Impact of the Belt and Road Initiative on Bilateral Trade with China

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Abstract: The Belt and Road Initiative (BRI) is China's most ambitious foreign policy initiative of the century. Through cheap loans and massive investment in infrastructure, it aims to closely tie dozens of countries to the Chinese economy. However, the current literature fails to empirically measure the effects of the BRI on bilateral trade between participating countries and China. This paper uses a database from the College of William & Mary and a two-way fixed effects difference-in-differences design to show that the trade between China and the BRI countries has become more linked thanks to the initiative. In fact, we find that bilateral trade between China and BRI countries has grown up to 8% faster than it has with the non-BRI countries. We follow this finding with a discussion of the results and a few suggestions for future research.

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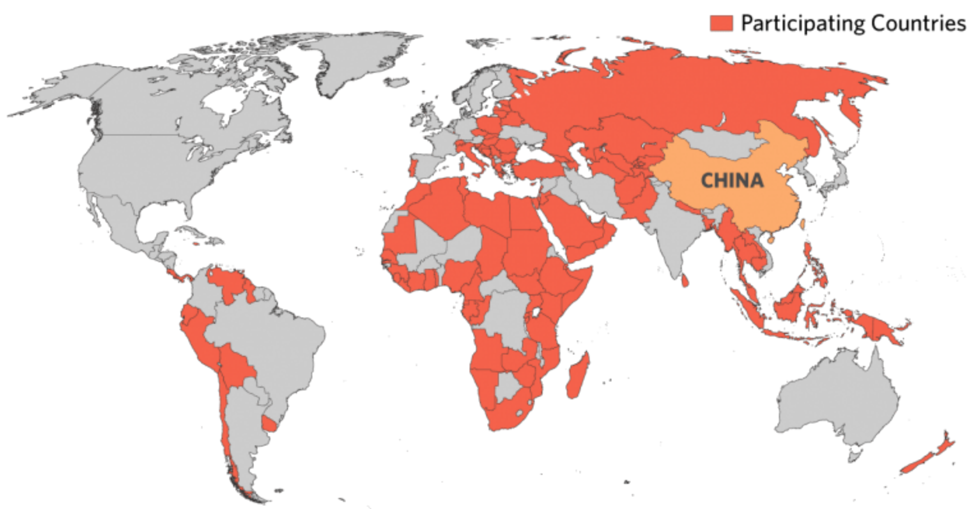
I. Introduction

Introduced at the end of 2013, the Belt and Road Initiative (BRI) is a $1 trillion economic development and commercial project that focuses on improving connectivity and cooperation among multiple countries spread across Eastern and Central Asia, Eastern Africa, the Middle East, and Europe. It is Xi Jinping's cornerstone international project and has been described as "China's grand connectivity blueprint," or "China's very own Marshall's Plan". At its core, the BRI aims to adopt a win-win strategy to stimulate economic growth by strengthening inter-regional cooperation through new infrastructure and institutional linkages between countries. Participating nations currently comprise 45% of the world's population and $13 trillion in their combined gross domestic product (GDP), and those numbers are only growing. According to Chinese authorities, the BRI has five major goals for cooperation among the participating countries: to coordinate international trade development policies, to forge infrastructure and facilities networks throughout the Asian and European continents, to strengthen investment and trade partnerships, to enhance financial cooperation among the participant countries, and to deepen social and cultural exchanges through trade partnerships. Beijing also hopes that the BRI will strengthen the position of the RMB against the USD, as it has been issuing RMB-denominated loans to BRI countries, and participating countries are incentivized to settle debts in RMB, and to pre-emptively hold RMB reserves for the settlement of future accounts.

During the past eight years, China's economic cooperation with the BRI countries has achieved remarkable results. On the one hand, the bilateral trade between China and the BRI community has significantly increased. The total trade value of goods between China and BRI countries had exceeded $7.8 trillion from 2013 to 2019, according to the data reported by the

Ministry of Commerce of China. In fact, a recurrent criticism is that the construction of some projects was too hasty, without sufficient consideration of their long-term economic benefits. Despite that, in 2019 the growth of bilateral trade between China and countries along the Belt and Road reached 10.8%, outpacing China's aggregate trade growth by 7.4 percentage points. To begin to understand the breadth of the BRI, one can take a look at Figure 1 and see the large number of countries that have already joined the project, including some members of the European Union.

Figure 1: Map of BRI Participating Countries (2019)



In light of the above achievements in China's economic cooperation, the purpose of the paper is to provide a quantitative assessment of BRI's priority to "coordinate international trade". In particular, we endeavor to quantitatively assess the impact of BRI on the bilateral trade intensity between China and BRI countries. In order to achieve so, we will use a difference-in-differences method to see how the accession to the BRI has affected trade with China by comparing how the bilateral trade intensity of BRI and non-BRI countries compares after and before the BRI was launched.

Developing a strong understanding of this topics is fundamental for several reasons: First, trade integration has important implications for business cycle synchronization, and there is substantial empirical evidence indicating that business cycles are more synchronized in countries with strong trade intensity, which provides further indication of policy coordination, one of the five priorities of the BRI. Additionally, bilateral trade links have always played an important role in the overall relationship between countries. In a world economy that increasingly has a regional architecture, national developments and regional trajectories will be intertwined, so that countries with more intense reciprocal trade links are inclined to have fewer trade conflicts. For example, Brülhart and Thorpe (1999) find that the increase in "two-way" trade among the East Asian economies reduces the labor market adjustment costs and, hence, reduces the trade friction between nations and has led to the extraordinary growth in exports from the 1970s to the mid−1990s. Furthermore, trade integration encourages the reallocation of resources to more efficient activities and thus opens up opportunities and boosts demands and employment. This is particularly important within the context of the foreseeable global economic adversity caused by the Covid-19 pandemic. Lastly, estimating the impact of the BRI on the trade links quantitatively may provide policymakers with valuable references about making further free trade agreements with the BRI countries.

This paper is organized as follows: section 2 reviews the existing academic literature and how this paper will contribute to it, section 3 analyzes the design and the key assumptions of our approach, section 4 looks over the data, section 5 applies the DID methodology to quantitatively assess the impact of BRI on the intensity of trade links between China and the Belt-Road countries and summarizes the empirical findings, and section 6 presents the concluding remarks and suggestion for future work. Our initial hypothesis was that the BRI has had a significant positive impact on bilateral trade with China for its members.

II. Literature Review

By attempting to measure the impact of the BRI on bilateral trade with China, this paper aims to add to the nascent literature studying changes in China's bilateral trade with its neighbors. Foo et al (2020) use the bilateral revealed trade preference (RTP) index and trade data from the IMF to investigate the dynamics of bilateral trade between ASEAN countries and China. Their RTP indicator is a modification of the one proposed by Iapadre and Tajoli (2014) that focuses on bilateral trade links. Their paper leverages a difference-in-differences method to conclude that the RTP level between China and the ASEAN countries has grown at a rate that is approximately 8% faster than that between China and the non-ASEAN countries that they measured. Additionally, they demonstrate that there is an especially strong improvement in bilateral trade partnerships between China and the ASEAN countries located along the Maritime Silk Road (the sea portion of the BRI). However, their paper focuses solely on ASEAN nations. Thus, going a step further than Foo et al, this paper would serve as a more comprehensive study of the impact of the BRI on bilateral trade and would greatly contribute to the current academic literature.

Additionally, this study contributes to the literature that quantitatively measures the impact of the BRI on bilateral trade links. Evidently, the BRI is still a young initiative that is far from a well-defined action plan. This lack of data leads to a lack of empirical evidence on the assessment of the impact of the BRI and, to date, only a handful of studies have touched upon the trade linkage impact of the BRI. Generally, these papers agreed that the BRI either facilitates trade or leads to trade creation among the countries along the Belt-Road route. For example, Han et al. (2018) and Sang et al. (2015) find complementation and competitiveness coexisting in bilateral trade relations between China and the Belt-Road countries. Hang et al. use a global computational general equilibrium model to conclude that there will be a trade creation as a consequence of a reduction in shipment time and trade costs for countries participating in the BRI. Sang et al. draw similar conclusions, finding that improvements in border administration and physical infrastructure from implementing the BRI promote trade across the board.

Furthermore, this analysis takes a novel approach at how to measure the variables that impact bilateral trade flows with China. Trade economists tend to use a gravity equation model that explains bilateral trade as a function of the size of the GDP and geographic distance of the two countries, along with other factors. One of such models is used by Cinar, Johnson, and Geusz (2016). That paper used a gravity model equation to calculate the potential of the trade relationship and compared it to the actual data in order to measure the impact of the BRI. Their paper concluded that most BRI countries are underperforming in their trade with China when compared to the gravity equation. However, their paper fails to deal with potential endogeneity or reverse causality in their model, so we should not interpret their result as causal effects. In fact, it is generally very difficult to establish causality using only a gravity model. Therefore, we believe that using a difference-in-differences approach would enrich the existing literature by using a new method to measure variables that affect bilateral trade.

This paper also aims to update the projections made before the first wave of BRI projects was finalized in 2019. Until then, researchers could only forecast the impact that the BRI might have on trade, rather than quantitatively measure it. For example, Shen and Chan (2018) tried to predict the effect that investment in infrastructure could have on trade in the Asia-Pacific region by using data from Europe in the 1950s and comparing the BRI to the Marshall Plan. Nevertheless, even the authors admitted that it was difficult to reach a solid conclusion due to the lack of data and the ever-changing economic conditions in the region. We believe that our paper could fill the gap in the literature by using updated data to quantify the impact of the BRI on trade.

Lastly, this study contributes to the literature by considering the impact that the BRI will have specifically on bilateral trade with China. Since the BRI is fundamentally focused on improving infrastructure, it is no surprise that there is plenty of academic research focused on measuring the impact of this new infrastructure on trade flows among BRI countries. For instance, Baniya, Rocha, and Ruta (2019) found that BRI-funded transportation infrastructure improvements boosted intraregional trade, with the impact varying across countries and regions. Using a difference-in-differences method, they found that BRI infrastructure improvements increased total trade among BRI economies by 4%. More specifically, they found that China benefited the most in terms of the value of their exports, with their trade with other BRI countries increasing by 9%. Similarly, Zhao (2015) looks at trade linkages within the regional value chains between the economies along the BRI route and finds that the trade of high value-added has increased dramatically. Furthermore, he states that thanks to the BRI, there is still considerable room for improvement regarding bilateral trade links between China and the BRI participating countries. While their findings are useful in demonstrating that the BRI is already paying dividends for China and their neighbors by expanding their trade links, we believe that it is still worthwhile to look at bilateral trade relations to understand where trade is increasing the most.

III. Design

To quantitatively estimate the effects of the BRI on trade relations between China and Belt-Road countries, we will use a two-way fixed effects (2WFE) difference-in-differences approach. This approach differs from the more traditional “2x2” difference-in-difference design in that thet treatments is implemented at different times (also known as a “rollout” design). While “2x2” is a more popular identification strategy in applied work, 2WFE has become a staple to estimate causal effects from panel data, according to Imai & Kim (2021). In fact, the 2WFE estimator is used to adjust for unobserved unit-specific and time-specific confounders at the same time, which makes it particularly useful to determine the effects of BRI on trade with China as more countries are continuing joining the initiative. More broadly, this type of analysis uses simple panel-data methods applied to sets of group means when certain groups are exposed to the causing variable of interest and others are not. However, the 2WFE approach has the risk to produce a bias results if treatment effects differ across groups. Ultimately, we believe that this approach is well-suited to estimating the effect of sharp changes in the economic environment or changes in government policy, such as the change in minimum wage or the launch of a global infrastructure development project.

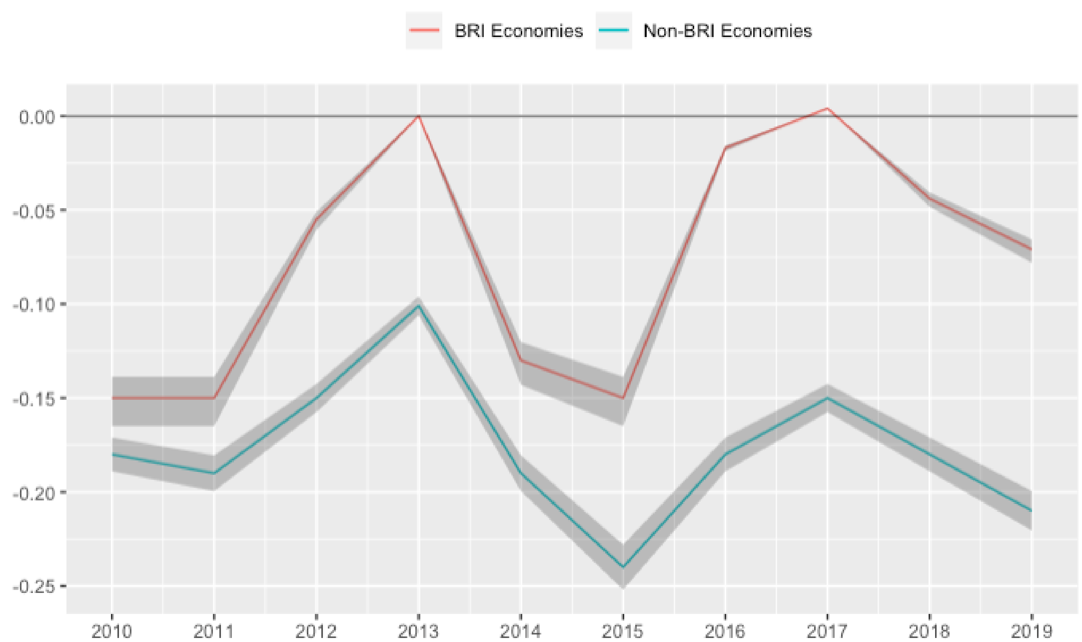
The BRI participating countries will serve as the treatment group, and the non-BRI nations will be the control group. Since difference countries joined the BRI at different times, the shock will not always occur the same year. However, we will start the pre-shock period in 2010 and end the post-shock period in 2019. The difference-in-differences model will be specified as follows:

$$(1)\ Y_{jt} = \beta_0 + \beta_1 BRI_j{*}\ Post_t\ + \beta_2 Z_{jt} + \alpha BRI_j + \gamma Post_t + \epsilon_{jt}$$

In this equation, we will denote Y_{jt} as the bilateral trade intensity index between China and a country j in year t (a more comprehensive explanation for this variable is offered in section 4) and ϵ_j representing the regression error term. The dummy variable BRI_t represents the treatment and controls for permanent differences between groups- in this case, entrance to the BRI. The variable $Post_t$ is a dummy binary for time effect- that is, it denotes whether the country was in the BRI in year j. In order to comply with the assumptions for 2WFE, the dummy variables for Post and BRI have been normalized such that $\alpha_i\Sigma_i = 0$ and $\gamma_i\Sigma_i = 0$. The coefficient of the term BRI_j*$Post_t$, obtained by multiplying the two variables we just mentioned, is the causal effect that we are trying to measure. The variable Z_{jt} represents as many as seven other control variables that we will use to isolate the effect of the BRI on bilateral trade. Most of these variables are chosen by following the work of Sutherland, Anderson, Bailey, et al, (2020), who investigated the determinants of Chinese bilateral trade, but we have also added two other dummy variables for the presence of an open land border or a free-trade agreement between China and country j.

It is also important to make a note of the key assumptions of the difference-in-differences models. First, we must make sure that the parallel-trend assumption, the most critical to ensure internal validity of difference-in-differences models and the hardest to fulfill, holds in our model. This assumption requires that, in the absence of treatment, the difference between the treatment and control group is constant over time. While there is no statistical test for this assumption, we can conduct a visual inspection of our data to ensure thats it is satisfied. Figure 2 provides graphical support that demonstrates that this assumption holds. Figure 2 shows the progression of China's bilateral trade intensity with the treatment group (the 51 BRI countries) and the control group (the 55 non-BRI countries) between 2010 and 2019. As can be observed, after 2014 the gap of the average Trade Intensity Index between China and BRI countries has been widening since the BRI effectively started in late 2014. This is not only indicative of the fulfillment of the parallel trends assumption but also hints towards a potential positive relationship between BRI participation and an increase in trade with China, which will be demonstrated in section 5.

Figure 2: China's Average Trade Intensity Trajectory (2010-19)



The second assumption refers to the random sampling of the treatment group. This assumption is often challenged by those claiming that China is using the BRI to solidify its own pre-existing sphere of influence in Asia and Africa. However, we argue that the assumption is satisfied for two main reasons. First, as Huang (2016) points out, the countries involved in the BRI are determined primarily by their geographical location throughout the main trade routes between China and Europe. Thus, a country's participation in the BRI is more randomized by its location than any existing international arrangement. Additionally, many countries and regions along the Belt-Road route (Middle East, Eastern Africa, South Asia) are unstable and face frequent political turmoil, which is certainly not welcoming to FDI programs such as the BRI or infrastructure investment. Therefore, there is very little evidence that shows that China could have chosen the BRI participating countries based on geo-strategic or political considerations. Ultimately, we believe that the difference-in-differences approach is an effective way to demonstrate the causality links between the BRI and bilateral trade links with China.

Nevertheless, there is an assumption for difference-in-differences (and SUTVA) that this design does not hold: avoiding spillover effects. When studying international trade, it is very complicated to control for spillovers, as globalization in trade and markets has deepened the financial and economic connections between countries. For instance, since our analysis starts in the year 2010, we might see some European countries affected by the Greek debt crisis in 2015 or Brexit in 2016, which could have negatively impacted their economies and, consequently, their bilateral trade with China. We hope that by grouping treated units into two groups (BRI and non-BRI), we will be able to partially mitigate these concerns. Additionally, this paper will refrain from using commonly applied methods such as absorbing unobserved heterogeneity through fixed effects, as the current academic literature (Berg, T., Reisinger, M. and Streitz, D., (2020)) has shown that these approaches can actually exacerbate the estimation bias caused by the spillover. We also understand that these strategies might be insufficient to control for spillover effects and might hinder the reliability of our results.

IV. Data

The sample size has 106 observations; 51 BRI countries and 55 non-BRI countries. The non-BRI countries chosen are those that have substantial trade with China and are included in the global economy, such as the US or the European Union. The time period is between 2010 and

2019 and the type of data is panel, as it contains observations about different cross sections across time. We have decided to use this time period because we did not want to include the year 2020, as the Covid-19 pandemic has caused a significant disruption in global trade- especially given China's zero-Covid strategy to deal with the effects of the pandemic. While looking at how the pandemic affected trade with China might be an interesting future study, that is not the focus of this paper.

As our independent variable, we will use the country's inclusion or exclusion from the Belt and Road Initiative. The data on BRI accession was found on the Belt and Road Portal and the IS AidData's Global Chinese Development Finance Dataset, published by the College of William & Mary. We will use the bilateral Trade Intensity Index (TII), as calculated by the World Bank, for our outcome variable. The main dataset used is the aforementioned IS AidData's Global Chinese Development Finance Dataset, which has information regarding Chinese aid to both BRI and non-BRI countries. Other sources include the World Bank database, the Heritage Foundation, the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) database, and the World Trade Organization (WTO), and will be more precisely specified in this section.

The index for bilateral trade intensity is defined as the ratio of one country's exports going to a partner divided by the share of world exports going to the partner. The decision of using TII instead of other bilateral trade indicators such as rate of trade growth or share of trade is deliberate and it stems from the fact that, in the last few decades, virtually every country's trade relations with China have deepened at an accelerated rate. Thus, demonstrating that the parallel-trends condition holds would be hard to prove because every country would have a similar upward trajectory before and after our treatment. Additionally, while share of trade might prove helpful when comparing flows between two trading partners, academic literature suggests that it is limited when looking at cross-country comparisons because it does not control for the effect of the size of the economy or regional bias (Li and Edmonds, 2010). Lastly, because the non-BRI bloc of countries contains countries such as the USA, Japan, and some of the leading European nations, its economic size is much larger than the BRI-bloc and using absolute trade figures would produce extremely biased results. In this paper, we will use the TII as calculated by the World Bank:

$$(2)\ \mathrm{TII}_{ij} = \frac{(t_{ij})/(T_{iw})}{(t_{wj})/(T_{ww})},$$

where TII_{ij} is the Trade Intensity Index of a country i with country j, t_{ij} is the dollar value of total trade of country i with country j, T_{iw} is the dollar value of the total trade of country i with the world, t_{wj} is the dollar value of world trade with country j, and T_{ww} is the dollar value of world trade. An index larger than 1 indicates that trade flow between countries is larger than expected given their importance in world trade. The formula of this index is based on the one proposed by Iapadre and Tajoli (2014).

The following tables display more information regarding the variables used. Table 1 serves as a description of the variable names and their sources. Table 2 displays the count, mean, control mean, standard deviation, minimum and maximum for each control and outcome variable.

Table 1: Description of the Variables

Variable Name	Description	Source
Bilateral Trade $(Y)_{cjt}$	Trade intensity index between China and country j at year t	World Bank
BRI_{ij}	Dummy variable that takes a value of 1 if country j is part of the BRI	AidData
Post_t	Dummy variable that takes a value of 1 if year t is after 2014	AidData
IT $\mathrm{Infrastructure}_{jt}$	Logarithm of the level of information and communication infrastructure of country j	World Bank
Technology Gap_{cj}	Logarithm of technology gap between China and trading partner j	World Bank
Difference of Real GDP_{cj}	Logarithm of the gap of real GDP per capita between China and the trading partner j	World Bank
Economic Freedom Index_{jt}	Logarithm of Economic Freedom index	Heritage Foundation
ODI from China_{jt}	Logarithm of China's Outward Foreign Direct Investment (FDI) to country j	AidData
Free-Trade $\mathrm{Agreement}_{cj}$	Dummy variable that takes a value of 1 if the FTA between China and country j entered into force	CEPII Database
Border_{cj}	Dummy variable that takes a value of 1 if country j shares a common border with China	WTO Database

Table 2: Summary Statistics

	Count	Mean	SD	Min	Max
Bilateral Trade (Y)	798	-0.17	0.42	-0.633	0.786
BRI×Post	798	0.34	0.42	0.000	1.000
BRI	798	0.49	0.017	0.000	1.000
Post	798	0.5	0.018	0.000	1.000
IT Infrastructure	798	6.70	0.78	0.000	15.122
Technology Gap	798	5.34	0.69	0.558	8.886
Difference of Real GDP	798	4.56	1.43	2.022	11.622
Economic Freedom Index	798	4.13	0.17	3.063	4.493
ODI from China	798	10.07	2.46	2.485	15.617
Free-Trade Agreement	798	0.07	0.22	0.000	1.000
Border	798	0.11	0.31	0.000	1.000

V. Results

5.1 Two-Way Fixed Effects Regression Results and Discussion

As noted, this study is centered around a difference-in-differences model specified by equation (1). The results of a baseline regression are reported in Table 3, and they show that the effect of the BRI on bilateral trade is positive and significant even at the 1% level. This can be seen not only in column (1), but also in columns (2) to (7). Columns (2) and (3) include the BRI and post variables, while (4) through (7) omit them and follow a more traditional 2WFE approach. All of the coefficients for the BRI variable are between 0.0637 and 0.0853. This means that the BRI increased bilateral trade between China and the BRI countries by between 6.37% and 8.53% more than that with the non-BRI countries, according to this model. A possible explanation for this phenomenon, and the objective of this study, is that the BRI facilitates trade flows between China and the BRI countries thanks to the investments in infrastructure and favorable trade agreements that joining the BRI brings to member countries. The highest coefficient is found when the regression included the Post variable, the log of the technology gap, the log of the GDP gap, the log of the infrastructure gap, the economic freedom index, and the log of China's ODI to the country.

Another interesting result of this regression was seeing that economic freedom has a negative estimate. Given that the US, Japan and Eruope are China's largest trade partners, one would think that a higher score in the economic freedom index would have a positive relationship with bilateral trade relations. However, it seems that China has a high trade preference for countries with lower degrees of economic freedom, which is one of the main criticisms of the BRI strategy. Additionally, it is surprising to observe that the variable for IT infrastructure loses statistical significance when more variables are added. This might suggest that IT infrastructure is a confounding variable. Another surprising insight we found was that the estimate for the log of the difference in GDP was not significant, given that much of the current literature suggests that the difference in GDP is one of the main explanatory variables for our dependent variable. While it would be tempting to rush to the conclusion that this paper has reached a historical breakthrough in trade economics, this could also mean that the relationship between log of the difference in GDP and TII is not linear (may be curvilinear or nonlinear), so further analysis might be necessary.

Some other intriguing insights from this baseline regression can be seen in the border variable. For instance, we can see the coefficients for economic freedom and for difference in real GDP tend to increase once border is included in the regression, which gives us a good idea of the state of China's neighbors and how they could benefit from joining the BRI. Also, it is interesting to note that the only time when the coefficient for difference in real GDP is not significant at the 10% level is in regressions (4) and (6)- this, again, could be explored in a future BRI-related study.

Table 3: Baseline Regression Results

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
BRI×Post	0.0637***	0.0821***	0.853***	0.0789***	0.0744***	0.0799***	0.0809***
	(0.0173)	(0.0188)	(0.0156)	(0.0155)	(0.0151)	(0.0180)	(0.0181)
IT Infrastructure		-0.0235***	-0.0228***	-0.0190**	-0.0227***	-0.0153**	-0.0191*
		(0.008)	(0.009)	(0.013)	(0.008)	(0.009)	(0.101)
Technology Gap		0.00892	0.00792	0.00910	0.00783	0.00804	0.00682
		(0.012)	(0.012)	(0.12)	(0.12)	(0.12)	(0.12)
Difference of Real GDP		0.0117*	0.0.131*	0.0126	0.0136*	0.0129	0.0125*
		(0.008)	(0.008)	(0.008)	(0.007)	(0.008)	(0.007)
Economic Freedom Index		-0.264**	-0.253**	-0.269**	-0.197**	-0.214**	-0.194**
		(0.021)	(0.028)	(0.019)	(0.021)	(0.028)	(0.019)
ODI from China		0.0229***	0.0224***	0.0267***	0.0233***	0.0222***	0.0189***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Free-Trade Agreement				0.511***		0.512***	0.521***
				(0.120)		(0.134)	(0.123)
Border					0.334***	0.352***	0.340***
					(0.079)	(0.089)	(0.086)
BRI		0.516**					
		(0.132)					
Post			0.1001				
			(0.092)				
Observations	798	798	798	798	798	798	798

Note: *p<0.1; **p<0.05; ***p<0.01

Lastly, this baseline regression analysis has also provided some results that were expected prior to running the regression. On of such results is that the presence of a free-trade agreement is significant in the 1% level in every regression and that it carries the second largest coefficient, after BRI×Post, our outcome variable. Likewise, when the BRI dummy variable is included, it is significant at the 5% level, which validates the claim that the BRI is an important factor in TII.

Furthermore, the variable ODI from China is also significant in the 1% level in every regression, which corroborates the current literature regarding the importance of direct investment on bilateral trade.

5.2 Difference-in-Differences

Table 4 summarizes the levels and changes in average bilateral trade intensity per country. We present data separated by treatment (BRI) and control (non-BRI) groups in the first two columns and the difference between those in the third column. The estimation is obtained using the formula:

$$(3)\ \ddot{Y}_{jt} = Y_{jt} - \overline{Y}_{j} - \overline{Y}_{t} + \overline{\overline{Y}}$$

In this equation, the estimate $\ddot{Y}_{jt}$ is obtained by subtracting the time (t) and individual (j) effects from the average outcome (jt) and adding back the slope estimator. From the table, we can see that the average TII actually decreased in the period that followed the country's inclusion in the BRI. This could be due to the turbulence that the Chinese economy experienced between 2015–2016, which might have affected their exports. It is also noteworthy to point out that, even at that time, the Chinese government continued distributing BRI funds, which shows the commitment and importance that Beijing places on this project. Nevertheless, the BRI economies experienced a relative gain when comparing them to their non-BRI counterparts- this is the difference-in-differences of the changes in TII and what confirms the existence of causality in our model. According to our model, this gain is about 9.6% with a margin of error of 0.0093. Thus, the results of the analysis suggest that the BRI has a positive impact on bilateral trade relations between China and BRI countries. Ultimately, the magnitude of the impact corroborates current academic literature and we can see the BRI as a moderate success of China's foreign policy.

Table 4: Average TII Before and After Joining the BRI

	Difference-in-Differences		
	Change in Bilateral Trade		
	BRI	Non-BRI	Difference
TII Pre-BRI	−0.045	−0.12	0.075
	(0.0017)	(0.0019)	(0.0032)
TII Post-BRI	−0.019	−0.19	0.171
	(0.0059)	(0.0051)	(0.0037)
Change in Mean TII	−0.022	0.07	0.096
	(0.0028)	(0.0055)	(0.0093)
Observations	798	798	798

5.3 Robustness Checks

Next, we will conduct two robustness checks to validate the results from the previous section. We will first run a placebo test and then analyze the lag effects of the BRI. These types of tests help us conduct fictional analyses where the treatment would not be able to have an effect, or where it would have a lagged effect on the study participants. Finding an effect in a placebo test would indicate important flaws in the study, while we would expect the lag effect to be significantly positive.

In order to achieve so, we can analyze what would happen if the "Post" variable was set differently. Since bilateral trade differences might be affected by more than just the BRI, this robustness check can examine whether the effects of the BRI could be replicated if countries had joined the BRI earlier. We can do so by running the regression again, this time changing the Post dummy variables and keeping everything else equal. Table 5 shows the results of this pre-period placebo test. If the coefficients of the new BRI_{jt}* $Post_{t-1}$ or BRI_{jt}* $Post_{t-2}$ are not statistically significant, it would not be possible to replicate the the positive effects of the BRI.

Table 5: Robustness Check (Placebo)

Variables	(1)	(2)	(3)	(4)
$BRI \times Post_{t-1}$	0.0242	0.0317		
	(0.019)	(0.020)		
$BRI \times Post_{t-2}$			0.0294	0.0295
			(0.024)	(0.024)
BRI		0.515**		0.511**
		(0.128)		(0.132)
Post		0.121		0.132
		(0.080)		(0.081)
IT Infrastructure		-0.0152*		-0.0141*
		(-0.0008)		(-0.0008)
Technology Gap		0.00334		0.00262
		(0.0191)		(0.0120)
Difference of Real GDP		0.0114		0.0110
		(0.008)		(0.008)
Economic Freedom Index		-0.207*		-0.206*
		(-0.113)		(-0.113)
ODI from China		0.0177**		0.0173**
		(0.007)		(0.007)
Free-Trade Agreement		0.509***		0.507***
		(0.122)		(0.123)
Border		0.354***		0.356***
		(0.088)		(0.087)
Observations	798	798	798	798

Note: *p<0.1; **p<0.05; ***p<0.01

As seen in Table 5, when we rerun the regression from section 5 with our new interaction variables, its coefficients are statistically insignificant. Thus, our findings suggest that the positive BRI impact is not valid when assuming the countries joined the BRI one or two years before. In other words, the positive effects of the BRI cannot be replicated for different years of the treatment, which implies that the BRI has a significantly positive impact on the bilateral trade preferentiality between China and the Belt-Road countries.

Additionally, we can conduct a second robustness check to examine the lag effects of the BRI. Now, we will use the coefficients BRI_{jt}* $Post_{t+1}$ and BRI_{jt}* $Post_{t+2}$ to rerun our regression while keeping everything else equal. As seen in columns (2) and (4) of Table 6, the results of this regression show that the coefficients of the interaction variables are significantly positive. Thus, this test confirms that the BRI had a significant positive impact on the bilateral trade between China and the BRI countries over the two years after the countries joined the BRI and implies that the BRI has a long-term positive effect on intensifying trade links between China and the Belt-Road countries.

Table 6: Robustness Check (Lag Effects)

Variables	**(1)**	**(2)**	**(3)**	**(4)**
$BRI \times Post_{t+1}$	0.0482** (0.019)	0.0562*** (0.019)		
$BRI \times Post_{t+2}$			0.0298 (0.024)	0.0410* (0.025)
BRI		0.517*** (0.110)		0.521*** (0.112)
Post		0.129 (0.073)		0.140 (0.087)
IT Infrastructure		-0.0220** (0.001)		-0.0365*** (0.013)
Technology Gap		0.0007 (0.014)		-0.0012 (0.015)
Difference of Real GDP		0.0027 (0.008)		-0.0078 (0.01)
Economic Freedom Index		-0.0844 (0.12)		-0.0400 (0.14)
ODI from China		0.0182** (0.008)		0.0213** (0.008)
Free-Trade Agreement		0.503** (0.12)		0.507** (0.12)
Border		0.358*** (0.088)		0.358*** (0.089)
Observations	798	798	798	798

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

VI. Conclusion

This study attempts to quantify the impact of the BRI on bilateral trade between China and the participating countries. As the most important Chinese foreign policy project since Xi Jinping became the paramount leader of the country in 2013, we believe that analyzing its impact on trade is fundamental to understand what moves policymakers in Beijing. Additionally, measuring the impact of the BRI is important for its implications on future free-trade agreements that other countries might want to negotiate, as it could be seen as a valuable point of reference.

Our analysis uses the World Bank's Trade Intensity Index as the outcome variable and a series of control variables to help isolate the causal effect. After an initial regression analysis, we observed that the bilateral trade intensities between China and the BRI countries grew approximately between 6.37% and 8.53% faster than those with the non-BRI countries after joining the BRI. Additionally, using a difference-in-differences approach we also demonstrated the causal relationship between the BRI and an increase in bilateral trade with China. In fact, we found that the relative gain as a consequence of the implementation of the BRI is an increase of 9.6% in the TII means of the treatment group compared to the control group.

In a future paper, we would be interested to look at how Covid-19 has changed the trajectory of our findings. While we have found a positive relationship between BRI participation and bilateral trade links with China, it would be fascinating to see how the pandemic and subsequent supply chain crisis have affected Chinese trade. Furthermore, we would have liked to better control for spillover effects. We understand that, even with random treatment, spillovers often lead to an intricate bias in estimating treatment effects that cannot be solved by simply dividing the dataset by two. We would therefore be interested in solving this weakness of our paper in future work.

VII. References

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