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Analysis of China's Importance in "Belt and Road Initiative" Trade Based on a Gravity Model

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Abstract: This study used a gravity model to analyze the importance of China within the "Belt and Road Initiative" (BRI) trade pattern based on different regression methods, including pooled ordinary least squares (POLS), fixed effects (FE), and the Heckman two-step calculation. The results show that from 2000 to 2018, China's position in the BRI trade pattern constantly rose in both exports and imports. After removing zero trade flow, POLS and FE analyses showed GDP and a common language had more influence on national exports than population or common religion. The Heckman two-step results with zero trade flows are similar to the other regression results, showing that both a country's economic aggregate of a country and a common language between two countries were important during trade exchanges. China is one of Eurasia's most attractive trading partners; while China provides more goods for BRI countries to export, it also provides a huge market for other BRI countries' goods while promoting their economic development. Thus, China plays a very important role in the BRI trade pattern. Its huge export/import growth potential is a key economic foundation for further promoting Eurasia's economic and trade integration.

Keywords: Belt and Road Initiative; China; trade; gravity model

1. Introduction

The Belt and Road Initiative (BRI) is a regional cooperation initiative that was proposed by China. It has attracted substantial attention since its inception. Although different BRI countries have different languages, cultures, and religions, each shares the same aspirations for economic development. As has been the case in Eurasia for thousands of years, trade is one of the most important bridges between countries. Today, considering that globalization and environmental protection are critical issues for most countries, several studies have shown that trade between countries is closely related to the sustainable economic and social development of the country, region, and entire world [1–5]. To a certain extent, trade also plays a role in integrating regional development resources and achieving common development. It is also one of the core concepts that China has emphasized while promoting the BRI.

The BRI relies on rapid economic growth from China, and is now creating the world's largest trade region; this brings optimistic growth prospects to the entire world economy [6]. The Chinese government realizes that the success of the BRI requires trade-based support between itself and related countries. It has thus promoted unimpeded trade as a key element of the BRI concept. Behind this lies the ability of Chinese economic growth to produce an increasing amount of merchandise for export to BRI countries. This poses a couple of important questions. One, as the largest economy in Eurasia, to

what extent will China's economic growth affect the level of exports among other BRI countries? Two, can China provide a large import market for merchandise from those countries? In this regard, exports and imports are two sides of the same coin, thus reflecting China's influence on the overarching BRI trade pattern.

As the second-largest economy in the world, China has a decisive influence on the economic and trade patterns of Eurasia. However, further study is needed to accurately express this effect at a quantitative level. There are few specialized studies on BRI trade issues, and those that have been conducted mainly focused on the perspective of geoeconomics and geopolitics. As one of the important components of sustainable economic development, trade should be studied in depth. The BRI covers a geographical spectrum that includes countries with large differences in language and religion, making it crucial to determine how these variations are incorporated into the analytical framework. As a widely used method for analyzing trade problems, the gravity model is suitable for assessing predicted interregional trade patterns under the influences of different factors, thus enabling a deeper exploration of the differences between actual and predicted import and export values among different regions. In turn, this provides a way to calculate the potential growth spaces of different regions in terms of trade. This study used a gravity model to analyze the importance of China in the context of BRI trade, including imports and exports.

This study seeks to answer the following research questions:

1. Over the past few decades, what has China's overall status been in the context of BRI trade? Does China maintain a strong export capacity in Eurasia while absorbing a sufficient amount of goods in order to provide a broad market?
2. How can a more innovative export flow regression equation be formed after incorporating religious beliefs (an indicator of cultural similarities and differences) into the gravity model? How can this be used to analyze the level of influence for each element via different regression methods?
3. How has the potential space of China's exports and imports to BRI countries changed over the last several years based on calculations of different gravity equation parameters? Is China increasingly capable of simultaneously providing countries with a broad market and wealth of products? In other words, what is China's trade position in the BRI?

This study fills a gap left by previous literature because it not only includes religious factors rarely used by scholars but also integrates a variety of regression methods to try to demonstrate China's important position in BRI trade.

2. Literature Review

We conducted a two-part literature review, including an overall gravity model exploration and a BRI trade summary.

2.1. Gravity Model

Theoretical Progress: The gravity model has successfully been used to examine international trade flows since the 1960s [7]. However, it has been quite controversial when applied to social science research (including the field of economic geography) because of the lack of rigorous mathematical derivations and proofs. Many economic scholars have thus raised doubts about the gravity model's theoretical framework, with some holding the view that it is unprecise and cannot explain the multiplicative function form [8,9]. However, Bergstrand further theorized the gravity model [10], thus presenting a clear formulation derived from the Dixit–Stiglitz–Krugman (DSK) framework [11] and demonstrating it as the reduced form of a partial equilibrium subsystem of a general equilibrium model with nationally differentiated products.

Subsequently, the theoretical progress of the gravity model is mainly manifested in economic modeling based on both the demand side and supply side [12]. Regarding the demand side, Wei [13] studied the relationship between intranational and international trade by establishing a version

of the gravity model based on constant-elasticity-of-substitution (CES) monopolistic competition. Head et al. [12] slightly modified Wei's version in 2014. Regarding the supply side, the Ricardian comparative advantage was widely adopted in constructing the gravity model. For example, Eaton and Kortum [14] incorporated realistic geographic features into general equilibrium and delivered simple structural equations for bilateral trade using parameters related to absolute advantage. Each of these two models can explain data variations quite well [15].

Empirical Progress: Compared with theoretical progress, a large number of empirical studies based on the gravity model have emerged alongside the deepening of economic globalization and the rapid development of econometrics. This has greatly enriched the overall research scope of the gravity model. Generally, empirical research can be divided into the following four dimensions:

(1) Diverse variables

As an important index representing basic economic scale and trade capacity for a given country (or region), most scholars have adopted gross domestic product (GDP) (or gross national product, GNP), population, and distance as important analysis elements for the gravity model. This has achieved good empirical results. However, deeper research into economic geography has placed more focus on the influence of dummy variables, many of which have successively been included in the gravity equation. This includes language, the social system, colonial status (CS), and reciprocal trade agreements (RTA). For example, Srivastava and Green [16] posited that cultural similarity, political instability, and membership in particular economic unions should be employed in the gravity equation. Furthermore, cultural differences and spatial distances represent substantial trade barriers, which reflect the difficulties and costs associated with both interregional and international trade. Of course, dummy variables are not the only factors used to measure trade costs. Some studies have also used time-varying variables such as exchange rates and tariffs in the gravity equation [17,18]. Notably, among those used to measure trade barriers, the transportation cost variable is still unable to replace straight-line distance in many empirical studies due to limited data availability. However, some studies have attempted to make changes that better reflect reality. For example, Huang [19] quantified higher transport costs among trade routes originating from a high uncertainty-aversion country.

(2) Diverse regression methods

With the development of econometrics, an increasing number of regression methods have been introduced into the empirical study of the gravity model. In this regard, the results have been good. Especially in the 21st century, a growing number of scholars are interested in finding ways to choose or adjust optimized estimation methods for the purpose of more accurately predicting trade flows. Since the original form of the gravity model is mathematically nonlinear, it is still the mainstream method in the field of economic geography for taking the logarithms of both sides of the gravity equation in order to realize the regression under linear conditions. Furthermore, the use of panel data meets the requirements of simultaneously investigating time-series and cross-sections. Many researchers have employed panel data to study trade over the last few decades, including Kalirajan [20], Christie [21], Zhou [22], and Ravishankar and Stack [23]. Two main techniques are employed to fit data. That is, fixed-effects (FE) and random-effects (RE). The FE estimator assumes the existence of an unobserved heterogeneous component that is constant over time and which affects each individual (pair of countries) of the panel in different ways [24], while RE is a generalization of the classical linear model; that is, the regression coefficient of the FE model is regarded as a random variable. For example, Fratianni and Oh [25], Oh and Selmier [26], and Kavallari et al. [27] have all used RE to conduct regressions.

However, some researchers believed that the gravity equation's linear regression will lead to inefficient estimations in the presence of heteroskedasticity [28]. Thus, many recent studies employed different techniques from linear regression methods (based on OLS), including nonlinear least squares (NLS) [29,30], feasible generalized least squares (FGLS) [31], and both gamma and Poisson pseudo maximum likelihood (GPML and PPML, respectively) [32,33]. However, these methods still have

some shortcomings: they are (1) not robust to heteroskedasticity (NLS) and give (2) less weight to observations with large conditional means (GPML) [24].

(3) Single commodity trade

In terms of the types of products involved, existing studies based on the gravity model have not only focused on total trade volumes, but have also taken the trade transactions of a single commodity as objects of analysis. Because agricultural products are closely related to the physical and geographical environment and their transportation is more constrained by distance (e.g., the need to keep items fresh), it is more meaningful to use the gravity model when analyzing agricultural commodity trades. For example, Ghazalian et al. [34] and Koo et al. [35] employed the gravity model to analyze the effects of different factors (including livestock production capacity, distances, and tariffs) on the meat trade. Many studies have also used the gravity model to examine the wine trade. Castillo et al. [36] posited that higher incomes, lower prices, cultural and geographical affinities, and trade agreements promote wine exports. Gouveia et al. [37] supported this opinion in finding that the quantity and value of total port wine exports were positively determined by overall GDP per capita, while exports were negatively influenced by landlocked conditions. Several studies have also used the gravity model to comprehensively discuss wood product exports [31], forest product trades [38], olive oil trading [27], rice exports [39], cocoa bean trading [40], and the wheat trade [41]. As such, studies of single-traded commodities are mainly focused on agriculture and farming.

(4) Different study scales

When conducting trade analyses via the gravity model, most studies focused on the following three scales:

- Global (e.g., Carrere [42] used a gravity model to assess ex-post regional trade agreements among 130 countries, while Batra [43] used an augmented gravity model equation to analyze world trade flows among 146 countries).
- Continental or supranational (because different continents or national alliances have different development situations, it is of diversified value and significance to study internal trade issues. This widely concerns empirical studies in Asia [44], South Asia [45], Central Asia [46], Europe [47], and the EU-15 [48]).
- Single country (the study of a single country mainly explores the potential of opening up or the trade advantages/disadvantages of an export product by establishing the gravity equation of the trade flow between a given country and other countries. For example, many researchers have paid more attention to China's trade because of its rapid economic development [49,50], while some studies have focused on Australian and Irish merchandising trades [20,51]).

2.2. BRI Trade

Although it has been a long time since China proposed the BRI, its geo-economic significance is very far-reaching, especially in regard to the integration of trade routes between Eurasia and Africa, which are attracting extensive attention from geographers, economists, and political scientists. On one hand, many studies argued that the BRI will promote infrastructural construction in both Eurasia and Africa, reduce the costs of trade and transportation, help realize the efficient and convenient circulation of commodities, and activate economic development for many countries. For instance, Zhai [52] believed that the BRI would bring sizable benefits to the world economy in terms of welfare and trade, while Vines [53] posited that infrastructures created through the BRI would lead to very large trade increases. Furthermore, higher levels of trade will increase mutual political trust between countries [54]. On the other hand, research into BRI trade has not only involved the analysis of overall patterns and effects but has also entailed discussions on specific products, such as oil/gas [55] and agricultural items [56].

Since the BRI was first proposed by China, many Chinese scholars have discussed the relationship between import and export trades in different regions of China and other BRI countries. For example, Lei et al. [57] conducted an empirical analysis of Xinjiang agricultural products and trade enterprises

based on strengths, weaknesses, opportunities, and threats against the background of the BRI, while Gao et al. [58] analyzed the fundamental patterns of trade in Jiangxi Province and BRI countries, and Zongyi et al. [59] put forward the idea that Tibet should adopt a more prudent attitude based on the surrounding geographical situation when integrating itself into the BRI trade environment. While the literature shows many positive views about BRI trade as a whole, there is also no lack of skepticism about the level of trade development it can ultimately bring [60]. Regardless of what perspective one takes on the BRI, however, there is no denying that China significantly influences its overall trade pattern.

3. Materials and Methods

This part includes the introduction of the gravity model, different regression methods and the data characteristics.

3.1. Gravity Model and Regression Method

Tinbergen [7] proposed the basic form of the early gravity model, as follows:

$$T_{ij} = \alpha \frac{G_i G_j}{D_{ij}} \tag{1}$$

where T_{ij} is the bilateral trade volume between country i and country j, while G_i and G_j are the GDPs of country i and country j, respectively, and D_{ij} is the spatial distance between country i and country j expressed as the straight-line distance between their capitals; α is constant. After decades of development, the gravity model has become increasingly mature, forming a general linear expression that is convenient for empirical testing and expression:

$$\ln T_{ij} = \alpha_0 + \alpha_1 \ln G_i + \alpha_2 \ln G_j + \alpha_3 \ln P_i + \alpha_4 \ln P_j + \alpha_5 \ln D_{ij} + \alpha_6 X_1 + \ldots + \alpha_k X_p + \mu \tag{2}$$

where P_i and P_j are the populations of country i and country j, respectively, while $X_1, \ldots X_p$ are other variables (including dummy variables such as language and RTA), and μ is a random error term.

This study proposed the following formula based on previous research:

$$\ln E_{ij} = \alpha_0 + \alpha_1 \ln G_i + \alpha_2 \ln G_j + \alpha_3 \ln P_i + \alpha_4 \ln P_j + \alpha_5 \ln D_{ij} + \alpha_6 Lang_{ij} + \alpha_7 Reli_{ij} + \mu \tag{3}$$

where E_{ij} is the exports from country i to country j. $Lang_{ij}$ and $Reli_{ij}$ are dummy variables indicating language and religion, respectively (the meanings of other variables are the same as shown in Formula (2)). If two countries speak the same language, then the value is 1; if not, then the value is 0. If country i and j share a religion, then the value is 1; if not, then it is 0. Based on the current literature, it is very common to incorporate language into the gravity model, but few studies have input religious beliefs when analyzing trade. Over the past few decades, common religion has been brought into gravity model analysis involving the EU agricultural trade [61], New Zealand's trade with Asia [62], Pakistan's trade [63,64], Iran's tomato trade [65], etc. Most of these studies supported the idea that common religion has a greater impact on inter-state trade than common language or regional trade agreements. This study included religion because the BRI runs across Asia, where there are huge cultural differences between countries. Furthermore, economic and trade exchanges are also influenced by religious concepts. It should be noted that we only consider the export of country i to country j, because country i's import from country j is country j's export to country i, and this is already included in the regression model.

However, there is a problem with this logarithmic method; that is, zero trade flows. While zero trade flows are commonly discarded, this induces a selection bias [66]: some countries do not trade with each other (i.e., zero trade flows) for reasons such as distance, and to ignore this means that is not considered for analysis. However, when the proportion of zero trade flows is not very high, their direct

deletion will not significantly impact the model's fit with reality. In fact, international trade studies have discarded zero trade flows for many years [67–69]. This relatively biased approach significantly improved following the study of Helpman et al. [29], who solved zero trade flows by constructing a gravity model based on the Heckman two-step calculation. The procedure of Heckman two-step is presented in a two-equation framework, namely (1) a selection equation that determines whether any pair of countries engages in trade and (2) a regression equation that determines the extent of trade given the existence of a trade relationship [70]. This method preserves and the information of zero trade flow so as to build a better regression model, especially when the proportion of zero trade flow is larger. Many scholars regard the Heckman two-step calculation as an important method to analyze trade, believing that it can better deal with zero trade flow than the traditional gravity model [71–73].

For the first step of equation construction (i.e., the "select equation" construction), we introduce the concept of two countries that shared the same language and religion, thus forming the following model:

$$Y_{ij} = \beta_0 + \beta_1 \ln G_i + \beta_2 \ln G_j + \beta_3 \ln P_i + \beta_4 \ln P_j + \beta_5 \ln D_{ij} + \eta_1 Lang_{ij} + \eta_2 Reli_{ij} + \delta_{ij} \quad (4)$$

When $E_{ij} > 0$ (see Formula (3)), then $Y_{ij} = 1$. When $E_{ij} = 0$, then $Y_{ij} = 0$. In this way, we constructed the select equation. Based on the probit model, we can then obtain the estimation of Y_{ij}, called $\hat{Y}_{ij}$ This enables us to use the probit model to obtain the inverse Mills ratio—λ (the inverse Mills ratio includes information about the unobserved factors [74] and it can control for potential biases arising from including only data from export flows greater than zero [75,76]). This allows us to obtain the new variable—$\lambda\hat{Y}_{ij}$—to establish the regression equation as follows:

$$\ln E_{ij} = \beta_0 + \beta_1 \ln G_i + \beta_2 \ln G_j + \beta_3 \ln P_i + \beta_4 \ln P_j + \beta_5 \ln D_{ij} + \beta_6 \lambda\hat{Y}_{ij} + \tau_{ij} \quad (5)$$

Considering that this study only found a 5.86% percentage of zero trade flows, the Heckman two-step method and elimination of zero trade flows were both implemented when analyzing the influencing factors of export trade along the BRI. Calculating the gravity equation by using multiple regression methods is not a first creation of this article. In the past few years, many scholars have adopted this analytical approach to do research related to trade [77–79].

As for the judgment of a given country's importance in the regional trade pattern, the "difference between predicted value and actual value" can be used to construct the necessary framework [80–83].

We can calculate exports (predicted value) between BRI countries during different years at the model level. Thus, for each trade flow, the difference between its actual and predicted value (which may be positive or negative) is a measure of the potential trade growth between two countries. We can further form two new analysis indicators via the following:

$$\mathrm{GPex}_i = \sum_j E'_{ij} - E_{ij} \quad (6)$$

$$\mathrm{GPim}_j = \sum_i E'_{ij} - E_{ij} \quad (7)$$

where GPex_i is the growth potential of country i's export to BRI countries in the model calculation compared with the actual value, GPim_j is the growth potential of country j's imports from BRI countries in the model calculation compared with the actual value, E_{ij} represents the actual exports from i to j, and E'_{ij} represents the predicted exports as calculated by the gravity model from i to j. Obviously, $E'_{ij} - E_{ij}$ can be both negative and positive. Hence, if GPex is positive, it indicates that the country's exports to BRI countries still have growth potential in general (the greater the absolute value, the greater the potential). If the GPex is negative, it indicates that the country's exports to BRI countries have no growth potential in general (the greater the absolute value, the less potential there is). GPim is similar to GPex.

3.2. Study Area

The geographical scope of the BRI spans the Eurasian continent and is generally considered to cover a total of 65 countries and regions, including developed and developing countries. Although developed countries such as Japan are not among those 65 countries (regions), they still play important roles in the BRI trade pattern. Therefore, this study included developed Eurasian economies in its assessment. In contrast, some data were missing due to the large number of years spanning the examination period. For that reason, a total of 50 countries (See Appendix A) were selected as analysis objects (Figure 1).

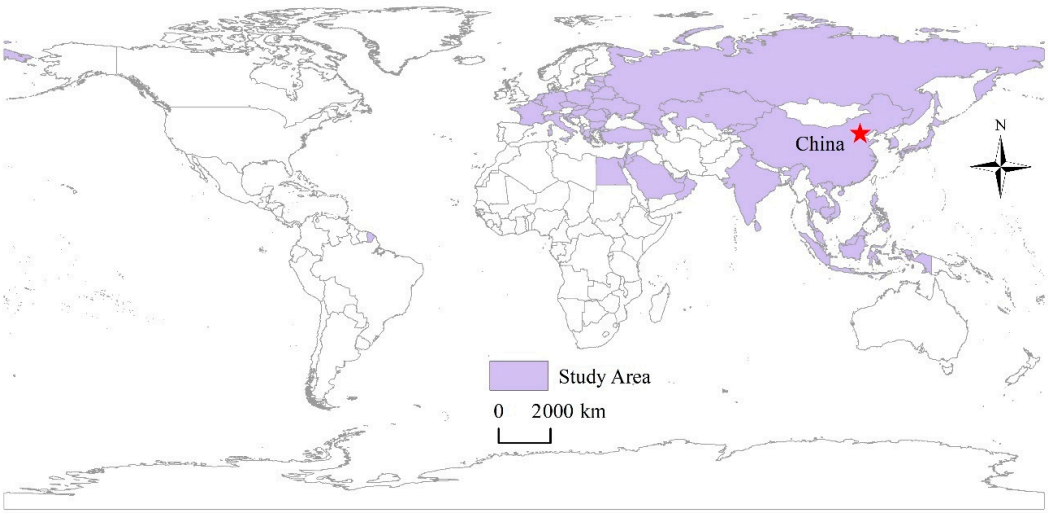

Figure 1. Study area.

3.3. Data

GDP and population data for each country were retrieved from the International Monetary Fund (https://www.imf.org), while export data were taken from the United Nations Trade Database (https://comtrade.un.org). All data were from 2000 to 2018. Next, data on the distances between countries and any shared languages were derived from CEPII (http://www.cepii.fr), while religious information was obtained from the official website of the Central Intelligence Agency (https://www.cia.gov) and Wikipedia (https://en.wikipedia.beta.wmflabs.org). It should be noted that this study divided the religions into the following categories due the existence of many schools and branches: Christianity, Judaism, Islam, Buddhism, Hinduism, Shintoism, and Atheism. As such, countries with the same predominant religions based on populational proportions were considered to have common religious beliefs. For example, the Christian religion constituted the highest such proportions in Germany and France (59.3% and 63–66%, respectively), meaning the two are considered to have common religious beliefs.

4. Results

The results mainly include the evolution of trade pattern among BRI countries, regression analysis of gravity model based on multiple methods, and the potential of import and export trade of different countries. Finally, the status and influence of China in the BRI trade pattern are obtained.

4.1. Historical Evolution

The analysis of China's position within the BRI trade pattern first required an understanding of actual trade volumes across different years. Since exports and imports are considered two sides of the same coin, the network comprising lines of different colors and thicknesses in Figure 2 can reflect both exports and imports.

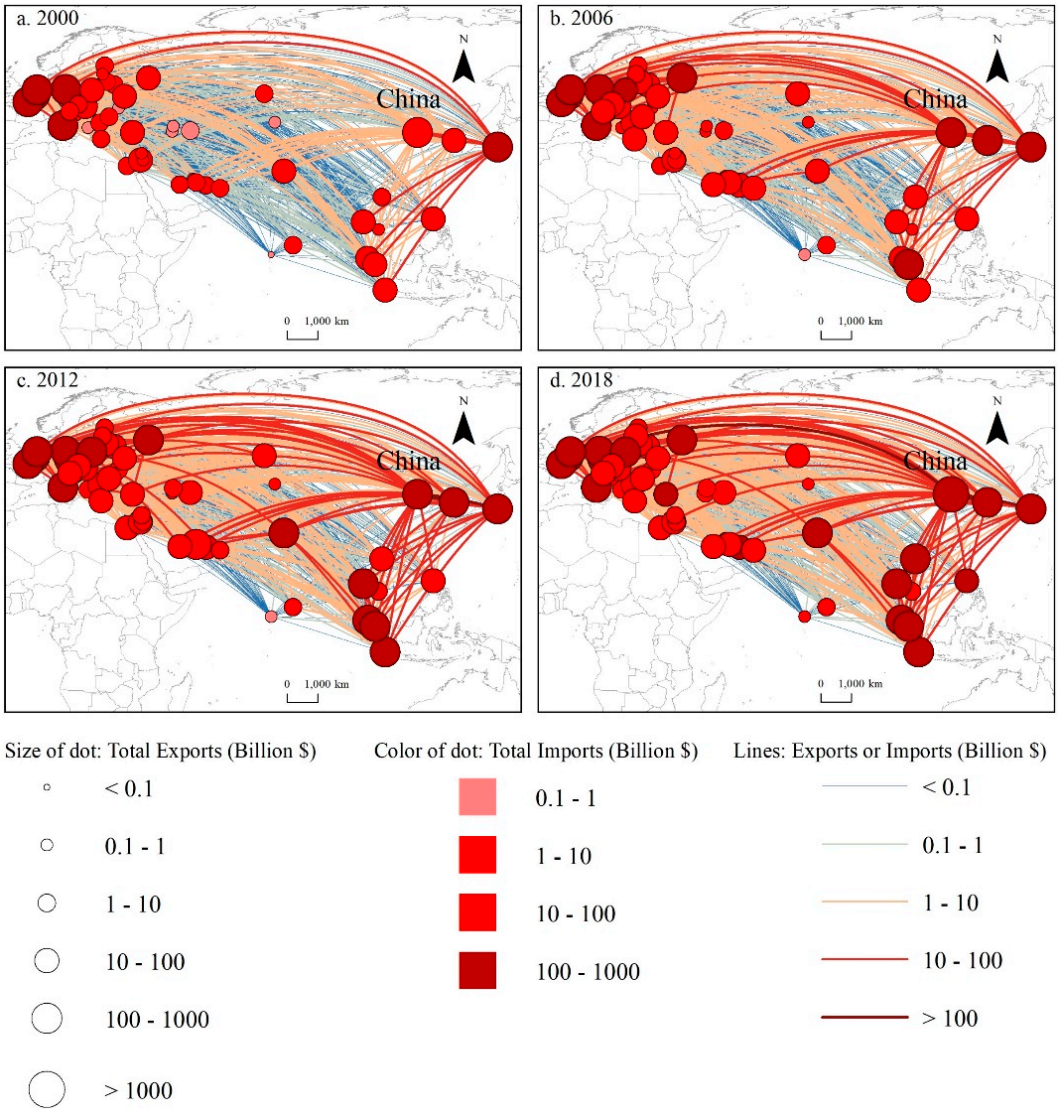

Figure 2. Export/import network and each country's total exports/imports within the Belt and Road Initiative (BRI).

From the perspective of evolutional characteristics related to the overall pattern, the export volumes between countries within the BRI have continued to rise. In 2018, the total exports of BRI countries increased by 2.94 times when compared with 2000, when the largest flow was from Germany to France (over USD 6.28×10^{10}; current price, same below). In 2018, the largest flow was from South Korea to China (over USD 1.62×10^{11}). In fact, the three largest flows in the BRI range in 2018 were from East Asia, and all involved China: that is, South Korea → China, China → Japan, and Japan → China. Obviously, the center of the Eurasian trade pattern has shifted eastward since the early 2000s. In particular, China contains the world's second largest economy and is thus playing an increasingly important role in the overall East Asian trade pattern (even considering the whole BRI range). As shown in Figure 2, increasingly large flows have formed a trade network radiating from Europe and Asia around China from 2000–2018.

A specific analysis revealed that the proportion of China's exports and imports have risen in a fluctuating manner within the BRI (Figure 3). In 2018, China's total exports to the BRI accounted for 16.42% of the total exports in all BRI countries, which was up 9.95 percentage points from 2000. By contrast, both Germany and Japan have seen fluctuating decreases in their export shares to BRI countries (Figure 3a). In 2018, Germany's BRI exports were measured at 13.13%, which was down 3.34 percentage

points from 2000. Looking at the historical evolutionary process affecting the overarching export patterns of Eurasia, Chinese economic development during the early 21st century has thus provided rich export commodities for BRI countries.

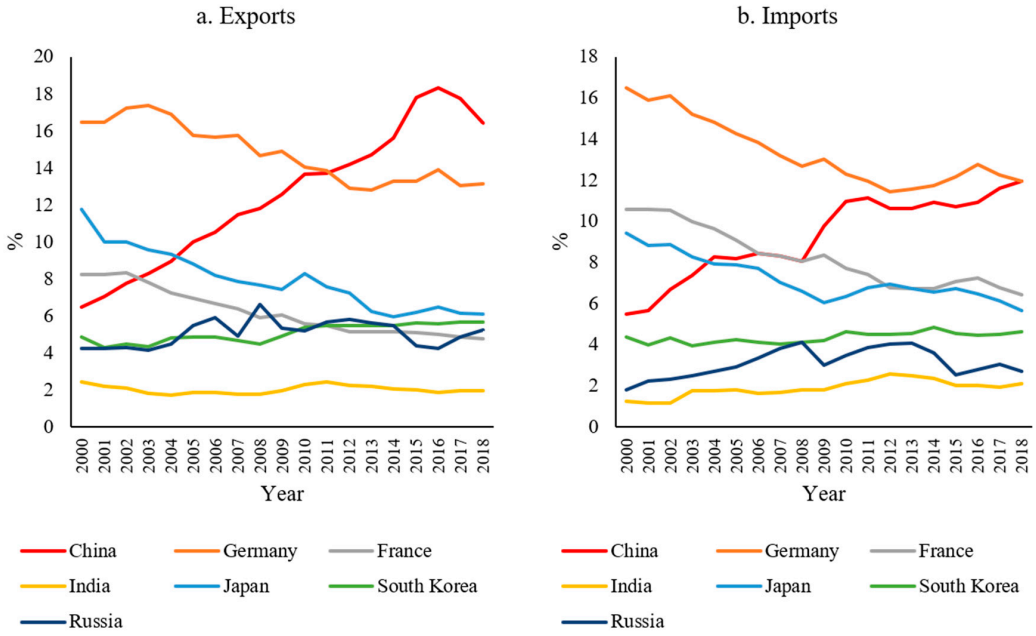

Figure 3. Each country's total exports (imports) to (from) BRI account for a percentage of total exports (imports) in BRI.

In terms of imports, China has been expanding its opening to the outside world over the past decade, thus providing a broad market for BRI countries while driving the overall economic growth in Eurasia, including many developed countries. In 2000, Germany, France, and Japan ranked high (respectively) in terms of their capacity to import goods from the BRI (the total import volume of these three countries from BRI countries accounted for 16.47%, 10.59% and 9.41% of BRI's total import volume, respectively (Figure 3b)), while China ranked behind The Netherlands and Belgium. Rankings for the ability to absorb goods from BRI countries changed significantly in 2018 (Figure 3b), when China was second only to Germany. In 2018, China imported USD 1.62×10^{11}, USD 1.44×10^{11}, and USD 1.1×10^{11} goods from South Korea, Japan, and Germany, respectively. In this regard, China's export and import capacities demonstrate its growing influence on the BRI trade pattern.

The above content was derived through a descriptive analysis of China's position within the entire BRI trade pattern over past decades. As discussed in the following section, the gravity model was used to better indicate whether China will experience additional growth in both exports and imports within the BRI.

4.2. Gravity Model Results

In this part, the parameter characteristics of the gravity model in different regression methods are discussed, and they are compared from different angles.

4.2.1. Pooled Ordinary Least Squares (POLS) and Fixed Effects (FE)

Panel data contains three-dimensional information for time, cross-section, and the variable index, which increases the observed sample size and improves sample freedom. Panel data models are used to test cross sections and time series data in order to more accurately reflect a given problem, thereby weakening the multicollinearity influence of explanatory variables while reducing the risk of estimation errors. Table 1 presents the estimated parameters and significance tests for five different regression

methods. As indicated, the second column shows POLS without FE, while columns three through six show the results of FE while controlling for different objects. For example, column three reports the result after adding time dummies to the regression to account for the changing nature of the relationship over time, while columns four and five show the results for time-invariant importer/exporter effects and time-varying exporter/importer fixed effects, respectively. Finally, column six shows the results of a specification in which paired effects were also added. It should be noted that to keep the standard of comparison at the same level when constructing POLS and FE regression models, pairs that do not occur in all years are also eliminated.

Table 1. POLS and FE results.

Variables	Without FE	With FE			
$\ln G_i$	1.0448 ***	1.1001 ***	0.7501 ***	0.6186 ***	0.6185 ***
	(0.0072)	(0.0075)	(0.0277)	(0.0361)	(0.0227)
$\ln G_j$	0.7901 ***	0.8426 ***	0.7487 ***	0.6169 ***	0.6169 ***
	(0.0070)	(0.0074)	(0.0250)	(0.0335)	(0.0188)
$\ln P_i$	0.0703 ***	0.0299 ***	−0.2485 ***	−0.2523 ***	−0.2523 ***
	(0.0076)	(0.0078)	(0.0911)	(0.0912)	(0.0574)
$\ln P_j$	0.0355 ***	−0.0036	0.0424	0.1450	0.0450
	(0.0077)	(0.0079)	(0.0721)	(0.0726)	(0.0466)
$\ln D_{ij}$	−1.2243 ***	−1.2291 ***	−1.5165 ***	−1.5165 ***	−0.0663
	(0.0106)	(0.0105)	(0.0115)	(0.0115)	(0.1304)
$Lang_{ij}$	0.8149 ***	0.7881 ***	0.8628 ***	0.8628 ***	1.6749 ***
	(0.0361)	(0.0360)	(0.0421)	(0.0420)	(0.3618)
$Reli_{ij}$	0.0908 ***	0.0951 ***	0.1259 ***	0.1259 ***	−2.3920 ***
	(0.0204)	(0.0202)	(0.0203)	(0.0202)	(0.4326)
Constant	18.7514 ***	18.8136 ***	21.0575 ***	21.4192 ***	14.2345 ***
	(0.0926)	(0.0986)	(0.2495)	(0.5548)	(0.6291)
Time FE	No	Yes	No	Yes	Yes
Exporter FE	No	No	Yes	Yes	No
Importer FE	No	No	Yes	Yes	No
Country-pair FE	No	No	No	No	Yes
R^2	0.7051	0.7089	0.7990	0.7993	0.9370

Robust standard errors are shown in parentheses; *** $p < 0.01$; POLS = pooled ordinary least squares; FE = fixed effects.

Not all coefficients matched our expectations, such as lnP_j in column three and lnP_j in columns four, five, and six, which seemed to have negative impacts (Table 1). Generally speaking, a country's large population means that it cannot only produce abundant goods based on a sufficient labor force for export to other countries but that it also has a large domestic consumption market, which can absorb a large number of foreign goods. However, the positive and negative of the coefficient was not as we expected, reflecting that the capacity and market size of countries in the BRI region do not match or are even inversely proportional to the population size (the coefficient is negative). This is because most of the BRI countries included in this study, with the exception of a few developed countries such as Germany, Japan, and France—who have relatively small populations but more production capacity and a huge market—have large populations but weaker production capacity, such as Vietnam, Cambodia, India, and other developing countries. Thus, the regression model of the population coefficient resulted in some negative values. The common language factor in column six also had a negative impact, which was different from columns two through five. Furthermore, lnP_j in columns three, four, and five did not meet the requirements of the significance test, nor did lnD_{ij} in column six. Therefore, in terms of the advantages and disadvantages of the regression equation for statistical properties, all factors in the gravity model based on POLS passed the significance test well. In other words, POLS without FE was better. We found that GDP affected exports among BRI countries more substantially than population, while the size of the exporter country had a positive and significant impact, with an elasticity of 1.0448. This means that a GDP increase of 10% resulted in a 10.448% trade increase. In contrast, a GDP increase of 10% among importers resulted in a 7.901% trade increase. Under the same circumstances, neither the exporter or importer populations substantially promoted

trade between two countries because their elasticities were only 0.0703 and 0.0355. It is also worth noting that the existence of a common language led to a greater export boom than having a common religion. In other words, a common religion did not seem to matter much for export trades in the BRI. It is precisely because religion does not impose such a severe constraint on trade that China has the confidence and courage to build an economic/trade network across Europe and Asia in order to form a win–win geo-economic pattern. This will help achieve overall prosperity and development across Europe and Asia.

4.2.2. Heckman Two-Step Calculation

The above method must eliminate zero trade flows, which will inevitably cause some measure of estimation deviation. We therefore adopted the Heckman two-step approach to solve the problem.

From the results of the selection equation (Table 2), the main factors that determine whether export occurs among BRI countries are: the GDP (coefficient is 0.2597) and population (coefficient is 0.2654) of the exporter, the GDP of the importer (coefficient is 0.2465), the geographical distance between the exporter and the importer (coefficient is −0.3421), and whether there is a common language (coefficient is 1.4460) between them. Factors such as the population of the importer (coefficient is 0.0883) and common religion (coefficient is 0.0615) have less influence. It should be pointed out that the influence of common religion on trade is similar to the above results (Table 1)—that is, whether the BRI countries have common religion has little influence on the trade between them.

Table 2. Heckman two-step results.

Variables	Regression Equation	Select Equation
$\ln G_i$	1.1416 *** (0.0083)	0.2597 *** (0.0101)
$\ln G_j$	0.8242 *** (0.0079)	0.2465 *** (0.0097)
$\ln P_i$	0.1444 *** (0.0088)	0.2654 *** (0.0121)
$\ln P_j$	0.1091 *** (0.0089)	0.0883 *** (0.0106)
$\ln D_{ij}$	−1.4250 *** (0.0105)	−0.3421 *** (0.0212)
$Lang_{ij}$		1.4460 *** (0.2533)
$Reli_{ij}$		0.0615 ** (0.0297)
Constant	19.0530 *** (0.0880)	1.7179 *** (0.1678)

Robust standard errors in parentheses; **: $p < 0.05$, ***: $p < 0.01$.

Following the regression equation (Table 2), the coefficients of the variables obtained via the Heckman two-step method were similar to those obtained via POLS regression (Table 1). More specifically, GDP and population maintained positive impacts on exports, but GDP played a larger role. In contrast, distance had a negative effect on exports (Table 2). However, compared with the results based on POLS (Table 1), the Heckman two-step calculation results highlight the influence of population on exports between BRI countries (Table 2). Specifically, the population impact coefficients of exporter and importer in POLS are 0.0703 and 0.0355, respectively (Table 1). However, using the Heckman two-step method, the population impact coefficients of exporter and importer are 0.1444 and 0.1091, respectively (Table 2). Thus, the Heckman two-step calculation raises the weight of population's influence on trade, though it is still small relative to GDP.

4.3. Trade Pattern Simulated by the Gravity Model: China's Importance

In order to comprehensively examine China's performance in GPex and GPim, this study calculated predicted values for the above two gravity model parameters (POLS and Heckman two-step calculation). Considering length constraints, only the years 2000 and 2018 are presented in this article.

There was an obvious gap between China and other BRI countries in terms of GPex, especially when compared to developed countries in 2000. Specifically, the top three GPex countries in 2000 were France, Saudi Arabia, and Egypt (see POLS, Figure 4a; also see France, Japan, and Germany based on

the Heckman two-step calculation, Figure 4c). China also had very weak growth potential regarding its exports to BRI countries in 2000 (Figure 4c); even its GPex was less than zero in the calculation results from the gravity model (see POLS, Figure 4a); that is, the predicted value of exports was lower than the actual value. However, things had changed dramatically by 2018 when the growth potential of China's exports to BRI countries showed a significant increase in GPex based on both the POLS and Heckman two-step regression equations. According to POLS-based calculation results, China's GPex was over France's, almost reaching USD 550 billion (Figure 4b). Furthermore, the Heckman two-step calculation results show that China's GPex clearly surpassed France's, thus giving it the largest export potential among all BRI countries (Figure 4d). Not only were developed countries such as France weaker than China in terms of the growth potential of their exports to BRI countries, but other Eurasian geostrategic powers such as India and Russia also lagged behind in comparison with China in 2018.

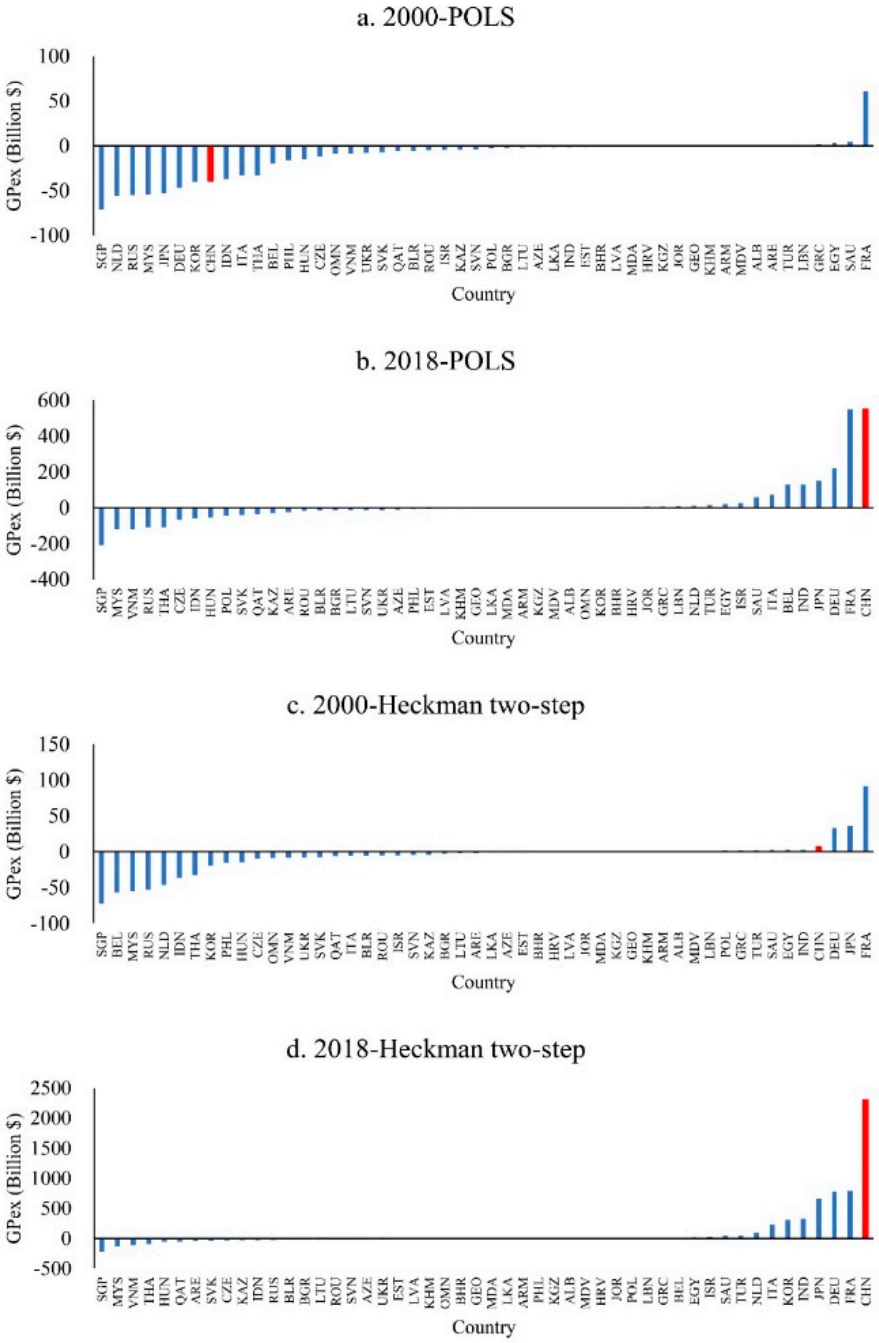

Figure 4. GPex for each country.

GPim revealed a similar situation as GPex. Specifically, China's GPim in 2000 was USD −22 billion (POLS, Figure 5a). However, the Heckman two-step calculation results showed that China's GPim was relatively high, second only to that of South Korea (Figure 5c), reaching USD 33 billion. China's potential to absorb goods from BRI countries increased significantly in 2018, when the POLS-based GPim was USD 120 billion (Figure 5b), which was smaller than that of Japan, France, South Korea, and Belgium. Belgium has a strong ability to absorb goods from the BRI region because it still has huge growth potential regarding importing from France, Germany, and other European countries. According to the results calculated by POLS, the predicted value of Belgium's imports from France and Germany in 2018 was significantly higher than the actual value. However, based on the Heckman two-step calculation results, China's ability to absorb goods from BRI countries was second only to that of South Korea in 2018, and the GPim of the two countries was USD 950 billion and USD 1000 billion, respectively.

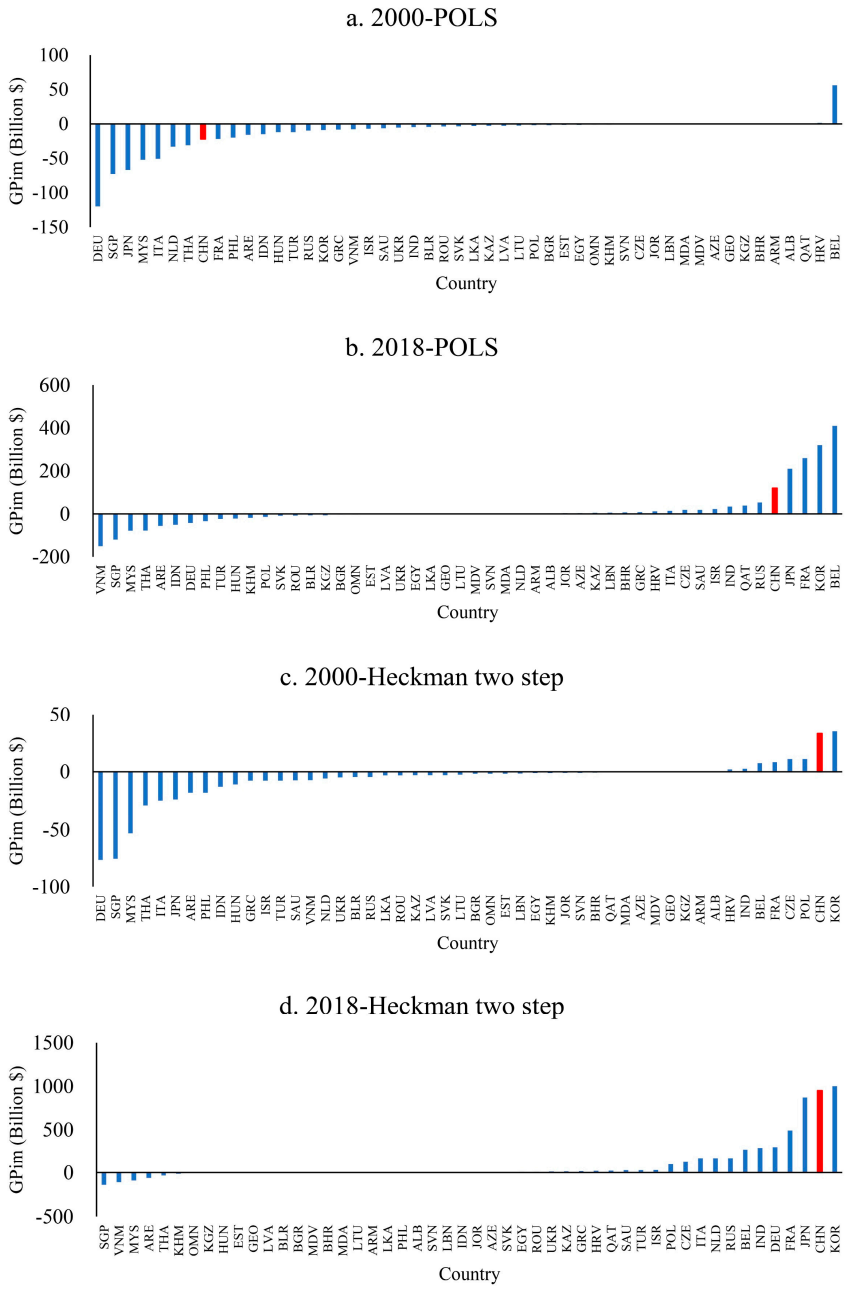

Figure 5. GPim for each country.

In sum, the above shows that China will provide BRI countries with rich export commodities (GPex) and a broad consumer market (GPim) based on steady and progressive economic growth, both in terms of exports and imports. This demonstrates China's high level of importance in BRI economic and trade patterns.

5. Discussion

Based on the two aspects of historical evolution and model measurement, this study confirmed China's key position and influence within the BRI trade system, thus verifying a scientific basis for China's implementation of the BRI. In other words, China's BRI has provided a solid economic foundation from a trade perspective. With the completion of a series of major infrastructure improvements (e.g., the China–Europe train and implementation of related policies and measures), China will further exercise its development potential, provide products and markets for various countries, stimulate economic vitality for Eurasian countries, and facilitate common development.

China's enormous influence in the BRI trade pattern has been gradually rising. This is both a reflection of China's growing overall national strength and its expanding leadership in Eurasia. China's extensive trade within the BRI was not greatly affected by cultural differences (coefficient of religion was small). Therefore, in the face of national economic development, culture can seek common ground while preserving differences, which is also the cornerstone of China's pursuit of common development. Nowadays, COVID-19 is spreading around the world, leading to a general economic recession and a huge impact on trade. China's stable economic recovery and extremely large population provide substantial space for future trade with BRI countries.

China is not the only country aware of the importance of trade. Eurasian powers such as Russia and India have also planned or are planning cross-regional initiatives that can either achieve economic integration or the partial integration of Eurasia. For example, Russia put forward its own framework for Eurasian integration called the North–South Transport Corridor (NSTC) in 2016. It is designed to form more efficient trade routes by constructing transportation networks that connect countries such as Iran and Azerbaijan. The plan has certain economic benefits and seems reasonable, as related construction efforts will shorten transportation times for trade routes between Middle Eastern countries and Russia. In addition, India's Project Mausam was proposed in 2014, just after China's BRI [84]. Project Mausam seeks to strengthen India's socioeconomic ties with several Eurasian countries, including those on the Arabian Peninsula and in the Southeast Asian islands. However, the idea of Eurasian social and economic integration held by both these nations is more focused on supporting domestic development. In fact, their own market sizes and economic strengths in the Eurasian context make it difficult to gain a significant advantage, thus increasing the difficulty associated with providing large amounts of products or markets with the same potential as China. In this sense, these proposed connectivity schemes are less attractive than the BRI (study has shown that NSTC projects are not attractive to multinational companies [85]), just as this study indicates. Although the schemes proposed by these countries are less attractive than the BRI, many studies have been conducted on how they impact the integration of the Eurasian continent [86–88]. However, China's trade influence in the BRI remains a strong attraction for scholars. Just as trade between China and BRI countries complement other countries' advantages [89], it also serves as an example role for promoting trade and investment of the whole region [90].

Trade can help create an integrated framework for regional cooperation and sustainable development. Although the BRI is supported by China's vast economy and a consumer market of more than 1.4 billion people, various influences and constraints from countries or regions regarding culture and system are still inevitable. It will take time for the concept of unimpeded trade to be fully realized among BRI countries.

6. Conclusions

The main conclusions are as follows:

(1) China's position in the BRI trade territory is increasing due to rapid and stable economic growth. Its import and export volumes to other countries are also increasing, thus gradually surpassing developed European and Asian economies (including those of Japan and Germany) while shifting its trade center from the west to east. As such, Chinese trade in the BRI context is significant.

(2) Based on the classical gravity model, this study added the factor of religion, which is less involved in regression. This was specifically added to construct POLS and FE regressions with zero trade flow removed. In order to make the argument more rigorous, this study also used the Heckman two-step calculation to construct a regression equation that could avoid the influence of zero trade flow. On this basis, the coefficients obtained via different regression methods were analyzed and compared. The impacts of factors such as GDP, population, and distance on export trade conformed to the basic judgment of existing achievements. A common religion was found to have a much weaker influence on trade than a common language.

(3) Differences between predicted and actual values based on the gravity model provided a key basis for us to analyze whether China still provided great potential for BRI countries to maintain export commodities and markets. Compared with conditions during the early 21st century, China now has a greater potential to export large numbers of commodities to the BRI due to its huge economic scale and population. It can also absorb commodities from BRI countries while providing a broad market for trading partners.

Therefore, we have the answers to the research objectives: firstly, China's rising status in the BRI trade pattern enables China to export abundant commodities to other countries and provide a huge market for international commodities; secondly, whether the two countries have the same religious belief is taken as a dummy variable into the gravity model, and we find that it has little impact on trade. In addition, the POLS and Heckman two-step methods are used and compared to explore the trade growth potential of different countries. Finally, China still has great potential to provide goods and markets for the other countries, and its role of trade within BRI will remain important in the future.

This study included the index of religion in the gravity model, and by using different regression methods, it confirmed that religion only relatively weakly affected BRI trade between countries; thus, the BRI provides favorable conditions for China to conduct trade in the region. The conclusion that China has great export and import potential through empirical analysis can also provide an effective basis for China to formulate trade development strategies and for foreign goods to enter the Chinese market in the future. This study also had some limitations. The definition of trade status or influence was limited to the volume of imports and exports and the potential measured by the model. However, a country's level of importance in a given region's economic and trade structure is also related to its import/export structure, commodity structure, and technical level. Regarding this latter aspect, China's current export products still show a certain gap in the manufacturing process when compared to Germany and Japan. This should be an important point of discussion at a later period.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. BRI countries and their economic status, population size and growth potential of trade in BRI in 2018.

Code	Country	GDP (Billion $)	Population (Million)	GPex by POLS (Billion $)	Gpex by Heckman Two-Step (Billion $)	GPim by POLS (Billion $)	Gpim by Heckman Two-Step (Billion $)
ALB	Albania	15.12	2.87	0.21	−0.31	3.09	3.59
ARE	United Arab Emirates	432.61	9.63	−24.10	−43.53	−55.85	−62.59
ARM	Armenia	12.53	2.95	−0.44	−0.84	1.23	0.98
AZE	Azerbaijan	45.59	9.94	−11.21	−11.98	4.16	5.48
BEL	Belgium	536.06	11.43	131.07	8.74	409.22	267.63
BGR	Bulgaria	63.65	7.03	−14.29	−15.57	−4.08	−1.37
BHR	Bahrain	39.30	1.57	2.79	−1.85	7.20	0.18
BLR	Belarus	56.93	9.48	−16.06	−16.88	−6.57	−1.73
CHN	China	13,457.27	1392.73	549.69	2300.86	115.25	947.69
CZE	Czechia	244.54	10.63	−67.57	−35.96	18.01	124.25
DEU	Germany	4029.14	82.91	220.14	778.27	−43.27	302.67
EGY	Egypt	249.47	98.42	21.42	21.20	−2.55	8.66
EST	Estonia	29.53	1.32	−5.44	−6.32	−3.04	−2.77
FRA	France	2794.70	66.97	547.95	789.68	260.04	487.38
GEO	Georgia	16.72	3.73	−1.11	−1.61	−2.00	−2.15
GRC	Greece	218.06	10.73	6.24	5.77	8.36	16.68
HRV	Croatia	59.97	4.09	3.57	2.24	12.41	17.61
HUN	Hungary	156.39	9.78	−55.02	−53.04	−22.41	−3.78
IDN	Indonesia	1005.27	267.66	−58.88	−30.86	−50.61	4.36
IND	India	2689.99	1352.62	134.43	331.92	33.92	288.99
ISR	Israel	365.60	8.88	25.54	28.45	22.69	29.87
ITA	Italy	2086.91	60.42	73.48	226.20	13.94	173.25
JOR	Jordan	41.87	9.96	5.73	4.30	3.84	4.58
JPN	Japan	5070.63	126.53	152.94	658.92	212.95	865.22
KAZ	Kazakhstan	184.21	18.28	−32.20	−33.53	4.47	13.70
KGZ	Kyrgyzstan	8.01	6.32	−0.23	−0.47	−6.49	−6.24
KHM	Cambodia	24.14	16.25	−4.18	−4.42	−17.63	−15.57
KOR	Rep. of Korea	1655.61	51.61	1.84	314.13	316.79	1026.43
LBN	Lebanon	56.71	6.85	8.68	5.70	6.20	3.94
LKA	Sri Lanka	92.50	21.67	−0.67	−1.04	−2.22	1.64
LTU	Lithuania	52.47	2.80	−14.30	−15.76	−1.49	0.77
LVA	Latvia	34.29	1.93	−4.67	−5.90	−2.79	−2.22
MDA	Rep. of Moldova	11.44	2.71	−0.47	−1.15	0.96	0.40
MDV	Maldives	4.81	0.52	0.03	−0.07	−0.79	−0.98
MYS	Malaysia	347.29	31.53	−116.13	−127.46	−79.27	−90.82
NLD	The Netherlands	909.89	17.23	11.72	92.24	1.07	171.83
OMN	Oman	81.68	4.83	0.28	−3.98	−4.03	−7.26
PHL	Philippines	331.68	106.65	−6.72	−0.62	−33.92	2.76
POL	Poland	549.48	37.97	−44.88	4.86	−13.95	94.80
QAT	Qatar	188.30	2.78	−33.99	−50.35	38.61	22.82
ROU	Romania	239.44	19.47	−17.90	−15.41	−7.45	9.46
RUS	Russian Federation	1576.49	144.48	−114.73	−26.35	53.02	169.08
SAU	Saudi Arabia	769.88	33.70	59.03	43.32	18.33	26.16
SGP	Singapore	346.62	5.64	−206.19	−221.83	−122.03	−144.73
SVK	Slovakia	106.94	5.45	−41.61	−41.37	−8.64	5.67
SVN	Slovenia	54.97	2.07	−13.04	−14.74	0.25	3.79
THA	Thailand	490.12	69.43	−109.78	−96.27	−76.98	−31.66
TUR	Turkey	713.51	82.32	12.53	42.60	−23.58	27.98
UKR	Ukraine	126.39	44.62	−13.10	−11.20	−2.77	12.01
VNM	Vietnam	241.43	95.54	−119.24	−111.84	−150.48	−111.56

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