.1752 ***
VOC	−7.2403 ***	−7.6109 ***

*** = 1%, and ** = 5%, significance level.

4.4. Cointegration Analysis

From the cointegration results in Table 5 below, the findings indicate that with the exception of total recoveries (TR) and population (PP), the remaining study variables are statistically significant at either 1%, 5%, or 10%. This implies that there exists a long-run relationship among the variables. Hence, an appropriate estimation technique can be employed to establish the exact long-run relationships among the study variables.

Table 5. Cointegration test.

Dependent	Tau-Statistic	Z-Statistic
ISE	−7.375642 ***	−28.9458 *
TC	−4.336988 **	−33.7941 **
TD	−6.61493 **	−33.7143 *
TR	−5.13716	−27.0288
PP	−4.88683	−27.4479
GDP	−7.8816 **	−32.9418 ***
DEG	−6.30885 *	−34.8053 **
VOC	−7.16794 **	−38.2108 ***

*** = 1%, ** = 5%, and * = 10% significance level.

4.5. Multiple Regression

In order to explore the long-run relationship between COVID-19 and international students enrolled on a provincial basis in China, our study used the Dynamic Ordinary Least Square (DOLS) estimation techniques for the multiple regression because it performs systematically better than both the fully modified OLS (FMOLS), the canonical correlation as well as the Ordinary Least Square (OLS) estimators. Since the data were stationary at level, the regression was performed using levels. To establish the robustness of our findings, the regression analysis was performed using only total cases (TC), death rate (TD), and recovery rate (TR) for R1, R2, and R3, respectively. In R4, all the independent variables were combined for the regression.

The regression results in Table 6 showed “R-Square” of 0.6734, 0.6881, 0.7103, and 0.6900 for R1, R2, R3, and R4, respectively. This indicates that about 67.34%, 68.81%, 71.03%, and 69.00% of the variation on how the independent variables affect the dependent

variable are explained by R1, R2, R3, and R4, respectively. The R-squared and statistically significant F-statistics value for the four regression models show that the models are fit for the empirical analysis. That is, the explained variable is appropriately chosen, consolidated, and utilized as the considerable value of detailing quality is represented by the independent variables. Hence, the findings of the study are valid.

Table 6. Multiple regression analysis.

Variables	R1	R2	R3	R4
LNTC	−0.3007 *			−0.9144 **
LNTD		−1.1093 **		−0.8613 **
LNTR			21.8322 ***	20.5336 ***
LNPP	0.3565 **	0.5712	1.4906 *	1.5138 *
LNGDP	0.4431 *	2.0174 *	0.9215	1.0616 *
LNDEG	1.8546	2.7122	1.0901	0.7855
LNVOG	2.2123	1.9509	1.6559	1.1138
R-squared	0.6734	0.6881	0.7103	0.6900
F-Statistics	0.0000	0.0000	0.0000	0.0000

*** = 1%, ** = 5%, and * = 10% significance level.

From the findings in Table 6, total cases revealed an inverse relationship with international students enrolled for the 2020/2021 academic year for both R1 and R4. This implies that a percentage increase in the confirmed cases of COVID-19 reflects in a decrease of 0.3007 in R1 and 0.3007 in R4 of international students enrolled. The relationship was statistically significant at 10% and 5%, respectively, for R1 and R4.

Similarly, an inverse relationship was found between death rate and international students enrolled for the 2020/2021 academic year. This indicates that a percentage increase in death rate of COVID-19 resulted in a decrease in the number of foreign students enrolled. This is likely to be as a result of the fear of foreign students of contracting the virus and dying as a result of that. The inverse relationship was statistically significant at a 5% level for both R2 and R4.

Contrary to the inverse relationship that exists between total cases and international students enrolled as well as death rate and international students enrolled, recovery rate revealed a positive relationship with international students enrolled. That is, a percentage increase in recovery rate of COVID-19 reflects in 21.8322 and 20.5336 a change of international students enrolled for R3 and R4, respectively. The positive relationship was statistically significant at 1% significance level for both R3 and R4.

With the exception of R2, a positive and statistically significant relationship was found between population and international students enrolled in terms of the control variable. This implies that international students were inclined to study in highly populated provinces within China. In R2, a positive but insignificant relationship was recorded. Furthermore, except for R3 which recorded a positive but insignificant relationship between GDP and ISE, the other study variables recorded a positive and significant relationship between the two. A positive but statistically insignificant relationship was found between higher institutions offering only degree programs and international students' enrollment, as well as higher institutions offering only vocational programs and international students' enrollment.

4.6. Post-Diagnostic Tests

4.6.1. Heteroskedasticity Analysis

The results from the heteroskedasticity test in Table 7 revealed that the data had homoscedasticity elements due to the insignificant probability > chi2 value, which was more than 0.10. This implies that the variance of the error term is constant. Hence, we reject the alternative hypothesis implying that the model is free from heteroskedasticity.

Table 7. Heteroskedasticity test.

chi2(1)	Prob > chi2
0.61	0.4016

4.6.2. Multicollinearity Analysis

The variance inflation factor (VIF) results in Table 8 below revealed a range of 1.41 to 5.34, suggesting an absence of multicollinearity. All the independent variables recorded VIF values below 2.0, suggesting that the independent variables are not highly correlated.

Table 8. Multicollinearity test results.

Variables	VIF	1/VIF
LNDEG	5.34	0.187399
LNVOG	5.22	0.191637
LNNGDP	4.81	0.207900
LNTR	1.80	0.554313
LNTC	1.55	0.644526
LNPP	1.53	0.655244
LNTD	1.41	0.707337
Mean VIF	3.09	

4.7. Discussion

With the continuous progress of China's full integration into economic globalization, the "One Belt One Road" initiative has enhanced the internationalization trend of higher education over the past few years. International higher education has taken on a strategic and essential role in resolving the world's socio-economic challenges, making quality international higher education services very essential.

The emergence of the new coronavirus in December 2019 has slowed down international higher education globally due to movement restrictions imposed by most countries' governments. According to [52], the new coronavirus which has severely impacted society and the economy did not spare educational institutions globally. In the study of [53], the authors emphasized how the new coronavirus has affected academic institutions to the point that some countries, as of September 2020, still had not resumed in-person schooling.

With China's aim of becoming the top destination for international students in higher education, the emergence of COVID-19 has had a negative impact on prospective international students on choosing China as a destination for their higher education [42]. This therefore calls for stakeholders and policymakers to analyze counter-measures on how the negative impact can be changed. Based on the above, the study used the number of confirmed cases, number of COVID-19 deaths, and recovery rate of COVID-19, to examine the impact of COVID-19 on international students' enrollment before and after the emergence of COVID-19.

In terms of total COVID-19 confirmed cases, the study's findings revealed an inverse relationship with international students enrolled after COVID-19 emergence. A good number of international students who graduated one level of higher education in December 2019 and wished to continue to the next level of higher education in China left China following the high-rate of COVID-19 spread [54]. Some students traveled back to their home country, hoping to travel back to China when the COVID-19 spread rate reduced. However, after the closure of Chinese borders on 28 March 2020, potential students who wished to pursue their higher education in China have not traveled to China. This has affected international students' mobility [7]. The movement of students from their country of origin to China as a way of promoting regional economic integration and education cooperation has been affected by the number of confirmed COVID-19 cases. This, in effect, has caused the inverse relationship between COVID-19 confirmed cases and international

students' enrollment. The findings affirm our first hypotheses which assumed an inverse relationship between total confirmed cases of COVID-19 and the total number of students enrolled for the 2020/2021 academic year. That is, the high rate of COVID-19 confirmed cases in the first two quarters of 2020 had a negative impact on international students' mobility. COVID-19 has been a disincentive for prospective students to pursue higher education in China, notwithstanding the numerous scholarship packages which attracted more international students to China [37,38].

Following the widespread nature of COVID-19 in the early stages of the emergence of the virus and the high mortality rate, the Chinese government put restrictions on people, including students, traveling to and from high-risk areas which recorded more COVID-19 deaths. Similarly, non-Chinese nationals who were already in their home country avoided traveling to China due to the widespread virus associated with high mortality rates at the pandemic's early stages. Some potential and substantive international students within China during the early stages of the pandemic traveled back to their hometowns to the point of some deferring and abandoning their studies [54]. Based on the above, the authors assumed an inverse relationship between death rate and the total number of enrolled foreign students after the emergence of COVID-19. Our findings affirm our assumption; hence the second hypothesis is also accepted. That is, the freedom of internationalized students' mobility has been curbed by the emergence of COVID-19. Our findings are contrary to the findings of [31], who suggested that internationalized student mobility is the freedom to seek knowledge opportunities in order to improve living standards.

Since international students' mobility is used as a significant indicator of international higher education ranking globally [32], high rate of recoveries leading to normalcy in academic work was expected to have a positive slope relationship with international students' enrollment. The total recovery rate of COVID-19 gave hope to the Chinese people, as life gradually became normal once again in China [53]. By April 2020, when China started recording high rate of recoveries with low rates of confirmed cases, international students who were still in China and planning to defer their program or return to their home country decided to stay in China and continue with their studies [50]. Based on the above, our third hypothesis assumed a positive relationship between recovery rate and the total number of international students enrolled after COVID-19 emergence. Our findings affirm our last hypothesis since a positive and statistically significant relationship was found between recovery rate and the number of international students enrolled.

Similar to China, all countries that accept international students were affected by the emergence of COVID-19 for the 2020/2021 academic year due to the traveling restrictions for international students. As the daily confirmed cases of the new coronavirus increased in Europe and North America, all the global study destinations had been affected due to the lockdown and movement restrictions in such countries. Campus activities have been suspended in the USA, UK, Canada, Germany, just to mention a few [50]. The emergence of COVID-19 is a wake-up call for stakeholders and policymakers in internationalized higher education to consider and improve other areas of learning and studying outside classrooms. This will help to minimize the effect of future pandemics on international higher education.

5. Conclusions and Recommendations

5.1. Conclusions

Internationalized higher education is aimed at enhancing the international literacy and cross-cultural competence of all students by creating a learning environment centered on an international curriculum. A crucial factor to the successful implementation of international higher education is the development of a cross-cultural and international educational atmosphere in the school through an international curriculum and a high rate of international students' mobility. In addition, since internationalization is a necessary condition for establishing a world-class university, the Chinese government is currently working on increasing international students' enrollment to enable more higher education institutions to be part of first-class and world-class universities as well as first-class disciplines.

Our study, therefore, sought to empirically analyze the impact of COVID-19 on international higher education enrollment in China for the 2020/2021 academic year after the introduction of virtual learning. Three variables, namely total confirmed COVID-19 cases, COVID-19 death rate, and recovery rate of COVID-19, were selected as the independent variables while total enrolled international students on a provincial basis were selected as the dependent variable. Regarding control variables, the authors selected the proportion of provincial population to the total population, the provincial GDP, the proportion of higher learning institutions that offer degree program to the proportion of total higher learning institutions in the province, and finally, the proportion of colleges that offer vocational programs to the proportion of total universities and colleges within the province.

Using cross-sectional data for all the thirty-one provinces on the Chinese mainland, the study employed Dynamic Ordinary Least Square (DOLS) to examine the impact of COVID-19 on international students enrolled in the 2020/2021 academic year. Stata version 15.0 and EViews version 13 statistical tools were used for the empirical analysis. Our findings revealed an inverse, and statistically significant relationship between total confirmed cases and international students enrolled. Similarly, a negative relationship was found between death rate and the number of international students enrolled for the 2020/2021 academic year. On the contrary, a positive and statistically significant relationship was found between recovery rate and the number of enrolled international students in higher education.

The study's findings revealed that total confirmed cases and death rate had an inverse relationship with the total number of international students enrolled for the 2020/2021 academic year. Therefore, in order to improve students' enrollment, China has to enforce its preventive and pandemic control measures so that both domestic and imported confirmed cases will be brought to zero or very minimal figures. This will eventually also reduce the rate of COVID-19 deaths. China should continue to enforce the preventive measures so as to minimize the spread rate of the virus as well as the death rate of COVID-19. This will encourage potential students who wish to pursue higher education in a foreign land to choose China as their higher education destination.

5.2. Limitations

The study employed cross-sectional data for the empirical analysis using China. Cross-sectional data do not support some statistical analysis. Hence, future studies can consider other countries and China to investigate the impact of COVID-19 on international students' enrollment. The findings from such studies might bring different results. In addition, due to limited data, this study could not use the Difference-In-Difference (DID) estimation technique to examine the prior stages and the later stages impacts of COVID-19 on international students' enrollment. With the availability of such data, future studies can consider the DID estimation technique for the empirical analysis. Furthermore, the authors limited the scope to only COVID-19 impact on international students' enrollment. However, there are other factors, such as future employment, individual psychological conditions, experiencing of different cultures, and global university rankings. Future studies on a provincial basis could consider these factors in their empirical analysis.

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