Impact of the Belt and Road Initiative on the development of bilateral trade between China and South Asian countries

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Abstract. This study investigates the impact of the Belt and Road Initiative (BRI) on bilateral trade between China and South Asian countries through a quantitative research approach. The research focuses on the independent variable of BRI participation, comparing India, which does not participate, with Pakistan, which does. The dependent variable is the development of bilateral trade, measured by total imports and exports and their growth rates from 2014 to 2022. Findings confirm Hypothesis 1, showing a significant positive correlation between BRI participation and total trade volume. However, Hypothesis 2 is not supported, as no significant relationship is found between BRI participation and trade growth rates. The study highlights the influence of other factors on trade growth rates and suggests future research should expand the sample size for more robust analysis.

Keywords: Belt and Road Initiative (BRI); bilateral trade; South Asian countries.

1 Introduction

The BRI is a multilateral platform for regional economic and trade cooperation proposed by China, aiming to build a community of shared destiny with countries along the route[1][2]. However, countries in the region exhibit varying levels of BRI recognition, leading to differing participation rates[3].

This study explores the impact of the BRI on bilateral trade between China and South Asian countries, employing a quantitative research approach. South Asian countries participating in the BRI will be treated as independent variables, with India and Pakistan compared in a comparative analysis. The development of bilateral trade between China and South Asian countries will serve as the dependent variable, utilizing panel data on total imports, exports, and their growth rates for regression analysis.

Hypothesis 1: There is a positive correlation between the countries participating in the BRI and their total export and import trade.

Suppose Pakistan's total import and export trade is greater than India's. This hypothesis will hold.

Hypothesis 2: There is a positive correlation between the countries participating in the BRI and the growth rate of their export and import trade.

Suppose Pakistan's export and import trade grows faster than India's. This hypothesis will hold.

2   Data Sources and Measurement Issues

Based on the "Table of Total Import and Export Commodity Countries 2014 to 2022" published by the General Administration of Customs of the People's Republic of China, this study provides data on imports, exports, and their growth rates for Pakistan and India[4], as shown in Table 1. Both countries were selected as independent variables due to their geographical proximity in South Asia and similar economic sizes; however, Pakistan participates in the BRI while India does not[5][6].

As this study relies on secondary data, issues of reliability may arise. The study will compare the annual import and export data from the General Administration of Customs with available information. If significant data errors are identified in the reports, the affected year's data will be excluded from the sample.

3   Research Design and Preliminary Analysis

For H1 and H2, this study examines the correlation using total export and import trade and the growth rates of these trades as dependent variables. India, which does not participate in the BRI, and Pakistan, which does, will serve as the independent variables.

Table 1. Total exports and imports of goods from India and Pakistan, 2014 to 2022

	India	Pakistan	India	Pakistan
2022	135,984,340	26,502,694	8.4	-4.6
2021	125,664,343	27,822,327	43.3	59.1
2020	87,584,845	17,489,816	-5.6	-2.7
2019	92,814,703	17,489,816	-2.8	-5.9
2018	95,543,109	19,083,143	13.2	-5
2017	84,407,737	20,087,062	20.3	4.9
2016	70,147,595	19,134,763	-2	1.2
2015	71,622,891	18,927,092	1.5	18.3
2014	70,593,572	16,003,273	7.9	12.6
	Total imports and exports from China to India and Pakistan		Cumulative compared with the same period last year ±%	
	Unit: thousands of dollars			

source: The General Administration of Customs of the People's Republic of China

3.1   Correlation Analysis of Hypothesis 1

Table 2. Normality test result

variable name	sample size	me-dian	average value	standard deviation	measure of skewness	kurto-sis	S-W checkout	K-S checkout
China's total exports and imports to India and Pakistan	18	9.5	9.5	5.339	0	-1.2	0.961(0.629)	0.078(0.999)

Note: ***, **, * represent 1%, 5%, 10% level of significance respectively

China's total import and export trade with India and Pakistan, sample using Shapiro-Wilk test. As shown in Table 2, significance p-value of 0.629 (p>0.05), the level does not show significance, can not reject the original hypothesis, therefore the data meet normal distribution.
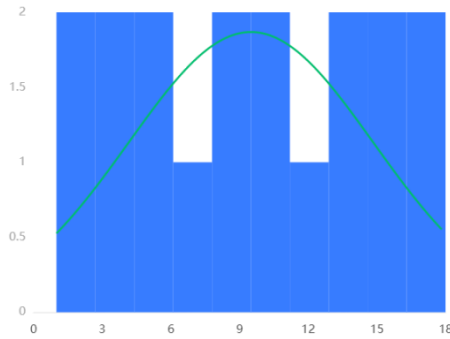

Fig. 1. Histogram of normality test

As shown in Figure 1, the results of the normality test for the quantitative variables of China's total exports and imports to India and Pakistan. If the normal graph is essentially bell-shaped (high in the middle and low at the ends), then the data is not normal, but it is generally accepted as a normal distribution.

Table 3. Chi-squared test

	Participation in the BRI (standard deviation)		F	P
	0(n=9)	1(n=9)		
China's total exports and imports to India and Pakistan	2.739	2.739	0.000	1.000

Note: ***, **, * represent 1%, 5%, 10% level of significance respectively

As shown in Table 3, the results of the chi-square test showed that for China's total exports and imports to India and Pakistan, the significance p-value is 1.000 (p>0.05), which does not show significance at the level of the original hypothesis and cannot be rejected, therefore the data satisfies the chi-square test.
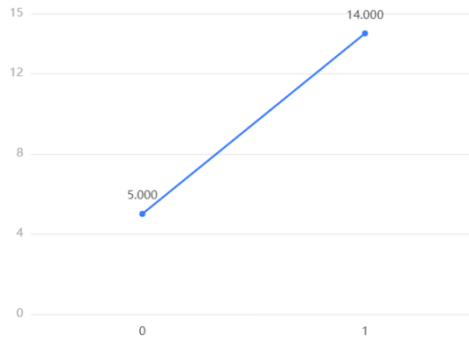
Fig. 2. One-way ANOVA comparison chart

As shown in Figure 2, the results of the ANOVA for the means, and by comparing the means, the relationship between the differences can be explored.

Table 4. Table of ANOVA results

Variable name	Variable values	Sample sizes	Average value	Standard deviations	F	P
China's total exports and imports to India and Pakistan	0	9	5	2.739	48.6	0.000***
	1	9	14	2.739		
	Total	18	9.5	5.339		

Note: ***, **, * represent 1%, 5%, 10% level of significance respectively

As shown in Table 4, 0.0 and 1.0, the mean values on the total import and export of China to India and Pakistan are: 5.000*/14.000* respectively; so it can be judged that the countries participating in BRI are positively correlated with their total trade import and export. The ANOVA results in a p-value of $0.000^{***} \leq 0.05$, so the statistical result is significant, indicating that there is a significant difference between whether or not to participate in the BRI in terms of China's total exports and imports to India and Pakistan.

Table 5. Quantitative **analysis of effects table**

Analysis items	Difference between groups	Total deviation	partial eta-squared (Partial η^2)	Cohen's f numerical value
China's total exports and imports to India and Pakistan	364.5	484.5	0.752	1.743

As shown in Table 5, the results of the quantitative analysis of effects show an Eta-square (η^2 value) of 0.75 ($\eta^2 > 0.14$) based on China's total exports and imports to India and Pakistan, indicating that the magnitude of variation in the data is large, with 75.2% originating from differences between groups. cohen's f value of $1.743 > 0.4$ indicates that the degree of variation in the quantification of effects of the data is a large degree

of variation. There is a correlation between a country's total import and export trade and whether it participates in the BRI.

3.2   Correlation Analysis of Hypothesis 2

Table 6. Normality test result

variable name	sample size	median	average value	standard deviation	measure of skewness	kurtosis	S-W checkout	K-S checkout
Cumulative year-on-year ± %	18	3.2	9.006	17.624	1.828	3.28	0.786(0.001***)	0.199(0.420)

Note: ***, **, * represent 1%, 5%, 10% level of significance respectively

Cumulative ± % over the same period last year, the sample was tested using the Shapiro-Wilk test. As shown in Table 6, the significance p-value was 0.001*** (P<0.05) level, the original hypothesis is rejected, therefore the data does not satisfy the normal distribution, its kurtosis (3.28) is less than 10 in absolute value and skewness (1.828) is less than 3 in absolute value, it can be combined with the normal distribution histogram, PP plot or QQ plot. Conduct further analysis.
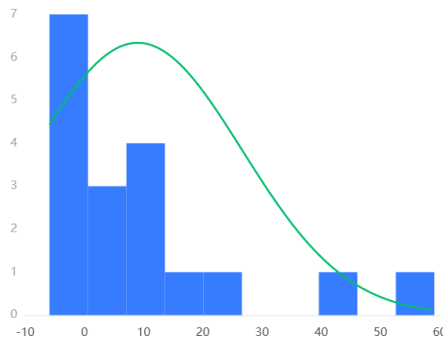

Fig. 3. Histogram of normality test

As shown in Figure 3, the results of the normality test for the cumulative year-over-year ±% data for the quantitative variables. If the normality graph essentially shows a bell shape (high in the middle and low at the ends), then the data, although not normal, are accepted as normally distributed.

Table 7. Chi-squared test

	Participation in One Way or Not (standard deviation)		F	P
	0(n=9)	1(n=9)		
Cumulative year-on-year ± %	15.215	20.694	0.347	0.564

Note: ***, **, * represent 1%, 5%, 10% level of significance respectively

As shown in Table 7, the results of the chi-square test showed that for the cumulative year-over-year ± %, the significance p-value is 0.564 (P> 0.05), which does not present significance at the level at which the original hypothesis can be rejected, and therefore the data satisfy the chi-square.
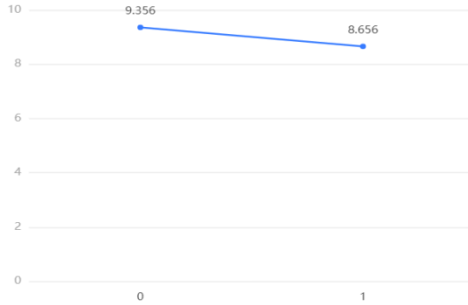

Fig. 4. One-way ANOVA comparison chart

As shown in Figure 4, the results of the ANOVA for the means, and by comparing the means, the relationship between the differences can be explored.

Table 8. Table of ANOVA results

Variable name	Variable values	Sample sizes	Average value	Standard deviations	F	P
Cumulative year-on-year ± %	0	9	9.356	15.215	0.007	0.936
	1	9	8.656	20.694		
	Total	18	9.006	17.624		

Note: ***, **, * represent 1%, 5%, 10% level of significance respectively

As shown in Table 8, 0.0 vs. 1.0, mean values on cumulative year-over-year ± % are 9.356*/8.656* respectively; ANOVA results in a p-value of 0.936>0.05, so the statistical results are not significant, indicating that there is no significant difference in growth rates with or without BRI participation.

Table 9. Quantitative analysis of effects table

Analysis items	Difference between groups	Total deviation	partial eta-squared (Partial η²)	Cohen's f numerical value
Cumulative year-on-year ± %	2.205	5280.009	0.000	0.02

As shown in Table 9, the results of the quantitative analysis of effects show an Eta-square (η² value) of 0.0 based on a cumulative year-over-year ratio of ±%, indicating that 0.0% of the variation in the data is derived from differences between groups. a Cohen's f value of 0.02 indicates that the degree of variation in the quantification of effects of the data is a very small degree of variation. There is little correlation between

the country's export and import growth rate and the presence or absence of participation in the Belt and Road.

The total volume and growth rate of import and export trade between countries participating in the Belt and Road Initiative may also be affected by the stability of economic policies and the size of the market.

On the one hand, the stability of a country's economic policies significantly impacts its trade environment. Consistent economic policies can attract foreign investment and trade partners, fostering bilateral trade development. Following Pakistan's accession to BRI, China established an all-weather strategic partnership with Pakistan, leading to infrastructure projects that have bolstered employment and economic growth in Pakistan. Data from the United Nations Trade Database shows a marked increase in China-Pakistan trade beginning in 2014, indicating a steady rise in total import and export trade[7]. Conversely, India's decision not to join the BRI, coupled with its unstable economic policies, has contributed to a decline in trade with China since 2013[8].

On the other hand, a larger market size presents more potential trade opportunities. By considering the market size differences among countries, we can better analyze the BRI impact on bilateral trade. Following the BRI launch, the total import and export trade between China and Pakistan increased, enhancing market size and stimulating production capacity development, which in turn expanded export product categories. Currently, Pakistan leverages its comparative advantages to enhance cooperation in traditional sectors such as machinery, electronics, textiles, and high-tech products, optimizing resource allocation between the two countries[9]. This strengthens production capacity and boosts international competitiveness. In contrast, India's exports to China primarily consist of fossil fuels, mineral oils, and industrial materials like cotton and salt, resulting in a limited product range that does not reach consumer markets directly[10].

At the same time, South Asia's complex geopolitical environment can significantly affect bilateral trade. Murshed and Eggert (2024) indicate that geopolitical tensions can obstruct interregional economic cooperation[11]. For instance, tensions between China and India may restrict trade growth between these nations. Thus, future research should thoroughly examine these factors, analyze their potential impact on bilateral trade, and suggest appropriate countermeasures.

3.3   Future Improvements

Future research should expand the sample size and consider additional variables to offer a more comprehensive analysis of the BRI's effects. At the same time, strengthen the empirical analysis, the following regression model can be used to test the hypotheses:

$Y_{it} = \alpha + \beta_1 \times BRI_i + \beta_2 \times \text{Economic policy stability}_{it} + \beta_3 \times \text{market size}_{it} + \epsilon_{it}$

Here, Y_{it} represents the total import and export value or growth rate of country i at time t, BRI is a binary variable indicating participation in the Belt and Road Initiative, and ϵ_{it} is the error term.

4   Conclusions

This study examines the Belt and Road Initiative's (BRI) impact on bilateral trade between China and South Asian countries, particularly India and Pakistan. The findings reveal a significant positive correlation between BRI participation and total trade volume, validating Hypothesis 1. However, Hypothesis 2 is not supported, as no significant link was found between BRI participation and trade growth rates. While BRI involvement enhances overall trade volume, other factors—such as economic policy stability, market size, and geopolitical issues—significantly affect trade growth rates. Pakistan's participation has led to increased trade with China through strategic partnerships, whereas India's non-participation and unstable policies have limited its trade prospects.

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