



THE IMPACT OF BELT AND ROAD INITIATIVE ON THE ECONOMIC GROWTH OF MEMBER COUNTRIES IN ASIA- A SPILLOVER EFFECT ON ECONOMIC SECTORS

O Impacto da Iniciativa de Correias e Estradas no crescimento econômico dos países membros da Ásia – Um efeito de contágio nos setores econômicos

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ABSTRACT

The study sought to answer the impact of the Belt and Road Initiative on the economic growth of Asian countries and how its growth affects various economic sectors of Asian countries. One of the significant contributions of this paper is that it highlights factors in Asian countries that account for the successful implementation of the Belt and Road initiative. The findings of this study are to serve as a guideline for firms, individuals, government, or any other entity willing to invest in Asian countries along the Belt and Road Initiative. Similarly, the study focused on identifying critical sectors of the host nation's economy that are being impacted significantly by the Belt and Road initiative in Asia. The findings of the study are to serve as a guide to governments, corporate entities, and all stakeholders in Asia the most likely sectors of their economy likely to be impacted significantly by the Belt and Road Initiative. On economic growth it was realized that BRI from mainland China has a significant positive effect on the GDP growth rate of Asia. However, BRI showed no direct significant effect on the various economic sectors, previous year's GDP growth rate has a significant positive effect on agriculture growth rate, manufacturing growth rate, services growth rate and external balance of trade growth rate indicating that there is a significant spillover from GDP growth rate as a result of BRI to other sectors of the economy.

Keywords: Gross Domestic Growth; Belt and Road Initiative; Human Capital; Unemployment; Asia.

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O IMPACTO DA INICIATIVA DE CORREIAS E ESTRADAS NO CRESCIMENTO ECONÔMICO DOS PAÍSES MEMBROS DA ÁSIA – UM EFEITO DE CONTÁGIO NOS SETORES ECONÔMICOS

*The impact of belt and road initiative on the economic growth of member countries in Asia -
A spillover effect on economic sectors*

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RESUMO

O estudo buscou responder o impacto da Belt and Road Initiative no crescimento econômico dos países asiáticos e como seu crescimento afeta vários setores econômicos dos países asiáticos. Uma das contribuições significativas deste artigo é que ele destaca fatores em países asiáticos que são responsáveis pelo sucesso da implementação da iniciativa Belt and Road. As descobertas deste estudo devem servir como uma diretriz para empresas, indivíduos, governo ou qualquer outra entidade disposta a investir em países asiáticos ao longo da Belt and Road Initiative. Da mesma forma, o estudo se concentrou na identificação de setores críticos da economia do país anfitrião que estão sendo impactados significativamente pela iniciativa Belt and Road na Ásia. As descobertas do estudo devem servir como um guia para governos, entidades corporativas e todas as partes interessadas na Ásia, os setores mais prováveis de sua economia com probabilidade de serem impactados significativamente pela Belt and Road Initiative. Sobre o crescimento econômico, percebeu-se que o BRI da China continental tem um efeito positivo significativo na taxa de crescimento do PIB da Ásia. No entanto, o BRI não mostrou nenhum efeito direto significativo sobre os vários setores econômicos, a taxa de crescimento do PIB do ano anterior tem um efeito positivo significativo sobre a taxa de crescimento da agricultura, a taxa de crescimento da indústria, a taxa de crescimento dos serviços e a taxa de crescimento da balança comercial externa, indicando que há um contágio significativo da taxa de crescimento do PIB como resultado do BRI para outros setores da economia.

Palavras-chave: Crescimento Interno Bruto; Belt and Road Initiative; Capital Humano; Desemprego; Ásia.

INTRODUCTION

The Belt and Road Initiative (BRI), which began in 2013 is mostly an infrastructure driven investment project by the Chinese Government as a way of creating an economic block by integrating countries and promoting infrastructural development among member countries. The initiative is one that fits the idea and concept of globalization and development through economic cooperation and unity. Since the launch of the Belt and Road Initiative in 2013, a total of 136 countries and 30 international organizations have signed the BRI cooperation documents, received up to \$90 billion worth of Chinese Foreign Direct Investment (FDI), and exchanged over \$6 trillion in trade with mainland China as stated in a 2019 report of Transitional institute on the Belt and Road Initiative. Currently, there are eleven countries from South East Asia, eight Southern Asia countries, five Central Asia countries that are part of the Belt and Road Initiative (BRI) and as such, making Asia a pivot continent in the Belt and Road Initiative (BRI). From 2013, the belt and road initiative has provided the signal of China's commitment and approach to addressing global issues such as infrastructural deficit countries and challenges in most developing as a way of solving global economic challenges. To prove the economic significance of the Belt and Road Initiative (BRI), these 136 countries jointly account for 65% of total world land, 62.3% of world population, 30% of total world GDP, and 59.76.0% household (STI, 2019).

Generally speaking, the Belt Road Initiative is an advancement of the ancient Silk Road initiative that seeks sought to connect China to other economies in the world including Europe, Asia, and Africa mostly the Northern part of Africa. BRI initiatives could be classified as an advanced form of FDI into countries proposed that are a part of the belt and road initiative by the Chinese Government in the quest to developing an economic belt through the construction of transportation facilities in South East Asia, the Middle East, Europe, and Africa.

Chiba (2015) noted that BRI initiatives could be China's second but major outward-oriented strategy to boost and strengthen its relationship and trade ties with Asian countries with road and maritime links to Africa, the Middle East, and on towards Europe. According to the initiative of the policy countries which are part of the project will adhere to the Paris declaration however member countries will not abide by the conditions that the DAC framework expects member countries to meet for intervention projects. The initiative is structured to help address issues of infrastructure underfunding, to create new pathways to sustainable development, with win-win cooperation and mutually compatible solutions to development problems facing countries, most especially developing and underfinanced countries with infrastructural deficits. To show a total commitment to the project, the Chinese government issued an official document on Mar. 28 2015, laying out the core provisions and priorities for the BRI initiative (National Development and Reform Commission, 2015).

According to the Chinese government, BRI could help promote economic prosperity and regional cooperation, strengthen exchanges and mutual learning between different civilizations, and promote world peace and development without replacing the existing development organizations that aid the development of developing countries (National Development and Reform Commission 2015), (Vladimir Yakunin. 2019). Chiba, (2015) provided evidence that the People's Bank of China recapitalized the China Development Bank (CDB), the China Exim Bank, and the Agricultural Development Bank of China (ADBC) with the U.S. \$62 billion to do the preparatory groundwork for these initiatives.

In recent years, the Chinese government proposed the Belt and Road Initiative (BRI) as the development strategy to promote cooperation and connectivity between Eurasian countries. With this initiative, amongst others, China intends to take a greater role in global affairs and transport a China-centered trading network globally. Generally speaking, the Belt and Road Initiative is made up of two distinct parts. The first part of the initiative is the 21st Century Maritime Silk Road (MSR) and the second part is the Silk Road Economic Belt (SREB). The 21st Century Maritime Silk Road (MSR) which links the financial industry in Europe to the financial sector in Asia-pacific. Usually, this captures the sea section of the Belt and Road policy. The Silk Road Economic Belt is the land part of the policy which originated from the legacy of the ancient Silk Road, during the Chinese Han dynasty by Zhang Qian. The land part of the initiative goes through central Asia mainly. This policy goes through the Central Asian countries, such as Kazakhstan and Afghanistan, to the south. Belt and Road Initiative covers numerous African and Asian countries, such as Kenya, Indonesia, Israel, and many others amongst its total reach of 44 countries.

The countries in Asia over the years have seen a great number of infrastructural projects under the Belt and Road Initiative that is geared towards the reduction of infrastructural deficit in Asian countries with the overall aim of promoting growth and development in member countries. Interestingly, most of these member countries in Asia are developing countries with substantial infrastructural deficits ranging from transportation, energy, manufacturing plants, just to mention a few. China's Belt and Road Initiative is aimed to help these countries improve their infrastructure among others are transportation, energy production, and trade.

On transportation, the Belt and Road Initiative (BRI) has assisted many countries in developing their transportation infrastructures through the construction of roads and railways. For example, China has invested \$14 billion in Eastern Africa Kenya's Standard Gauge Railway (SGR). The SGR, which is a 485km single-track rail-road and acts as one of the most significant projects since Kenya became independent in 1963. The SGR project stretches from Mombasa to the Kenyan capital, Nairobi, and in December 2015, Kenya with an extra \$1.5 billion from China extended the SGR further to Naivasha in the north. The SGR also facilitates local industries and trade between Africa and China. The expansion of the SGR project to the northern part of Kenya became the new engine of economic growth to the economy as it created numerous jobs in the country, increased the industrialization rate of the Kenyan economy, as well as reducing the cost of doing business in Kenya as the railway led to a significant drop in transportation cost most especially a reduction in cargo cost. Similarly, in Bangladesh under the belt and road initiative, the 225KM Padma rail link envisioned to be completed in 2022 has started. The project is intended to form the future backbone of the rail network in the southwestern part of Bangladesh connecting the region directly to the capital of Bangladesh.

Again, under the belt and road initiative, the Angren-Pap railway in Uzbekistan, which is the longest tunnel in Central Asia was constructed. The railway improves the connectivity in Uzbekistan's Fergana valley that allows freight traffic to bypass neighboring Tajikistan. Also, under the Vientiane-Boten Railway project also known as the China-Laos Railway under the belt and road initiative which is expected to be completed in 2021. The project is a 414 KM project connecting Boten to the Thailand Northeast railway as a way of fostering the movement of people and goods. The Vientiane-Boten project is part of the 5500KM railway project aiming to connect Yunnan's provincial capital Kunming to Singapore through Laos, Myanmar, Thailand, Vietnam, Cambodia, and Malaysia.

On energy, one example of the projects launched by the Belt and Road Initiative in Pakistan is an energy investment, which is the Nehru Tim Jielu Mu Hydropower Station. Electricity over the years has been the biggest problem in Pakistan; during summer in Pakistan, to address the over 500 million mega-watt shortage of electricity in the country that the national grid is unable to supply to the people and businesses in Pakistan. In 2014, the construction of Nehru Tim Jielu Mu Hydropower Station was approved and operated by a joint engineering team of China Gezhouba Group Co., LTD (CGGC), and China Machinery Engineering Corporation (CMEC). This project invested around \$4.3 billion, and its goal is to build a dam on Nehru River and provide electricity via hydroelectric generation. The Nehru Tim Jielu Mu hydropower station is Pakistan's largest hydropower project, which can generate a capacity of 5.15 billion kilowatts. This project brings light to Pakistan and assists in the nation's economic growth and development. A similar project in Cambodia, thus the Lower Sesan II hydropower dam is one of the energy projects under the belt and initiative. The plant is expected to produce 1.9 billion kWh per year. The new dam will increase energy supply in Cambodia by 20 per cent, which will enable the people in Sesan district with no electricity to have access to electricity.

On trade, the Belt and Road Initiative promotes trade between member countries in Asia and generates mutual economic benefits by removing trade barriers as a result of limited infrastructures. For example, Kazakhstan is a landlocked country in Central Asia, and as its winters are very cold, there is barely any vegetable production. Belt and Road Initiative connects Kazakhstan and the north. The cross-border trade of vegetables provides Kazakhstan's people with their basic needs. The total trade between Xinjiang and Kazakhstan is more than \$11 billion annually, a figure that composes 40 per cent of China-Kazakhstan trade in total. Also, in Brunei, the trade routes are from the Belt and Road initiative is helping the country address its infrastructure deficient in its oil production. Brunei has abundant oil and gas resources, but the nation lacks the material for producing oil and gas pipelines. Belt and Road Initiative shortens the distance between each country and promotes the global economy, and will hopefully see ongoing progress and generate benefits for every country along the Belt and

Road Initiative. It is because of this prospect this paper seeks to analyze the impact of the Belt and Road Initiative on countries that are members to serve as a guide for other countries who seek to join the policy.

It is no doubt that the Belt and Road Initiative (BRI) initiative will have huge impacts on countries as well as the Chinese provinces, along the roads. Despite the number of research being carried out on BRI due to the promising benefits of the initiative to developing countries by helping them overcome their infrastructural deficits, it is evident that little to none is done on how the investments under the belt and road initiative in infrastructure translates into the various sectors of the economies of host countries that are part of the Belt and Road Initiative. Our paper analyzed the impact of the belt and road initiative on economic growth in Asian countries', how it affects the various sectors of these economies and factors that influence the Belt and Road Initiative.

1. LITERATURE REVIEW

Despite the significant benefits of BRI, investing wisely in infrastructure involves crucial decision makings as over-investment can lead to inefficiently large projects, and therefore have low marginal returns. This implies that the effective implementation of the BRI strategy is core and one that both host, state-owned entities, and corporate bodies in the BRI investment should be concerned about. Fan Zhai (2017), using a global computable general equilibrium model studying the macroeconomic impact on belt and road countries, found out that BRI will bring a good number of benefits to the world economy with regards to welfare and trade, however China and all other countries along the belt and road route need to address the various challenges to implement the initiative to enjoy the full benefit that BRI can offer.

Wen Shu-hui, Hu Qiong, and Cheng Xian-nan(2019), in their studies on the Influence of "The Belt and Road" Countries' Financial Development and Institutional Environment on China's Outward FDI, argued that the quality of the host country systems and the environment has a significant impact on the performance of China's outward FDI under BRI.

According to Xiao Bing Jiang and Li-Ming Liu in their paper "China's Direct Investment Efficiency toward the countries along the Belt and Road," the overall efficiency of China's investment in the countries along the line is not high. In the meantime, the investment efficiency of Chinese investments along the line shows a slight downward trend during their investigation. The rate of technological advancement in developing countries is the main factor restricting the investment efficiency of BRI countries. According to them, China should optimize its investment structure and location selection and strengthen investment skills. They also propose innovativeness in technology, construct a transnational knowledge network system, deepen capacity cooperation between the two sides, and enhance the agglomeration of investment industries.

According to the study of Sghaier and Abida (2013) on their research on the relationship between FDI and economic growth using data on Algeria, Morocco, Tunisia, and Egypt for the period of 1980 to 2011, with a Generalized Method of Moment, the study concluded that there exists a strong positive relationship between FDI and economic growth. Their findings are somehow similar to the results of Alfaro et al. (2010) and Choong (2012), the authors emphasized that the development of the local financial system served as an essential precondition necessary for FDI to have a notable effect on an economy. Therefore, it can be concluded, based on the reviewed literature, that BRI being an outward FDI from China to developing countries, can positively affect economic growth through various channels such human capital development spillover, unemployment growth rate reduction spillover, agricultural, manufacturing, and service sector productivity increment in Asia but this effect is conditional since the impact of BRI in Asia is based on the quality of institutions in Asian countries, government and policy implementation efficiency as well as human capital development of these countries.

The study of Noorbakhsh et al. 2001 and Khan 2007 concluded that the human capital of host nations is one of the critical factors of FDI inflow and an accelerator of inward FDI performance in host countries. Also, Ramasamy and Yeung (2010) and Kaliappan et al. (2015) also concluded that there is a notable positive effect of human capital development of host countries and the performance of FDI in the country since most foreign direct investment projects use some amount of human capital from host nations.

On government and policy efficiency and corruption perception in host nations, it is argued that weak institutions, including corruption, weak government institutions, and thwarted policies, prevent foreign direct

investments from exploiting their competitive advantage in a host country. Meyer Sinani (2009) concluded that corruption perception of a country has a U-shape effect on FDI in a country. They found out that countries with a medium level of transparency have the least benefit from inward FDI. Moran (2006) concluded that the effect corruption on FDI depends on the area or sector in which the FDI falls as corruption in infrastructural project FDI tends to have a positive impact on FDI because states bribery and corruption are often connected with infrastructure FDI and extractive industries. Also, Pederson and McCormick concluded that the development and implementation of effective FDI spillover policies depend critically on the quality of the host country's institutional environment. The potential for significant, proactive government policies in developing countries may be limited by capacity gaps. More importantly, the policy may be impeded by a lack of institutional contexts for close and effective relationships between the public and the private sector and poor integration among FDI, SOEs, and domestic (formal and informal) enterprises (Pedersen and McCormick 1999).

Wang et al. (2019). showed that institutions and taxation both matter in China's OFDI; however, Cheung and Qian argued that institutional quality is insignificant in determining FDI. Kolstad and Wiig argued that, as a host country's institutional environment worsens, China's OFDI becomes more attracted by its natural resources. Amighini et al. found that China's OFDI is associated with weak governance in low-income countries. Thus, the more stable the political environment is, the more flexible and transparent process of executing policies, and the better the government in the host countries, the more China's OFDI is attracted.

Conversely, worse institutional environment and weak governance of the developing host countries could also be considered an advantage associated with China's OFDI. This BRI Strategy, as intended by the government of the People's Republic of China, is an initiative that will boost the economy of China and countries that joins the initiative. Infrastructure is key to the success of a competitive modern economy.

Also, Zhang Ya-bin (2019) The Investment Facilitation of "One Belt One Road" and Choices of China's Foreign Direct Investment-Empirical Analysis Based on Cross-Panel Data and Investment using Gravity Model found out that GDP, size of the labor force, natural resource endowment, bilateral investment agreements, and investment facilitation has a notable role in advancing China's foreign investment.

For an FDI such as BRI or intervention to impact the economy of a host nation, specific economic, political, social, and human factors ought to be present for the impact of the policy to be realized. Despite the authors concluding on the improvement in infrastructure levels in BRI member countries and their prediction of a significant positive effect of the increase in infrastructure on growth, they did not state the mechanism necessary to cause the improvement in infrastructure to affect the economy of BRI countries. Similarly, previous studies failed to comment on how the unemployment rate, human capital development, a common language with mainland China affects the efficiency with which BRI projects are implemented in Asia and how these factors aid BRI to impact host countries significantly.

Previous studies failed to identify the various sectors in the host countries' economies being impacted the most the initiative. It is evident that BRI significantly affects the growth countries in Asia, but little is known about which sectors are being affected significantly, and the sectors that are not affected significantly.

Furthermore, most of the earlier studies failed to assess the impact of BRI on host nations after the implementation of the initiative and before the implementation of the initiative. Before the implementation of the Belt and Road Initiative, most of the countries in Asia were recipients of FDI from China. To know the actual impact of coming from the introduction of BRI, it is ideal for comparing the years after implementing the initiative to the years before the policy.

2.METHODOLOGICAL APPROACH

2.1 Some Linear Models

This paper analyzed the impact of the BRI on the economic growth and its impact on other sectors of Asian countries. The study used Gross Domestic Product (GDP gr) as the proxy for economic growth. In the first place, it seems more appropriate for us to consider using gross data since the focus of this study was to uncover the general benefits that BRI has on the host economy through the transfer of knowledge and other spillover effects. Additionally, the outflow of foreign direct investments does not involve adverse growth effects for the

donor country. Furthermore, in this framework, BRI as a foreign direct investment flow from a more industrialized economy (China) to developing economies to narrow the development gap in terms of infrastructure and technology. The study solely used secondary data from different sources. Time series data on GDP growth rate and the sectorial data were obtained from the World Bank's data bank and the organization for Economic cooperation and development. Also, the data on BRI was collected from the Ministry of Foreign Affairs of the people's republic of China's website. The study used the first difference of all the various data sets under study. The first level difference of the data sets is to control the porousness of the results.

On assessing the impact of Belt and Road Initiative on Asia, the study used a panel data of the key macroeconomic variables and environmental factors of countries that fall under the various regions in Asia. Over time, there have been several studies on the impact of policies or initiatives on economies and other variables by using Difference In Difference approach as it helps capture the true impact of the policy after its implementation (Meyer, Viscusi, and Durbin, 1995) The study adopted Difference-In-Difference method developed by Snow (1985) in its estimation of the impact of Belt and Road Initiative in Asia. The model has a general specification of

$$Y = \beta_0 + \beta_1[\text{Intervention}] + \beta_2 * [\text{Time}] + \beta_3 * [\text{Time} * \text{Intervention}] + \varepsilon \dots\dots 1$$

This study examines the impact of the belt and road initiative on the economic growth of Asian countries that are along the belt and how the growth affects the various economic sectors of countries and host nation factors affecting BRI using the Difference-In-Difference model to capture the true impact of BRI on economies after the implementation of the BRI in 2013. This is the same model used by Voon (2020) in the study of the impact of BRI on China's soft power. The authors used DID in explaining how China's soft power has increased following the implementation of the Belt and Road initiative.

First, the study assessed the impact of BRI on economic growth using gross domestic product growth rate as the proxy. The study used this function:

$$GDP\ GR = \beta_0 + \beta_1 * [\text{Intervention}] + \beta_2 * [\text{Time}] + \beta_3 * [\text{Time} * \text{Intervention}] + \varepsilon \dots\dots 2$$

Next, the study assessed the impact of BRI on individual sectors of Asian countries and how previous GDP growth rates also affect the various sectors. In measuring the impact of BRI on various sectors of economies in Asia, the paper used this function

$$Y = \beta_0 + \beta_1 * [\text{Intervention}] + \beta_2 * [\text{Time}] + \beta_3 * [\text{Time} * \text{Intervention}] + \beta_4 GDP\ GR_{t-1} + \varepsilon \dots 3$$

Where: $\beta_0, \beta_1, \beta_2,$ and β_3 are parameters to be estimated, Y represents the various sectors of an economy understudy. Thus, the agricultural growth rate, manufacturing growth rate, services growth rate, the external balance of trade, GDP growth rate ε represents the error term.

Sebastian Galiani (2005) used Difference-In-Difference to analyze the impact of water privatization of water supply in Argentina on the reduction of child mortality rate. Similarly, Tella (2004) analyzed the impact of the allocation of the police force on crime reduction after a terrorist attack using Difference-In-Difference by looking at how police allocation after a terrorist attack in Argentina help curb crime. The difference in the Difference model is best used for measuring the impact of a policy with a known starting date as $\beta_3 * [\text{Time} * \text{Intervention}]$ estimates the effect the policy is having after its implementation (Kleir and McClain 1995). Given this, the Difference in Difference is adopted in assessing the economic impact of BRI on Asia and the five regional blocks in Asia, taking into consideration 2013 as the policy start date. The economic impact of BRI on Economic growth and other sectors Model specification:

$$GDP_A = \beta_0 + \beta_1 BRI + \beta_2 PostBRI + \beta_3 BRI * PostBRI + \beta_4 POL + \varepsilon \dots \dots \dots 1$$

$$Manu_A = \beta_0 + \beta_1 BRI + \beta_2 PostBRI + \beta_3 BRI * PostBRI + \beta_4 GDP\ GR_{t-1} + \varepsilon \dots\dots 2$$

$$Serv_A = \beta_0 + \beta_1 BRI + \beta_2 PostBRI + \beta_3 BRI * PostBRI + \beta_4 GDP GR_{t-1} + \varepsilon \dots \dots \dots 3$$

$$Agric_A = \beta_0 + \beta_1 BRI + \beta_2 PostBRI + \beta_3 BRI * PostBRI + \beta_4 GDP GR_{t-1} + \varepsilon \dots \dots \dots 4$$

$$Trade_A = \beta_0 + \beta_1 BRI + \beta_2 PostBRI + \beta_3 BRI * PostBRI + \beta_4 GDP GR_{t-1} + \varepsilon \dots \dots \dots 5$$

2.2 Difference in difference analysis

The study focused on assessing the impact of BRI in host countries after implementing the initiative in 2013. This qualified the study to be noted as a natural experimental study. Craig et al. (2012) accentuate the assertion by elaborating that a natural experiment is when a particular intervention has been executed, and the circumstance around the execution of or the implementation of the policy is something beyond the control of researchers undertaking their study on the effect of the policy. Leatherdale (2018) argue that several research designs can be adopted to examine natural experiments. He, however, portrayed that the perfect among them include pre-intervention (Time₁) and post-intervention (Time₂).

This study, based on evidence from the literature above, adopts a difference in a different model to examine the impact of BRI on the economic growth of countries in Asia. The model is assumed on the basis that BRI is a new kind of FDI predominantly to boost infrastructural development in countries along BRI. The econometric methods for identifying unbiased estimates of the impact of treatment depend on the use of a breakpoint that is a starting date for the policy of the intervention, and this model permits the comparison of differences in outcomes before and after an intervention. The effect of this is given by;

$$\bar{\delta}_1^I - \bar{\delta}_0^I = \bar{\Omega}_1 \dots \dots \dots eqn (1)$$

Where, $\bar{\delta}_1^I$ is the mean outcome in the period in which BRI after the implementation of BRI, $\bar{\delta}_0^I$ is the mean outcome in the period before BRI and Ω_i is the difference in the outcome. It is considered that control variables that influence the GDP growth rate of countries in Asia do not change. In taking the expectation of equation (1), the equation will now be;

$$E[\bar{\Omega}_1] = E[\bar{\delta}_1^I] - E[\bar{\delta}_0^I] \dots \dots \dots eqn (2)$$

Given that the expected values of the average outcome of $E[\bar{\delta}_1^I]$ is $\lambda + \varphi + \tau + \Omega$ and $E[\bar{\delta}_0^I]$ is $\lambda + \varphi$. Where λ is a constant term, φ denotes the period after 2013 when the BRI came into operation. Thus, accounting for differences between the periods before and after the intervention in Asia. τ also represents time trend common to the pre and post the BRI execution, and ψ is the actual causal effect of the intervention. Hence, substituting this into equation (5) gives us;

$$E[\bar{\Omega}_1] = (\lambda + \varphi + \tau + \Omega) - (\lambda + \varphi) \dots \dots \dots eqn (3)$$

$$= \tau + \Omega \approx \tau \neq 0$$

This implies that the estimator will be biased in the intervention group alone since $\tau \neq 0$. That is to say, that, if a time-trend exists in the outcome δ_i then there is the need to confound the time-trend as being part of the intervention result. Taking into consideration post-intervention and control groups. The outcome of this effect is given by;

$$\bar{\delta}_1^I - \bar{\delta}_0^C = \bar{\Omega}_2 \dots \dots \dots eqn (4)$$

The expectation of this equation is as;

$$E[\bar{\Omega}_2] = E[\bar{\delta}_1^I] - E[\bar{\delta}_0^C]$$

Given that the expected values of the average outcome of $\mathcal{E}[\bar{\delta}_1^C]$ is $\lambda + \tau$ and substituting this into equation (4) we have;

$$\begin{aligned} \mathcal{E}[\bar{\Omega}_2] &= (\lambda + \varphi + \tau + \Omega) - (\lambda + \tau) \dots \dots \dots eqn (5) \\ &= \varphi + \Omega \approx \varphi \neq 0 \end{aligned}$$

Again, in the post-intervention, the estimator is still biased since $\varphi \neq 0$ from the solution above. With the introduction of BRI, we can admit that things will change over time; that is, host countries will see an improvement in their GDP growth rate, HCI and cause the unemployment rate to reduce in countries. By implication, there is an existence of lasting average differences in the outcome δ_i between the impact of China's OFDI to countries before and after the BR initiative. The actual intervention causal effect will be confounded by the lasting differences in the intervention and control groups that existed before the intervention. The changes that occur during this period are the main aim of this study to determine the impact of BRI on the economic growth of countries in Asia. We can estimate this difference within each group using a difference in differences estimation. Thus,

$$\hat{\Omega}_{dd} = (\bar{\delta}_1^I - \bar{\delta}_0^I) - (\bar{\delta}_1^C - \bar{\delta}_0^C) \dots \dots \dots eqn (6)$$

Where, $\hat{\Omega}_{dd}$ is the average difference in differences.

The time is denoted in this study by T , and it also takes the value of 1 for observations after 2013 and 0 before 2013.

Therefore, the DID average treatment effect is written as;

$$\begin{aligned} \hat{\Omega}_{dd} &= (\mathcal{E}[\delta_{it}|A_i, I = 1, T = 1] - \mathcal{E}[\delta_{it}|A_i, I = 1, T = 0]) \\ &\quad - (\mathcal{E}[\delta_{it}|A_i, I = 0, T = 1] - \mathcal{E}[\delta_{it}|A_i, I = 0, T = 0]).. eqn (7) \end{aligned}$$

2.3 Principal Component Analysis

The paper first analyzed the impact and efficiency of BRI (BRI) using Difference in Difference mode and then tested the efficiency of BRI using Ordinary Least Squares. Similarly, the paper conducted an impact and efficiency analysis of BRI in eastern Asia. The study focused on east Asia for its regional analysis because eastern Asia is the highest recipient of China's outward FDI and hence an ideal sample for measuring the efficiency of such investments.

Furthermore, the paper used Principal Component Analysis in selecting and reducing the dimension of variables that affects the performance of BRI in host countries. Principal Component Analysis (Principal Component Analysis) is a multivariate analysis that transforms the original variables correlated into new variables that are not associated with reducing the number of variables that have smaller dimensions but most of the changes that occur in the other variables. With PCA, the number of significant components that are formed equals the number of main variables under study. The reduction (Simplification) in dimensions is that the criteria of the percentage of the diversity of the data described by some of the significant components of the first. With PCA, when the first few components explain more than 75% of the variations in the original data is, then the analysis is done up to the main component; the main component is derived from a population of a multivariate normal random vector.

$X = (X_1, X_2, \dots, X_p)$.. eqn (8) and vector average $\mu = (\mu_1, \mu_2, \dots, \mu_p)$.. eqn (9) and covariance matrix Σ with root characteristic (eigenvalue) that $\lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_p \geq 0$.. eqn (10) obtained a linear combination of the main components is as follows:

$$Y_1 = e'_1 X_1 = e'_{11} X_1 + e'_{21} X_2 + \dots + e'_{p1} X_p \dots eqn (11)$$

$$Y_2 = e'_2 X_1 = e'_{12} X_1 + e'_{22} X_2 + \dots + e'_{p2} X_p \dots eqn (12)$$

$$Y_p = e'_p X_1 = e'_{1p} X_1 + e'_{2p} X_2 + \dots + e'_{pp} X_p \dots eqn (13)$$

Then $\text{Var}(Y_i) = e_i' \Sigma e_i$ and $\text{Cov}(Y_i, Y_k) = e_i' \Sigma e_k$ where $i, k = 1, 2, \dots, p$.

Requirements to form the main component is a linear combination of variable X in order to have maximum variant is to select a feature vector (eigen vector) that $e = (e_1, e_2, \dots, e_p)$ such that $\text{Var}(Y_i) = \text{maximum } e_i' \Sigma e_i$ and $e_i' e_i = 1$.

The first main component is a linear combination that maximizes $e_1' X \text{Var}(e_1' X)$ provided $e_1' e_1 = 1$. The second major component is a linear combination that maximizes $e_2' X \text{Var}(e_2' X)$ provided $e_2' e_2 = 1$. The main components of all i is a linear combination that maximizes $e_i' X \text{Var}(e_i' X)$ provided 1 and $\text{Cov}(e_i' e_k) = 0$ for k . The main components are uncorrelated and have the same variation with characteristic roots of Σ . The root characteristic of variance-covariance matrix Σ is a variant of the main components of Y , so the variance-covariance matrix of Y is:

$$\Sigma = \begin{matrix} \lambda_1 & 0 & \dots & 0 \\ 0 & \lambda_2 & \dots & 0 \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ 0 & 0 & \dots & \lambda_p \end{matrix} \dots eqn (14)$$

The total diversity of origin variable will be equal to the total diversity is explained by significant components, namely:

$$j = 1 p \text{var}(X_i) = \text{tr}(\Sigma) = \lambda_1 + \lambda_2 + \dots + \lambda_p = \sum_{j=1}^p \text{var}(Y_j) \dots eqn (15)$$

Depreciation dimensions of the original variable is done by taking a small number of components that can explain the largest part of diversity data. If the main components are taken as the component q , where $q < p$, then the proportion of the total diversity can be explained by the principal component to- i are:

$$\frac{\lambda_i}{\lambda_1 + \lambda_2 + \dots + \lambda_p} \text{ where } i = 1, 2, \dots, p \dots eqn (16)$$

Decreasing the main components of the correlation matrix is conducted when the data was first transformed into a raw form Z . This transformation is performed on the data unit is not the same observation. When the size of the observed variables on a scale with a vast difference or unit size is not the same, these variables need to be standardized (standardized).

Raw variable (Z) obtained from the transformation of the original variables in the following matrix:

$$Z = (V^{\frac{1}{2}})^{-1(x-u)} \dots eqn (17)$$

$V^{\frac{1}{2}}$ is the standard deviation matrix with main diagonal elements are $(\sigma_{ii})^{\frac{1}{2}}$, while other elements are zero. The expected value $E(Z) = 0$ and diversity is:

$$Cov(z) = ((V^2))^{-1} \sum (V^2))^{-1} = p..eqn (18)$$

Table 1: Description of Variables

Variable	Variable definition
BRI _{it}	China's direct investment in BRI countries
BRI _{gr}	The growth in OFDI from China to countries in Asia
PostBRI	Time dummy variable. 1 if the year is after 2013 and 0 if before 2013
Member	Is a dummy variable. 1 if a country is a member of BRI and 0 if not a member of BRI
GDP GR _{it}	Gross Domestic Product Growth Rate of host countries along the belt and road
SERV _{it}	Service sector growth rate of host nations along the belt and road
MANU _{it}	Manufacturing sector growth rate of host nations along the belt and road
AGRIC _{it}	Agricultural and Forestry sector growth rate of host nations along the belt and road
TRADE _{it}	External balance of trade of host nations along the belt and road
HCI _{it}	Human Capital Index of host nations along the belt and road
UNE _{it}	The unemployment rate of host nations along the belt and road
FTA _{it}	Is a dummy variable which captures the effect of having a free trade agreement with China on the efficiency of BRI. 1 if a country has an FTA with mainland China and 0 if a country has no FTA with mainland China
BORDER _{it}	Is a dummy variable to capture the effect of sharing a common border with mainland China on BRI in host countries [1, for countries, share a common border with mainland China and 0, for countries that do not]
LANG _{it}	Is a dummy variable to capture the effect of sharing a common language with mainland China on BRI in host countries [1, for countries, share a common language with mainland China and 0, for countries that do not]
ANCIENT _{it}	Is a dummy variable to capture the effect of the old silk road initiative on BRI [1, for countries that were part of the ancient silk road and 0, for those who were not a part of it]
COR _{it}	Corruption perception of host nations along the belt and road
Gov _{it}	Government efficiency of host nations along the belt and road
POL _{it}	Policy implementation efficiency of host nations along the belt and road
HCI DIFF	The growth in human capital index over time
Data Sources:	World Bank data catalog, China Foreign Direct Investment Bulletin Board (2014, 2015,2016), WDI, OECD

3. EMPIRICAL RESULTS AND DISCUSSIONS

The purpose of the study is to assess the impact of BRI on Asian countries. The study used panel data spanning from 2008 to 2020 for 47 Asian countries as well as time-series data on individual countries. The study, first of all, analyzed the impact of BRI on GDP growth rate in Asia, the overall factors in Asia that affect the belt and road initiative and how the impact of BRI on economic growth cause an improvement in the human capital development of countries in Asia. The table above shows the summary statistics of Belt and Road funds to Asian countries, the GDP growth rate of Asian countries, Agricultural growth rate of Asian countries, Manufacturing growth rate, services growth rate, Human capital development growth rate, and the external balance of trade growth rate of Asian countries throughout 2007 to 2020. Table 2 below reveals that except for trade which has a mean negative value, all the other variables have a positive mean value. The table further shows a positive maximum value for all variables. On the contrary, it is observed that the minimum values for BRI, HCI and unemployment growth are positive while the minimum values for GDP growth rate, Agriculture growth rate, Manufacturing growth rate, services growth rate, and trade growth rate are negative for the period between 2007 and 2020.

Table 2: Descriptive Statistics

Variable	Mean	Std Dev	Maxi	Mini	Obs
BRI	19.81666	2.66007	27.61	9.9	410
GDP GR	4.484091	5.012555	25.26	-25.91	443
GDP GR _{t-1}	4.385273	4.884154	25.26	-25.91	443
Agric GR	2.678596	7.509737	44.56	-36.88	416
Manu GR	3.945095	9.861504	100	-36.9	400
Services Gr	5.302328	5.165457	40.2	-22.88	411
HCI	.7025093	.1275006	.934	.355	433
Trade GR	-323.7244	3681.432	5766.27	-42677.31	413
Une GR	5.561718	6.02519	42	.14	450

Source: Authors' computation

3.1. Stationary Test of Datasets

In order not to have a porous analysis due to the non-stationarity of the datasets, a Fisher-type unit root test analysis was conducted for all the time series variables at Lag 1. The Fisher-type unit root test by Maddala and Wu (1999) was used for the stationarity test because the panel data is unbalanced, having some missing values. The Philip-Peron method was adopted since it is robust to serial correlation although it had a consistent result with the Augmented Dickey-Fuller test. The tables below show that all the panels are stationary at a 1% error level (P-value 0.0000). This means, the H_0 : All panels contain unit roots are rejected and the H_A : At least one panel is stationary is accepted, for all variables.

Table 3: Fisher-type Stationarity test

	P	Z	L*	PM
BRI	421.0805	-5.7331	-12.5731	24.2601
P-VALUE	0.000	0.000	0.000	0.000
HCI	102.8024	-1.4336	-1.6029	1.2812
P-VALUE	0.000	0.000	0.000	0.000
UNEMPLOYMENT	275.6134	-2.4462	-6.6346	13.8348
P-VALUE	0.000	0.007	0.000	0.000
GDP GROWTH RATE	267.0308	-8.5312	-9.5869	13.4950
P-VALUE	0.000	0.000	0.000	0.000
GDP GR_{T-1}	685.9454	-15.5555	-27.2739	45.0718
P-VALUE	0.000	0.000	0.000	0.000
MANUFACTURING GROWTH RATE	408.1498	-11.3782	-16.7579	25.4680
P-VALUE	0.000	0.000	0.000	0.000
SERVICES GROWTH RATE	274.2466	-7.9873	-9.9571	14.3537
P-VALUE	0.000	0.000	0.000	0.000
AGRICULTURAL GROWTH RATE	498.8363	-13.5965	-20.4747	32.0053
P-VALUE	0.000	0.000	0.000	0.000
TRADE GROWTH RATE	437.8625	-12.8107	-17.7248	27.7882
P-VALUE	0.000	0.000	0.000	0.000

Source: Stata 15 computation

3.2 Vector Inflation Variance

To assess the level of collinearity between variables, the paper used the Variance Inflation Factor to assess the extent of collinearity between one predictor and other predictors. The Variance Inflation Factor (VIF) states that when the variance inflation factor is less than 10 then there is no multicollinearity between factors. With this rule of thumb, this paper however concludes that there is no perfect multicollinearity between the variables.

Table 4: Variance Inflation Factor result

Variable	Variance Inflation Factor	1/VIF
Corruption coefficient	5.04	0.124308
Government effectiveness	5.90	0.169626
HCI	4.81	0.207943
Policy implementation	2.32	0.431909
Language	1.79	0.558783
Ancient	1.70	0.587404
Unemployment rate	1.46	0.683314
Border	1.40	0.716317
GDP GR	1.28	0.781113
GDP GR _{t-1}	1.27	0.789673

Source: Stata 15 computation

3.3 Heteroscedastic Testing

Heteroscedasticity test was carried out using the Breusch - Pagan test, to find out whether the regression data are homoscedastic or heteroscedasticity. Test results showed a p-value of 0.58 and 0.1 Therefore, the test rejected the null hypothesis that there is heteroscedasticity, and the alternative hypothesis that there is homoscedasticity was accepted. This validates the significance of the statistical test that the modeling errors are corrected.

Table 5 Heteroskedasticity test

Breusch-Pagan / Cook-Weisberg	Impact on GDP GR	Effectiveness
Chi ²	2.75	2.94
Prob > Chi ²	0.10	0.10

Source: Stata 15 computation

3.4 Impact of BRI on Economic Growth of Asia

Using the Hausman test with a probability value of 0.04 less than a 5% level, the study accepts the null hypothesis and uses a Fixed effect analysis of the impact of the belt and road initiative on GDP growth rate. From the table, it is observed that the belt and road initiative had a significant positive effect on the GDP growth rate of Asia with a coefficient of 0.57 indicating that the outward FDI from China to Asian countries causes the GDP growth rate of Asian countries to improve. More specifically, a 1% increase in the OFDI funds from China to Asian countries will cause a 0.57% increase in gross domestic growth rate all other things being equal. This confirms the findings of Guang-jun et al (2017) and Jiang and Liu (2018) in their study of the efficiency of China's OFDI to Asian countries along the belt and road.

Again, the study reveal that human capital index of host nations had a significant positive effect on the gross domestic growth rate of member countries with a coefficient of 26.06. This positive relationship reveals that when human capital index of member countries improves, the gross domestic product growth rate in these

countries will improve as well. A higher human capital index means that the labour force of countries will be more effective in their work and also will be able to grab technology from other foreign firms operating in host countries (Tytell and Yudaeva 2007). On the contrary, it is observed that the years after the implementation of the belt and road initiative have a significant adverse effect on GDP growth rate in Asia, all other things being equal. The findings also support the Neoclassical growth theory, Under the model of neo-classical growth, the resulted output is because of progress in the technology and labour force, and both are known as exogenous factors. This indicates that there is a need for both China and host countries to ensure a more efficient implementation of BRI project.

Table 6 Impact of BRI on the economic growth of Asia

Variables	Random Effect	Fixed Effect
	GDP Growth Rate	GDP Growth Rate
BRI	.32 (1.59) *	.57 (1.51) *
Post BRI	-8.89 (-2.14) **	-8.68 (-2.06) **
BRI*Post BRI	.35 (1.72) *	0.28 (1.34)
HCI	-2.72 (-0.77)	26.06 (2.26) ***
POL	.0008 (0.75)	0.0008 (0.75)
Constant	.18 (0.04)	-24.94 (-2.72) ***
Overall R-square	0.07	0.03
Between R-square	0.12	0.04
P-value	0.00	0.000

Source: Stata 15 computation

3.5 Difference in difference of BRI on GDP Growth Rate

The table below shows the difference in difference table of BRI in Asia. From the table, it is observed that before the introduction of the belt and road initiative, there was a significant positive difference between how Chinese OFDI to countries in Asia affected countries that are part of the belt and road initiative. Similarly, after the introduction of the belt and road initiative, there is a significant positive difference between how Chinese OFDI to countries in Asia affected countries that are part of the belt and road initiative. However, there is no significant difference between how the belt and road initiative affects member countries and countries that are not part of the belt and road initiative in Asia. The insignificant positive effect of BRI between the era before the belt and road and after the belt and road initiative is due to the fact that most of the projects under the belt and road initiative in Asia are uncompleted and also due to the fact that infrastructural projects takes some time before translating into the economy. This implies that over time, the significant impact of the belt and road initiative will come to a limelight as the projects near completion.

It is also observed from the table that prior to the belt and road initiative, there was no significant difference between how China's OFDI affected the gross domestic productivity of Asian countries however, with

the introduction of the belt and road initiative, there is a significant positive difference between how the belt and road affects the gross domestic productivity of countries that are a part of the initiative and countries that are not part of the initiative like India, South and North Korea. This positive difference is as a result of the fact that, there a proper regulation and monitoring of projects under the belt and road initiative to ensure its effective implementation and the realization of its goals.

Table 7: Difference in Difference table of BRI in Asia

	POSTBRI	GDP	T	Member	GDP	T
BEFORE	Control	0.067	(1.80) *	Control	4.85	(-0.03)
	Treatment	0.326		Treatment	4.81	
	Difference (T-C)	0.259		Difference (T-C)	-0.04	
AFTER	Control	-1.724	(2.11) **	Control	0.07	(2.72) ***
	Treatment	-1.457		Treatment	0.28	
	Difference (T-C)	0.267		Difference (T-C)	0.214	
	DiD	0.008		DiD	0.258	
R-square		0.04				

Source: Stata 15 computation

3.6 Regression Adjustments

The table below shows that there is a positive significant difference between the mean of GDP between countries that are members and countries in Asia that are not part of the belt and road initiative. On the contrary, there is a negative significant difference between the GDP growth rate in years before the implementation of the initiative and the years after the implementation of the belt and road initiative. Furthermore, the table reveal that GDP growth rate of in Asia on a whole is reducing following the implementation of the belt and road initiative however, it is seen that there is an improvement in the gross domestic productivity of member countries. This signifies that despite the fact that there is a general reduction in gross domestic productivity of countries in Asia, there is an improvement in gross domestic productivity of countries that are along the belt and road initiative.

Table 8: Regression adjustment of BRI on GDP growth in Asia

		GDP GR	Z		GDP GR	Z
PO means	Before	4.91	12.85 ***	Member	4.34	17.40 ***
	Post BRI	3.73	9.39 ***	Not member	3.91	3.27 ***
ATE		-1.18	-2.15 **		.43	0.35
ATET		-1.07	-2.09 **		.42	0.33

Source: Stata 15 computation

3.7 Impact of BRI on Economic Sectors in Asia

The table below shows the impact of BRI as well as last year's GDP growth rate on the various sectors of Asia. It is observed that the previous year's GDP growth rate has a significant positive effect on agriculture, manufacturing, service sector, the external balance of trade growth rate as well as human capital development in Asia. The previous year's GDP growth rate also has a significant negative impact on the unemployment growth rate. From this, it is observed that as current years BRI has a significant positive effect on GDP growth, the positive impact causes a boost in the various sectors in the next year also causes the unemployment rate to reduce as well. This confirms the findings of Hui and Yu-quin (2018). A rise in a year's BRI will cause GDP growth

rate to increase in the same year causing stability in the Asian economy which intends causes a boost in all sectors of the economy in the year, cause human capital development in the next year and reduce the unemployment rate in the following year. Duasa, (2007), explains that the positive relationship between FDI and GDP growth rate in the host country is a result of the fact that FDI contributes to the stability of the host nation's economy and hence the evidence of growth in the host nation. This positive effect is a spillover from the positive effect that BRI has on the overall growth of economies in Asia and confirms the argument of Margeirsson (2015).

Similarly, the belt and road initiative and the interaction between the belt and road and the years after the implementation of belt and road have a significant positive impact on the human capital index in Asia. This means that all other things being equal, the human capital index of Asia improves with the flow of OFDI from China this confirms the findings of Yii et al. (2018) in their study of the relationship between human capital and the belt and road initiative. This means that BRI facilitates the transfer of technologies and managerial expertise from Chinese companies to the companies of the host countries in Asia. This makes industries more competitive and efficient; as a result, the total output should increase (Jacobs, 2001). Aside from Chinese firms offering training to locals working on BRI projects, other host country businesses learn by observation on how BRI companies go about their work. This positive effect is mostly as a result of the fact the foreign firms and workers turn to have a higher productivity level of which most local firms turn to learn from (OECD, 2011). Also, local firms learn or upgrade their technological capabilities and learn from the technological and managerial practices of foreign firms in host countries. On the contrary, post-BRI is seen to have a significant adverse effect on the human capital index in Asia. This finding agrees with the findings of Hermes and Lensink (2003) that local indigenes or firms return to their typical attitude towards work after foreign firms have left.

On the unemployment rate in Asia, the study revealed that the interaction between BRI and the years after the belt and road initiative has a significant negative effect on the unemployment rate in Asia, indicating that after the implementation of BRI, Asia has seen a significant reduction in unemployment. This negative relationship is as a result of the fact that BRI improves the economy, hence an increase in the number of job opportunities. Similarly, the BRI projects also hire more local workers for the BRI project, which also helps reduce the unemployment growth rate in Asia. This confirms the findings of Shaari et al. (2014) when FDI in Malaysia significantly reduces unemployment growth rate in Asia, all other things being equal. On the other hand, the study revealed that post-BRI have a significant positive effect on the unemployment rate in Asia. This indicates that BRI host nations should work hard to sustain the job creation that BRI offers in countries along the belt and road initiative.

The results further show that BRI does not have a significant direct effect on the various economic sectors of Asia. However, these sectors are impacted through the general spillover effect of BRI on the gross domestic product growth rate of Asia. This contradicts the findings of Ali, Li, and Kamran, (2015); Rehman, (2015); Ullah, Shan, and Khan, (2014); Gul and Naseem, (2015) on their study of how FDI directly impacts the manufacturing sector of Pakistan and India.

Table 9: Impact of BRI on economic sectors in Asia

	Ordinary Least Squares						VCE-Robust					
	Agric GR	Manu GR	Trade GR	Serv GR	HCI	Une Rate	Agric GR	Manu GR	Trade GR	Serv GR	HCI	Une Rate
BRI	-.21	.00	-180.90	-.011	.01	.01	-.21	-162.28	-399.26	.05	.01	.01
	(-0.87)	(0.02)	(-1.40)	(-0.07)	(5.69) ***	(0.12)	(-1.76) *	(-1.21)	(-1.32)	(0.34)	(3.38) ***	(0.04)
<i>GDP GR_{t-1}</i>	.49	.60	41.31	.66	.0009	-.01	0.49	-17.19	66.98	.35	.0009	-.01
	(5.94) ***	(5.64) ***	(0.95)	(16.48) ***	(2.97) ***	(-1.03)	(3.19) ***	(-0.89)	(1.32)	(4.16) ***	(1.94) **	(-1.09)
Post BRI	2.81	.72	-2496.17	2.83	-.04	5.01	2.81	-2540.17	-1441.9	.01	-.04	5.01
	(0.45)	(0.08)	(-0.71)	(0.93)	(-1.87) **	(5.22) ***	(0.66)	(-1.10)	(-0.38)	(0.00)	(-2.10) **	(1.78) **
BRI*Post BRI	-.16	-.01	163.30	-.17	.003	-.24	-.16	160.54	125.87	-.05	.003	-.24
	(-0.51)	(-0.01)	(0.94)	(-1.12)	(3.11) ***	(-5.16) ***	(-0.79)	(1.20)	(0.69)	(-0.31)	(3.54) ***	(-1.80) **
Constant	5.19	.96	2594.73	3.07	.51	5.33	5.19	2547.09	6700	3.30	.51	5.34
	(1.08)	(0.15)	(1.03)	(1.01)	(13.63)	(3.27) ***	(2.31) **	(1.09)	(1.14)	(1.04)	(7.77) ***	(1.23)
Overall R-square	0.12	0.09	0.01	0.47	0.02	0.24	0.12	0.01	0.01	0.18	0.02	0.24
Between R-square	0.46	0.27	0.01	0.54	0.003	0.42	0.46	0.02	0.01	0.48	0.01	0.43
P-value	0.00	0.00	0.31	0.00	0.00	0.00	0.01	0.73	0.26	0.00	0.00	0.25

Source: Stata 15 computation

3.8 Difference in Difference of BRI on HCI and Unemployment

Table 10 shows the difference in difference effect of the belt and road initiative on the human capital index and the unemployment rate in Asia. The table shows that there is a significant positive difference between the impact of BRI on gross domestic product on countries that are part of the belt and road initiative and those that are not part of the initiative. This implies that the human capital index of member countries has improved significantly following the implementation of the belt and road initiative in Asia. On the unemployment rate, the study reveals that there is a significant negative effect of the belt and road initiative on the unemployment rate in Asia. This confirms that following the implementation of the initiative, the unemployment rate has reduced significantly in member countries following the implementation of the policy. These significant relationships are a result of the fact that BRI creates numerous employment opportunities in member countries and also, local firms learn a lot of skills from and positive attitude towards work from Chinese firms operating in belt and road countries in Asia.

Table 10: Difference in Difference of BRI on HCI and Unemployment

	POST BRI	HCI	T	POST BRI	Une	T
BEFORE	Control	0.67	(0.32)	Control	14.0	(-2.38) **
	Treatment	0.67		Treatment	13.56	
	Difference (T-C)	0.001		Difference (T-C)	-0.47	
AFTER	Control	0.56	(3.19) ***	Control	31.25	(4.22) ***
	Treatment	0.56		Treatment	29.98	
	Difference (T-C)	0.01		Difference (T-C)	-1.27	
	DiD	0.01		DiD	-0.80	
R-square		0.04		0.25		

Source: Stata 15 computation

3.9 Factors that affect BRI in Asia Countries

The table below shows the host country factors that affect the performance of the belt and road initiative in Asia. According to the Hausman test with a P-value of 0.000 indicates that the effect of host factors on BRI is best explained using a fixed-effect model.

The study revealed that the human capital index of countries in Asia has a statistically significant effect on the belt and road initiative with a coefficient of 19.39. This implies that the higher the human capital index of host countries, the higher the probability that the belt and road initiative will be effective. This is because when the human capital index of these countries is high, there will be a higher probability for these countries to absorb the skills and technological transfer from China confirming the findings of Balock and Gertler (2009). This also implies that when the HCI of host countries is high, host countries will be able to contribute significantly to the implementation of the projects by supplying qualified workers to work on the project. This confirms the findings of Ramasamy and Yeung (2010) and Kaliappan et al. (2015) also concluded that there is a significant positive relationship between human capital development of host countries and the performance of foreign direct investment in the country since most foreign direct investment projects use some amount of human capital from host nations.

Again, the study revealed that the efficiency of governments in Asian countries in Asia has a statistically significant effect on the efficiency of the belt and road initiative with a coefficient of 0.67. This implies that in countries where the governments are efficient, the belt and road initiative will be effective whereas, in countries where the governments are not efficient or have political troubles, the belt and road initiative will be less effective. An efficient government is more likely to undertake projects that are more important to the citizens of the country as well as supervise the investment under the belt and road initiative significantly compared to governments with less efficient governments. These findings contradict the findings of Jiang et al. (2019) on their conclusion that the belt and road initiative's performance in countries is not affected by the efficiency of host countries' government efficiency.

Furthermore, the study shows that policy implementation efficiency in host countries have a statistically significant positive effect on the efficiency of the belt and road initiative in Asia with a coefficient of 0.55. This shows that the belt and road initiative perform better in countries where the efficiency of implementing policies is higher. In contrast, the belt and road initiative perform lesser in countries where the policy implementation in the country is less.

On the contrary, the paper revealed that the corruption coefficient of countries along the belt and road initiative has a statistically negative effect on the belt and road initiative all other things being equal. This implies that the belt and road initiative will be less effective in countries where corruption is higher, whereas the initiative performs better in countries where corruption is lower. In countries where corruption is more elevated,

implementation of policies is mostly not effective, and funds for projects are mostly not used effectively. This finding confirms the result of Jiang (2020) that corruption in Asian countries along the belt and road initiative has a significant adverse effect on the performance of BRI in Asia.

Table 11 Factors affecting the efficiency of BRI in Asia

Variables	Random Effect	Fixed Effect
	BRI	BRI
HCI	16.93 (12.11) ***	19.40 (13.77) ***
COR	-.80 (-2.52) ***	-.51 (-1.52) *
GOV	.63 (2.36) ***	.67 (2.44) ***
POL	.52 (3.04) ***	.55 (3.11) ***
LANG	4.68 (2.84) ***	
ANCIENT	1.22 (1.54)	
COEFF	7.29 (6.63) ***	6.23 (6.05) ***
P-VALUE	0.000	0.000
OVERALL R-SQUARE	0.1042	0.0165
BETWEEN R-SQUARE	0.0807	0.0036

Source: Stata 15 computation

CONCLUSION

The study primarily investigated the impact of the Belt and Road Initiative on economic growth in Asia and how through the spillover effect, BRI impacts the various economic sectors to improve human capital development and reduce unemployment in Asia. The paper considered 2013 as the starting year of the belt and road initiative. Yearly data from reliable sources were used for the study, and the data were analyzed using STATA 15. In assessing the efficiency and the impact of BRI in Asia, the study used the logarithm of China's outward foreign direct investment to represent BRI funds to various Asian countries, and the gross domestic product growth rate was used to describe the performance of the countries. The study also used the services growth rate, manufacturing growth rate, agriculture, and forestry growth rate, unemployment growth rate, and human capital index in Asian countries to represent the essential sectors of an economy that BRI is likely to impact.

On economic growth, the gross domestic growth rate was used as a measure of economic growth. It was realized that BRI from mainland China has a significant positive effect on the GDP growth rate of Asia. However, BRI showed no significant direct effect on the various economic sectors, yet, previous years GDP growth rate has a significant positive effect on agriculture growth rate, manufacturing growth rate, services growth rate and external balance of trade growth rate indicating that there is a substantial spillover from GDP growth rate as a result of BRI to other sectors of the economy. Furthermore, the growth in the previous year's

GDP growth rate has a significant positive effect on the human capital index and a significant negative effect on the unemployment rate, indicating that growth in the previous year's GDP growth rate due to BRI causes a reduction in the unemployment rate in the current year.

The study revealed that the Human capital Index, sharing a common language with mainland China, governments of Asian countries efficiency, and policy implementation efficiency in Asia, positively affect BRI in Asia significantly. This means that in choosing the Belt and Road countries, China and its investments should take into consideration these characteristics for the optimal efficiency of the Belt and Road in Asia. Aside from the above, it was also revealed that corruption coefficients of host countries in Asia, also affect the efficiency of belt and road initiative negatively, indicating that the belt and road initiative performs better in countries where corruption is less and performs poorly when there is higher corruption. This show that in selecting or undertaking an investment initiative in Asian countries, Chinese firms should consider the corruption level in these belt and road countries. There is no doubt that the Belt and Road Initiative is having significant impact on Asia countries that are on the Belt and Road initiative. Asia has been the hub and home of the policy and one way or the other, the tremendous impact of the initiative has to be shouldered by the countries in Asia to set as a pace for other countries most especially the 54 African that are joining the Belt and Road Initiative with the hope of developing their infrastructures and hence their economies at large. It is an inevitable fact that one of the key components or factors that is aiding the positive effect of BRI in Asia is the human capital index, which means that countries that are part of BRI and countries that are seeking to join the initiative should consider building their human capital capabilities by adopting or enacting policies that seek to develop their human capital consciously.

The belt and road initiative have been a driving force for economic growth and development with overwhelming evidence in the case of Asian countries which is now one of the largest economies and continents in the world. Overall investment climate plays a crucial role in attracting FDI and BRI in Asia. The investment climate is influenced by policies at all levels.

To realize the full potential of BRI in Asian countries, host countries should put in place the significant necessary conditions necessary for the reduction in corruption and encouraging transparency. Host countries should be transparent to allow the full implementation of BRI projects with little or no bottlenecks such as unnecessary institutional bureaucracies. Corruption impedes the smooth implementation of projects and also increases the cost of undertaken projects. Civil services should be encouraged to be transparent as possible on their duties concerning belt and road projects.

Asian countries along the belt and road initiative can enhance the efficiency of implementing the belt and road projects by putting in place sufficient and timely supervision of these projects to ensure timely completion of these projects at a minimal cost. The effectiveness of these governments will ensure balanced budgeting, rational spending, and elimination of waste and duplicates. This can be done by reducing the interference of government in the duties of civil services in the country as most of the evaluation and implementation of these projects are carried out under civil services.

On the issue of the human capital index, host countries should negotiate for skill and knowledge transfer in the belt and road initiative as BRI has a significant positive effect on human capital index development in Asia which subsequently affect economic growth. Also, in selecting host countries for BRI projects, financiers should consider human capital capabilities in host countries since these affect the efficiency of BRI projects in Asia. The higher the human capital development of countries along the belt and road initiative in Asia, the more likely that countries will be able to supply workers that have the needed skills for the BRI projects.

The study was limited to Asian countries, and further studies should compare the results with other countries that are not in Asia to help get a true understanding of the effects of the Belt and Road Initiative policy. Further studies should as well cater for country-wise differences as not all the countries in Asia are the same in terms of human capital index and gross domestic product growth rate as well as infrastructural development in the various Asian countries. The data sets used for the study were gotten by archival and country-level data from different sources most importantly world bank database and the ministry of the foreign affair of the people's republic of china, which might be more consistent and reliable than survey-based studies since national statistics departments aggregated all data. Future research should primarily focus more on case studies and survey-based data covering companies like this method can help generate more proxies that will help explain the impact of Belt and Road Initiative in Asia more extensively.

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