ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics - International Bachelor of Economics and Business Economics

Bachelor Thesis

The effects of Chinese FDI on the economic growth of the recipient countries and the moderating roles of seaport and telecommunication infrastructures

Abstract

Since 2005, China has been actively investing in other countries. In 2016, China became the world's second-largest source of outward FDI. There is a vast majority of literature investigating the effects of FDI inflows on the economic growth of host countries; nevertheless, the research specifically focusing on the Chinese outbound FDI is limited. This paper investigates the effects of Chinese FDI on the growth of 125 recipient countries and the moderating roles of telecommunication and seaport infrastructures in promoting the FDI – economic growth relationship during the period 2005-2020. The results show that there is no relationship between Chinese FDI and the economic growth of the host countries. In addition, it is found that the moderating role of seaport infrastructure is only significant and positive for the BRI countries since the commencement of the Belt and Road Initiative (BRI) in 2013. The moderating role of telecommunication infrastructure for all countries, by contrast, is founded to be significant and positive only before the start of the BRI.

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Introduction

The past four decades were featured by a significant surge in Foreign Direct Investment (FDI) inflows all over the world. The total global FDI inflow has increased by nearly 108 times, from 13,257 million USD in 1970 to 1,429,807 million USD in 2017. In developed countries, the FDI inflows reached a peak of more than 1,000,000 million USD in the year 2000, and over the course of 40 years from 1970 to 2017, the FDI inflows have grown by 75 times. The growing trend of FDI inflows has even been witnessed more clearly in developing countries, accelerating 178 times from 3,766 million USD in 1970 to 670,658 million USD in 2017 (Stockmann, 2019).

FDI plays a crucial role in the economic development of both developing and developed countries. Asides from the capital, FDI stimulates technology diffusions, accelerates the knowledge spill-over effect, promotes international trade and cooperation (Conference on Trade and Development, 2000). For instance, research has found a positive relationship between FDI and economic growth in Pakistan (Shahbaz & Rahman, 2010), in Korea during 1980-2009 period (Koojaroenprasit, 2012), in 20 OECD countries (Alfaro et al., 2004), in 23 developing countries during 1978–1996 period (Basu et al., 2003). On the other hand, there is research documenting the insignificant and negative impact of FDI on economic growth. Konings (2001) documents that FDI hampers the economic growth of Romania and Bulgaria because it causes trade imbalances, monopolies and reverse diffusion of knowledge and technology. The negative is also found in Poland. The reason is that the competition arising from foreign firms demotivates the production of domestic firms, resulting in the rising average production cost. The negative effect from competition dominates the benefit of technology diffusion (Konings,2001)

Over the past four decades, China's growth from a closed rural country to a superpower nation is noticeable (Lee, 2017). One crucial factor explaining the fast economic acceleration of China is the FDI inflows into this country. From 1996 to 2017, the total FDI inflow into China has accumulated to more than 40 billion USD. China has also been one of the global destinations for FDI, and the amount China has received is equivalent to one-third of total FDI inflows in developing countries. FDI has promoted trade activities of China such that foreign-invested firms are responsible for more than one-third of Chinese export. The foreign shares in the export of high technology products were higher than those of domestics, constituting up to 80% during the 2000-

2012 period. China has also reaped other benefits of FDI, such as knowledge and technology transfers (Stockmann, 2019).

From a recipient country of FDI, China has oriented itself into a source country of FDI worldwide. Outbound FDI has increasingly made up a larger share of total Chinese investment (Stockmann, 2019). Before 2005, China's FDI outbound was inconsiderable. Since 2005, China has been on the catch-up growth in outward FDI, and in 2015, the total amount of Chinese outward FDI surpassed that of ASEAN, Brazil, Germany, India (Stockmann, 2019). This country became the world's second-largest source of outward FDI in 2016 (*China Becomes World's Second-Largest Source of Outward FDI: Report* , n.d.). In addition, with the inauguration of the Belt and Road Initiative in 2013, the FDI activities have been more robust, and the project is promised to strengthen trade activities and economic performances of the member countries through Chinese infrastructure investment. Therefore, it is time to investigate whether Chinese FDI has actually contributed to the economic growth of the host countries. The research question is thus "What are the effects of Chinese FDI on the economic growth of the recipient countries and the moderating roles of seaport and telecommunication infrastructures?"

The research is scientifically relevant. Studies on the relationship between FDI and economic growth or the relationship between infrastructure and economic growth are proliferating. However, research focusing specifically on the relationship between Chinese FDI and the growth of the recipient countries are relatively limited. Doku, Akuma and Owusu-Afriyie (2017) study the effect of Chinese FDI on the growth of 20 African countries during the 2003-2012 period and show that a 1% increase in China's FDI stock in Africa significantly increases Africa's GDP growth by 0.607%. Stockmann (2019) studies the effect of Chinese FDI on the growth of countries engaged in the Belt and Road during the 2005-2020 period and shows no significant relationship. The conflicting findings, alongside with limited research scope of the existing literature, will be addressed as this paper will encompass all host countries of Chinese FDI and stretch the timeframe to the maximum. Furthermore, to the best understanding of the author, there has not been any research investigating the moderating role of infrastructure for Chinese FDI and the economic growth of all recipient countries. This paper thus will fill in this gap.

The paper is also socially relevant. The economic power of China has become more dominant over the years; therefore, the impacts of this country on the rest of the world are worth investigating.

Since FDI is an essential part of global economic integration and development, examining the effects of Chinese FDI will bring valuable insights into the effectiveness of Chinese contribution to global economic growth. Furthermore, by the inclusion of the role of infrastructure, the paper sheds light on the doubts as to whether governments should focus more on infrastructure investment to attract more Chinese FDI and whether governments should take China's construction contracts or Chinese FDI.

To answer the research questions, two hypotheses are formulated. The first hypothesis states that Chinese FDI has positive effects on the growth of the recipient countries. The second hypothesis states that the positive effects of Chinese FDI on growth is driven by seaport and telecommunication infrastructures. Regarding data, the time scope of research starts in 2005 till 2020 because the data on Chinese outward is only available since 2005. Rather than taking a sample, statistics of all 125 countries that receive the Chinese FDI outflow is taken into account. Seaport infrastructure is proxied by container port traffic, measured by 20-foot-equivalent units. Telecommunication infrastructure is proxied by fixed telephone subscriptions (FTS) per 100 people, measured in per cent. Country fixed effects models are adopted to investigate both hypotheses. The robustness check concerns the estimates in the crisis time (2018-2020), which stems from the US-China tension and Covid-19. The heterogeneity check compares the estimates between the BRI countries and the non-BRI countries during the BRI implementation time 2013-2020. The baseline results for the first hypothesis show no relationship between Chinese FDI and growth in the recipient countries. For the second hypothesis, the moderating role of the seaport infrastructure is insignificant; meanwhile, that of telecommunication infrastructure is positive and significant. With one more per cent of fixed telephone subscriptions, the effect of Chinese FDI on growth on averages increases by 0.069 percentage points. The robustness check shows that all estimates are not significant during the crisis time. The heterogeneity shows the insignificant relationship between Chinese FDI and growth in both BRI and non-BRI countries. The estimates for the role of telecommunication infrastructure are insignificant for both groups during 2013-2020. While the role of seaport infrastructure is insignificant for the non-BRI countries, this is not the case for the BRI countries. With one more TEU of container port traffic, the effect of Chinese FDI on growth on averages increases by 0.014 percentage points.

The structure of the paper is organized as follows. In the second part, the theoretical framework where the mechanism between FDI, infrastructure investment and economic growth will be discussed. Next, data and methodology will be delineated. The fourth part will present the analysis results. The fifth part will encompass the robustness and heterogeneity checks. The final part will be about the conclusion and discussion.

Literature review

FDI

According to Duce and Espana (2003), Foreign Direct Investment is defined as the ownership of the lasting management interest in an enterprise locating in a different country through the investment of at least 10% of this enterprise' capital. A foreign direct investor can be an individual or a group of individuals, a private or public company or a group of companies, and a governmental institution. A foreign direct investment enterprise can be considered as either a subsidiary, an associate or a branch. A subsidiary is an incorporated enterprise that the foreign direct investor controls more than 50% of the votes. An associate is an enterprise where the foreign direct investor and its subsidiaries control 10% to 50% of the votes. A branch is an owned independent enterprise. The total amount of FDI is comprised of equity capital, reinvested earnings and other direct investment capital. Equity capital includes equity in branches and stocks invested in subsidiaries and associates. Equity also encompasses the supply of technology, factory, or machinery. Reinvested earnings comprise the direct investor's shares that are not distributed. Other direct investment capital refers to debt transactions between foreign direct investors and foreign direct enterprises, such as debt securities and trade credits.

There are critical factors that help a country attract FDI (Stockmann,2019; Balasubramanyam, 2001). Firstly, the size of the economy' market and economic growth are important determinants, meaning that the higher levels of GDP per capita and GDP growth rate, the higher chance this country receives FDI. The second factor includes nature and human resources. For instance, China focuses on investing in African countries that possess abundant precious natural resources and cheap labour (Kolstad & Wiig, 2012). However, it is important to note depending on the purposes; some investors prefer host countries where education levels of human resources are considerably high. Thirdly, the availability of infrastructure facilities such as communication and transport infrastructures facilitate the attraction of FDI. Other crucial determinants include macroeconomic

stability and political stability such as stable exchange rate, low inflation rate, transparent political framework, well-functioning institutions, peaceful societies. In 2019, United States was reported to be the top destination of FDI inflow of nearly 352 million US dollars, accounting for 20.98% of the world's net FDI inflows. The other countries belonging to the top three countries include China, Singapore. These top three destinations for FDI inflow have strengths in almost all criteria mentioned above (Net FDI Inflows by Country, 2020 - Knoema.Com, n.d.)

FDI and economic growth

The economic growth of a country is defined as a long-run increase in the capability of supplying goods to the country's population (Kuznets, 1973). Economic growth is thus conventionally measured by the growth rate of gross domestic product (GDP) because GDP represents "the market value of goods and services produced by a country in a certain time period" (Statista, n.d.). Kuznets (1973) lists characteristics of modern economic growth. The first feature is the increasing rates of per capita product and population. Before industrialization, technological progress led to the increase in population, yet the product per capita decreased since the food supply was unchanged. This situation is characterized as a Malthusian trap (Galor, 2005). However, during the industrial revolution, economic growth was remarkable as both population growth and increase per capita product were present (Alcalde, 2009). The second characteristic is the rise in productivity, such as the increase in the number of outputs per input. The productivity increase can be explained by technological progress and higher human capital. Indeed, technology was responsible for 80% of long-term growth in the USA (Krugman, 1994). Human capital is regarded as the education and skill levels labour force. The popular measure of human capital level is the average years of school attainment (Barro & Lee, 2001). Another characteristic is the high level of structural change, such as the transformation from an agriculture-based economy to non-agriculture, from industry-focused to service-oriented, from individual firms to conglomerations. Finally, urbanization, secularization and globalization are also considered as evidence of countries with economic growth.

There is a proliferation of research on the mechanism through which FDI enhances economic growth. Anwar and Nguyen (2010) document that FDI stimulates technology transfer, which eventually helps strengthen long-run economic growth. Furthermore, the presence of multinational companies (MNC) as a result of FDI help leverage the quality of human capital as local employees

have opportunities to approach global and up-to-date knowledge and skills as well as broaden their networks. Research and development (R&D) activities of MNC also contribute to the knowledge base, which is beneficial to economic growth. Neuhaus (2006) finds three channels through which foreign technological progress and capital stock are transferred and improve the host countries' economies. The three channels include the direct transfer, such as by establishing business branches in local countries; the indirect transfer, such as the ownership or participation in existing local companies and the second-round transmission, such as knowledge spill-over (Tiwari & Mutascu, 2011). He also finds that FDI enhances the economic growth of developing countries through capital accumulation and technology transfer; meanwhile, the way FDI improves the economic growth of developed countries is mainly through global technology diffusions (Neuhaus, 2006). Borensztein et al. (1998) study 69 developing countries for 20 years and confirm that technology diffusion is the main channel through which FDI affects economic growth. Technology transfer is also a key to explaining why foreign investment is more effective than domestic investment in improving the growth rate. However, foreign is more efficient than domestic investment only if the host country reaches a minimum threshold of human capital stock. Aside from technology, export-led growth is a benefit brought by FDI. The study in Mexico, Argentina shows that FDI enhances export activities, which increases GDP (Cuadros et al., 2004). Lastly, Alfaro et al. (2006) examine an extended dataset and find that with the same amount of FDI, countries with well-function financial markets witness growth rates that are nearly double those of countries with poorly performed financial systems. Other factors such as market structure and human capital play an important role in the FDI and GDP causality. Therefore, the first hypothesis is proposed as follows:

Hypothesis 1: Chinese FDI increases the economic growth of the recipient countries.

It is important to note that reverse causality may be present, meaning that FDI inflow is a result of economic growth. Chakrabarti (2001) finds that the rise in GDP causes an increase in FDI inflow. The study in India confirms the same finding (Chakraborty & Basu, 2002). Hsiao and Hsiao (2006) study cases of China, Korea, Taiwan, Hong Kong, Singapore, Malaysia, the Philippines, and Thailand. They document that FDI has a unidirectional positive impact on GDP via a channel of export. However, the relationship between export and GDP is bidirectional causality (Tiwari & Mutascu, 2011). Basu et al. (2003) find that there is bidirectional causality between FDI inflow

and GDP growth for countries with a high level of trade openness; however, countries with closed markets witnessed a one-way causality from GDP to FDI.

In contrast to the positive correlation between FDI and economic growth mentioned above, some studies identify insignificant, ambiguous, and negative relationships. Stockmann (2019) finds that Chinese FDI has an insignificant effect on the BRI recipient countries, despite the inclusion of various instrumental variables. Alfaro (2003) examines the impacts of FDI on economic growth in the main economic sectors, including primary (agriculture), secondary (manufacturing), and tertiary (service) in 47 countries over the 1980-1999 period. He finds that FDI inflows in the primary sector have a negative and significant impact on economic growth. By contrast, FDI inflows in the manufacturing sector have a positive and significant effect on economic growth; meanwhile, the tertiary sector witnesses a positive but insignificant effect (Stockmann, 2019). Jyun-Yi and Chih-Chiang (2008) study 62 countries during 1975–2000. Lyroudi et al. (2004) research emerging markets during 1995–1998. They both find no correlation between FDI and GDP growth. Furthermore, Konings (2001) documents that FDI hampers the economic growth of Romania and Bulgaria because it causes trade imbalances, monopolies and reverse diffusion of knowledge and technology. The negative is also found in Poland. The reason is that the competition arisen from foreign firms demotivates the production of domestic firms, resulting in the rising average production cost. The negative effect of competition dominates the benefit of technology diffusion.

FDI and Economic Growth: Seaport and telecommunication infrastructures as moderators

Infrastructure is an enabling environment that amplifies the benefits that FDI brings to economic growth. For instance, the telecommunication infrastructure facilitates the knowledge spill-over effect as information is exchanged efficiently. The transport infrastructures enable the commutes of human resources, capital and technology equipment more easily. Carlsson et al. (2013) affirm that transport and digital infrastructure help lower the cost of trade; thus, the economies of scale and knowledge accumulation are realized, which enhances economic growth. Horvat et al. (2015) investigate the impacts of infrastructure on the growth of East African countries from 1980 to 2018. The analysis encompasses various types of infrastructures, including road, air, sea transportation infrastructures, energy, water, telecommunication, and Internet infrastructures. The result shows the significant positive impacts of infrastructures on the economic growth of the countries. Munim

and Schramm (2018) document that port infrastructure enhances seaborne trades and thus increases the economic growth of developing countries. The positive impact of port infrastructure on growth is also found in developed countries, but the effect is weaker. Song and van Geenhuizen (2014) investigate the impact of seaport infrastructures on the growth of regions in China during the 1990-2010 period. The positive effects are found in all regions; however, the magnitudes differ. The lowest impact is found in the regions with the domination of landside transport infrastructures. The difference lies in the features of port (land or sea), development stage, international integration and knowledge spill-over effect from neighbouring cities.

Aside from seaport infrastructure, digital telecommunication infrastructure also plays a role in enhancing economic growth. Pradhan, Mallik and Bagchi, (2018) document that ICT infrastructure increases the per capita real GDP in G-20 countries during the period 2001–2012. The significant and positive impact of ICT on economic growth is also found in ASEAN countries during the period 1980-2009 (Mahyideen & Ismail, 2012). Sarangi and Pradhan (2020) analyze the mechanism through which ICT infrastructure improves economic growth. Advanced technologies integrated with the digital infrastructures enables people to optimize the capabilities and possibility, which accelerates economic growth. Therefore, the adoption of e-commerce, digitalized governmental administration and the widespread application of ICT are recommended to strengthen the economy. The study further indicates that to promote the prosperity of ICT, macro-economic and institutional stabilities are crucial. Since macro-economic and institutional stabilities are determinants of FDI attraction (Balasubramanyam, 2001), it can be inferred that ICT enhances the positive relationship between FDI and economic growth. Hypothesis 2 is thus proposed as follows:

Hypothesis 2: The effect of Chinese FDI on the economic growth of the recipient countries is driven by seaport and telecommunication infrastructures

Stockmann (2019) investigates the effects of Chinese FDI and transport and ICT infrastructures on the growth of participating countries in the Belt and Road Initiative (BRI) during the period 2005-2017 by using OLS and Instrumental variables. The results are that Chinese FDI has an insignificant effect on the BRI countries, and the relationship between Chinese FDI and the growth of BRI countries is not driven by both infrastructures. Despite the similar topic, this paper provides new insights and perspectives. Firstly, while Stockmann (2019) only investigates samples of 34

and 27 BRI countries during 2005-2017, this paper broadens to all 125 recipient countries of Chinese FDI throughout 2005-2020. Secondly, meanwhile Stockmann uses OLS and Instrumental variables; this paper adopts the fixed-effects approach, which is more appropriate for the panel dataset. In addition, the robustness and heterogeneity checks provide a deeper look as to whether the effects of Chinese FDI and infrastructures differ between pre-crisis and crisis times or whether they differ between the BRI and the non-BRI countries.

Data and methodology

Data

Data of Chinese FDI is retrieved from China Global Investment Tracker (2020)[1]. This dataset traces all Chinese outbound investments and construction contracts to 125 recipient countries in all sectors, starting in 2005. For this research, only data of outbound investment is applied.

The GDP growth rate indicator is taken from World Development Indicators, World Bank (2020)[2]. The GDP is defined as the sum of the gross values added of all resident producers at market prices, plus taxes less subsidies on imports. The asset depreciation and the exhaustion of natural resources are not taken into the measure of GDP. Statistics are presented in current USD, which are already converted from domestic currencies using annual official exchange rates or conversion factors. The GDP growth rate is the annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 USD.

Regarding the infrastructure, Fixed Telephone Subscriptions (FTS) is used to be a proxy for telecommunication infrastructure. The FTS per 100 people is "the total active number of analogue fixed telephone lines, voice-over-IP (VoIP) subscriptions, fixed wireless local loop (WLL) subscriptions, ISDN voice-channel equivalents and fixed public payphones". Additionally, the Container Port Traffic (CPT) is regarded as a proxy for seaport infrastructure. It measures the "flow of containers from land to sea transport modes and vice versa in all scopes of coastal shipping, international journey and transhipment", with the unit being 20-foot-equivalent units. Data of both FTS and CPT are retrieved from World Development Indicators, World Bank (2020)[3].

1 https://www.aei.org/china-global-investment-tracker/

2 https://databank.worldbank.org/source/world-development-indicators

3 https://databank.worldbank.org/source/world-development-indicators

The control variables include inflation, trade openness, corruption perception index, human capital level. Statistic for inflation is retrieved from World Development Indicators, World Bank (2020)[4]. Inflation is defined as the rate of price change in the economy. Inflation is measured by the annual growth rate of the GDP deflator. The GDP deflator is calculated as GDP in current local currency divided by GDP in constant local currency. Secondly, the trade openness index is taken from World Development Indicators, World Bank (2020)[5]. Trade openness is measured as the ratio of the sum of export and import to GDP. Thirdly, the corruption perception index is acquired from Transparency International (2020)[6]. This index refers to the scores of the transparency of countries by experts and businessmen's perceived levels of public sector corruption. The scale is 0-10, in which 0 means highly corrupted and 10 means very transparent. Lastly, the human capital level is proxied by the average number of years of education received by people aged 25 years or older, which is retrieved from Human Development Reports, UNDP (2020)[7].

Table 2 demonstrates the descriptive statistics of all variables. It is important to note that only data of 125 China FDI's recipient countries during the 2005-2020 period is taken into account. The global growth rates fluctuated over the period. It reached a peak in 2006 then plummeted in 2008 as a result of the global financial crisis. From 2011 to 2019, the global GDP growth was stable; however, it dived to negative growth value in 2020 due to the Corona crisis. The high and low records are made in 2020. The country with the highest GDP growth throughout the research time span is Guyana (43.48%) in 2020, and the country with the lowest GDP growth is Maldives (-31.08%) in 2020. Regarding the share of Chinese FDI in GDP, the lowest value is 0 since Chinese investors do not constantly invest in all countries throughout all the years, meaning that during years when countries do not get invested by China, the Chinese FDI was reported to be zero. The highest share of Chinese FDI in GDP is found in Niger (70.98%) in 2008. Concerning infrastructures, the country with the highest number of FTS is the United States, with nearly 175,16 million in 2005; meanwhile, the lowest number of FTS is reported in the Democratic Republic of Congo as this country constantly reported 0 FTS from 2013 to 2019. United States possessed the largest amount of CPT (55.52 million TEU) in 2019; meanwhile, the low record was found in

4 https://databank.worldbank.org/source/world-development-indicators

5 https://databank.worldbank.org/source/world-development-indicators

6 https://www.transparency.org/en/cpi/2020/index/nzl

7 http://hdr.undp.org/en/indicators/103006

Antigua and Barbuda (0.02 million TEU) in 2011. The inflation rate is highest in Zimbabwe (610%) in 2020 and lowest in Iraq (-30.2%) in 2015. The trade openness level is found to be highest in Singapore (437.33%) in 2008 and lowest in Myanmar (0.17%) in 2009. North Korea is perceived to be highly corrupted in 2011, with the CPI at 1. By contrast, the CPI levels are all reported to be 10 in Slovenia, South Korea, Hungary, Czech Republic, Bulgaria and Croatia during the period 2017-2020. Lastly, regarding human capital, Germany is reported to have the longest year of secondary schoolings (14.2 years) in 2019; meanwhile, people in Niger are reported to have the lowest average schooling time at around 1,3 years in 2005 and 2006.

Table 1: Descriptive statistics of all variables

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
GDP growth (%)	1,931	3.46	4.76	-31.98	43.48
Chinese FDI/GDP (%)	1,938	0.66	3.65	0.00	70.98
FTS (million)	1,816	6.94	16.57	0.00	175.16
CPT (million TEU)	1,334	4.87	8.41	0.02	55.52
Inflation rate (%)	1,931	6.96	19.02	-30.20	610.00
Trade openness (%)	1,785	89.43	58.62	0.17	437.33
Corruption index	1,907	5.78	2.43	1.00	10.00
Education (year)	1,840	8.41	3.19	1.30	14.20

Chinese FDI outflow presents an increasing trend from 2005 to 2017, especially the period from 2014 to 2017 witnesses the remarkable Chinese outbound investments as these are the first years of the Belt and Road Initiative. The investment in 2018, 2019, 2020 go down, which could be explained by the presence of the Corona crisis. North America & Europe was the top destination for Chinese FDI. From 2005 to 2020, these regions got an investment of $724.4 billion, constituting nearly 51% of total Chinese FDI outflows during this period. Throughout the period 2005-2020, the top three countries getting the highest amount of Chinese outflow FDI are the United States (184.97 billion USD), Australia (101.18 billion USD) and United Kingdom (95.2 billion USD). By contrast, the lowest total amount of Chinese investments is found in Botswana, Malawi and Qatar, which all bottom at 0.1 billion USD.

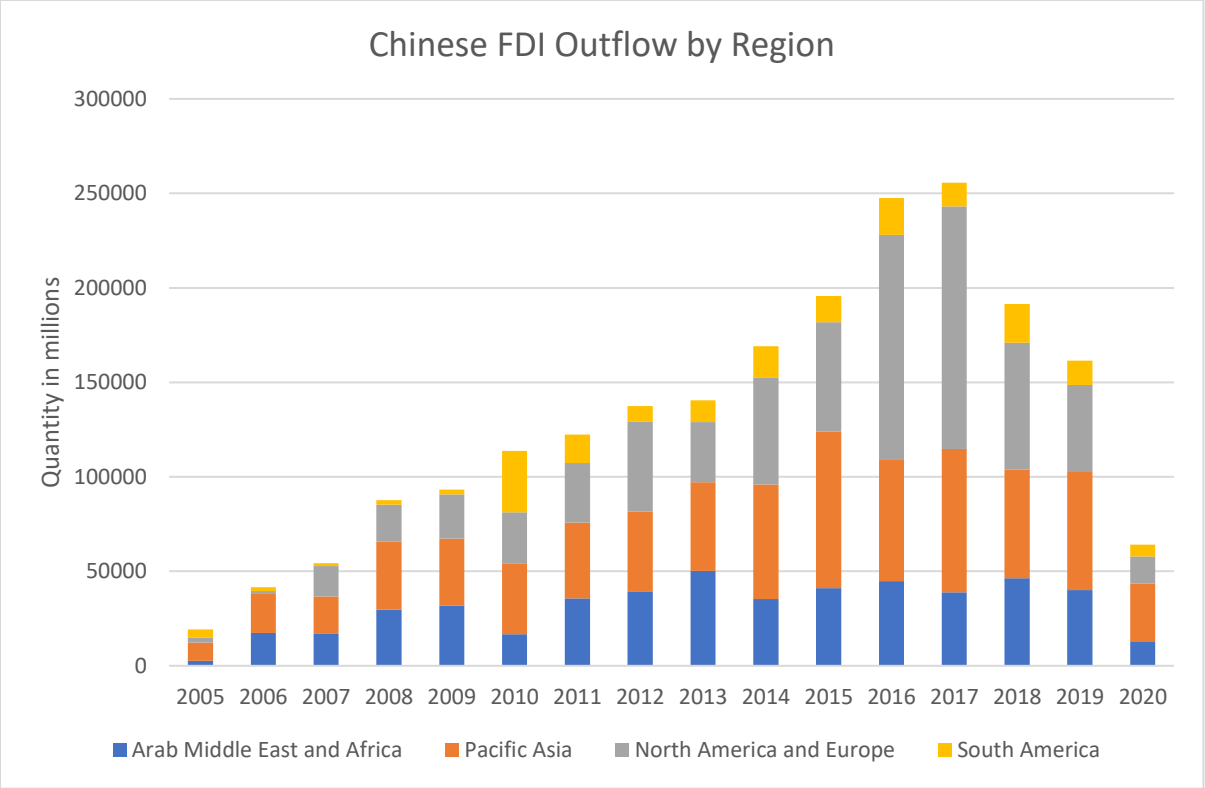
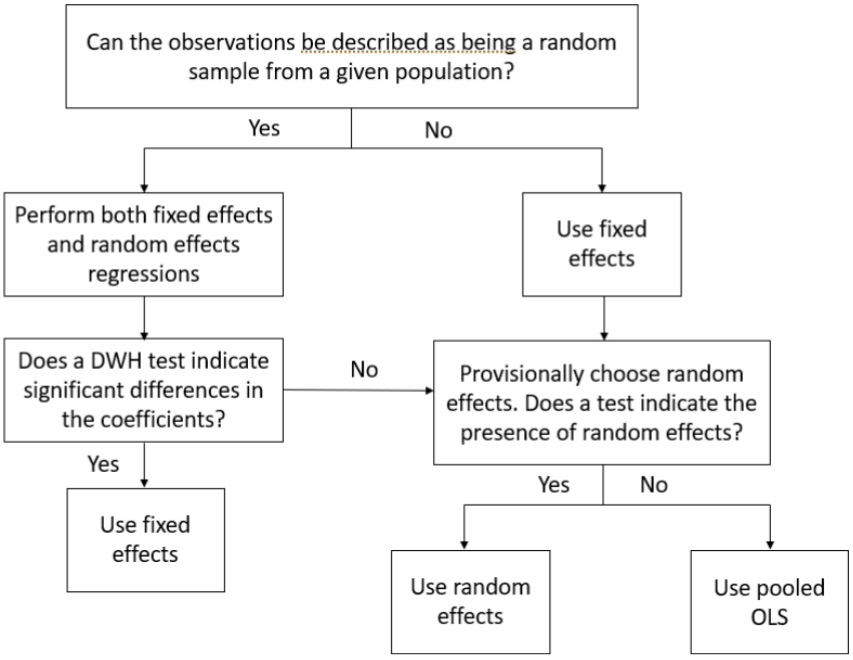


Figure 1: Chinese FDI outflow by region

Methodology

Model selection

The selection process to choose an appropriate model for the panel dataset is demonstrated in the diagram below (*Choosing Fixed-Effects, Random-Effects or Pooled OLS Models in Panel Data Analysis Using Stata*, 2021; Dougherty, 2011)



Source: Dougherty (2011)

Since the observations can be described as a random sample from a given population, i.e. the statistics for CPI and education variables, therefore both fixed effects and random effects regressions should be performed and compared by using the Durbin-Wu-Hausman (DWH) test.

With the DWH) test being significant 1% level, the random-effects model is rejected; thus, the fixed-effects will be adopted. Furthermore, to be more cautious, the Breusch-Pagan Lagrange multiplier (LM) is used to test the possible presence of random effect or the pooled OLS method. The LM test is significant at the 1% level, indicating the random effects and refusing the pooled OLS model. As the Hausman test eliminates the random effect model and the LM test rejects the pooled model, it comes to the conclusion that the fixed effect model is the most appropriate.

Regression model

To investigate whether changes in the share of Chinese FDI in GDP affect economic growth during the time period of 2005 to 2020, a country fixed effects model will be adopted via the following equation:

$$Growth_{it} = \alpha_i + \beta_1 Chinese\ FDI_{it}/GDP_{it} + \beta_2 X_{it} + \gamma_t + \varepsilon_{it} \quad (1)$$

where $Growth_{it}$ is the dependent variable for country i at time t where t is 2005, 2006, 2011...2020. α_i is the country fixed effect, X_{it} is a vector of time-varying controls variables, and γ_t is the time dummy.

Country fixed effects is adopted because it can remove time-invariant sources of omitted variable bias, such as a country's geographical location, ethnicity, or historic diplomatic relations with China. However, country fixed effects hold a core assumption stating that time-varying variables that influence both the independent and dependent variables should be absent; otherwise, the endogeneity problems can arise. Thus, control variables at the country level are also be adopted. The dependent variable is economic growth, proxied by GDP growth (Statista, n.d.). The control variables are time-varying variables that can affect each country's Chinese FDI inflow or the share of Chinese FDI in GDP, which includes inflation, trade openness, corruption perception index (CPI) and education. The inflation rate is used as a proxy for macroeconomic stability (Ali & Rehman, 2015). Trade openness features the weight of the sum of export and import over total GDP (Alfaro et al., 2004). The Corruption perception index is a proxy for institutional stability as higher corruption is positively associated with more institution instability (Serra, 2006). The human capital level is proxied by average years of secondary schoolings among people aged over 25 years old (Barro & Lee, 2013). The more year of fundamental education is associated with the higher capability and productivity. It is important to note that not all possible time-varying omitted variables can be controlled and included in the equation.

Hypothesis 2 is evaluated by using the country fixed effects model:

$$Growth_{it} = \alpha_i + \beta_1 Chinese\ FDI_{it}/GDP_{it} + \beta_2 Infrastructure_{it} + \beta_3 (Chinese\ FDI_{it}/ GDP_{it} * Infrastructure_{it}) + \beta_4 X_{it} + \gamma_t + \varepsilon_{it} \quad (2)$$

The second hypothesis is extended by the addition of the infrastructure variable and the interaction term between infrastructure and Chinese FDI. The intuition is to investigate the impact of Chinese FDI on the economic growth through infrastructures, such as countries with better existing infrastructure can make better use of Chinese FDI in improving the growth. Among many types of infrastructures (such as energy, transport, water, waste, ICT), the transport and telecommunication infrastructures have significant impacts on economic growth (Carlsson et al.,2013; Kuznets, 1973) Both quality and quantity of infrastructures should be examined, however,

due to the difficulty in assessing the quality, only quantity indicators are taken into consideration. The telecommunication infrastructure is proxied by the number of fixed telephone subscriptions (FTS) per 100 people, measured in per cent (Wilson et al., 2014, Stockmann, 2019) meanwhile the seaport infrastructure is proxied by container port traffic (CPT) measured in 20-foot-equivalent units (Horvat et al., 2015)

Result

Regression result

Table 2: Estimation of the effect of Chinese FDI on economic growth in the recipient countries

	(1)	(2)
	GDP growth	GDP growth
Chinese FDI/GDP (%)	0.022	0.016
	(0.015)	(0.015)
Inflation rate (%)		-0.007
		(0.025)
Trade openness (%)		0.032***
		(0.010)
CPI (point)		-0.119
		(0.090)
Education (year)		0.322
		(0.523)
Constant	5.306***	0.934
	(0.354)	(4.350)
Number of observations	1929	1626
R2	0.224	0.015
Country FE	YES	YES
Year Dummy	YES	YES

Notes. Country fixed effects results for GDP growth. Column 1 presents the unrestricted model, while Column 2 shows the model with controls. Standard errors are within parentheses. The significance levels are denoted as such: * p<0.01 Standard Errors are between the parenthesis; ***p<0.01, **p<0.05, *p<0.1

As can be seen in Table 2, there is no statistically significant relationship between the share of Chinese FDI in GDP and GDP growth. This is both the case in the model without the inclusion of the controls (column 1) and the full model (column 2). The insignificant relationship can be explained by the fact that the coefficients of the share of Chinese FDI in GDP are indistinguishable from 0.

Table 3: Estimation of the effects of seaport and telecommunication infrastructures on the relationship between Chinese FDI and economic growth of the recipient countries

	(1) GDP growth	(2) GDP growth
Chinese FDI/GDP (%)	0.018	0.006
	(0.021)	(0.016)
FTS (percent)		-0.039**
		(0.020)
CPT (TEU)	0.143**	
	(0.069)	
Chinese FDI/GDP * FTS		0.069**
		(0.030)
Chinese FDI/GDP * CPT	-0.002	
	(0.015)	
Inflation rate (%)	-0.043	-0.007
	(0.028)	(0.025)
Trade openness (%)	0.036**	0.035***
	(0.011)	(0.010)
CPI (point)	-0.115	-0.113
	(0.095)	(0.090)
Education (year)	-0.323	0.404
	(0.341)	(0.533)
Constant	5.306***	0.296
	(0.354)	(4.399)
Number of observations	1201	1626
R^2	0.111	0.015
Country FE	YES	YES

Year Dummy	YES	YES

Notes. Country fixed effects results for GDP growth. Column 1 presents the results with seaport infrastructure, proxied by Container Port Traffic, while Column 2 shows results with telecommunication infrastructure, proxied by Fixed Telephone Subscription. Standard errors are within parentheses. The significance levels are denoted as such: * p<0.01 Standard Errors are between the parenthesis; ***p<0.01, **p<0.05, *p<0.1

Table 3 presents the regression result for hypothesis 2. With the inclusion of either seaport or telecommunication infrastructure variables, the effects of the share of Chinese FDI in GDP on the GDP growth of the recipient countries remain statistically insignificant. Regarding seaport infrastructure, during the period 2005-2020, when a country has one more TEU of container port traffic, the country's GDP growth rate on average increases by 0.143 percentage points. The effect is statistically significant at the 5% level. In other words, countries with more developed seaport infrastructure have higher growth rates. The negative joint effect of container port traffic and the share of Chinese FDI in GDP is statistically insignificant, meaning the correlation between Chinese FDI and the economic growth of the recipient countries is not driven by seaport infrastructure.

Regarding telecommunication infrastructure, during the period 2005-2020, when fixed telephone subscription increases by 1 per cent, the country's GDP growth rate on average decreases by 0.039 percentage points. The effect is statistically significant at the 5% level. In other words, countries with more developed telecommunication infrastructure have lower growth rates. However, fixed telephone subscription increases by 1 per cent, the effect of the share of Chinese FDI in GDP on GDP growth rate increases on average by 0.069 more percentage points. The joint effect of infrastructure and the share of Chinese FDI in GDP is statistically significant at the 5% level.

Robustness

Robustness check: Crisis

A potential confounding factor could be a crisis, including the US-China tension and the Covid-19 pandemic. The trade war between the USA and China has escalated since 2018. The conflict between the two nations has slowed down global economic growth (Vilmi et al., 2019) and led to the decline of Chinese FDI outflow worldwide (Schrag, 2021). In addition, the Corona crisis bursting out at the beginning of 2020 has tremendously damaged the whole world economy (The Global Economic Outlook During the COVID-19 Pandemic, 2020) and further driven down the

Chinese outbound investment (Schrag, 2021). Since the Crisis negatively affects Chinese FDI and economic growth, this would result in underestimation of the results. Thus, for hypothesis 1, to test if economic growth stays robust with the presence of Crisis, an interaction term of Chinese FDI and crisis dummy is included:

$$Growth_{it} = \alpha_i + \beta_1 Chinese\ FDI_{it}/GDP_{it} + \beta_2 Chinese\ FDI_{it}/GDP_{it} * Crisis + \beta_3 Crisis + X_{it} + \gamma_t + \varepsilon_{it}$$

where $Crisis$ is a dummy taking value 1 if the observations are in 2018, 2019 and 2020.

For the hypothesis 2, the sample is split to investigate if results are different between the pre-crisis period (2005-2017) and the crisis period (2018-2020).

Table 4: Estimation of the effect of Chinese FDI on economic growth with the presence of crisis variable

	GDP growth
Chinese FDI/GDP (%)	0.016
	(0.015)
Crisis	-2.884***
	(0.904)
Chinese FDI/GDP*Crisis	-0.018
	(0.127)
Inflation rate (%)	-0.007
	(0.025)
Trade openness (%)	0.031***
	(0.010)
CPI (point)	-0.119
	(0.090)
Education (year)	0.323
	(0.523)
Constant	0.929
	(4.349)
Number of observations	1626

R^2	0.015
Country FE	YES
Year Dummy	YES

Notes. Country fixed effects results for GDP growth with the presence of crisis variable. The significance levels are denoted as such: * p<0.01

Standard Errors are between the parenthesis; ***p<0.01, **p<0.05, *p<0.1

Table 4 shows the crisis robustness check for hypothesis 1. With the inclusion of the Crisis dummy, the magnitude and significance of coefficients of all other variables are quite similar to the results in Table 3. The interaction term between the share of Chinese FDI in GDP and Crisis is statistically insignificant, meaning that the relationship of Chinese FDI on the economic growth of the recipient countries is not driven by Crisis.

Table 5: Estimation of the effects of seaport and telecommunication infrastructures on the relationship between Chinese FDI and economic growth before and during crisis time

	Dependent variable: GDP growth			
	(1)	(2)	(3)	(4)
	2005-2017	Crisis	2005-2017	Crisis
Chinese FDI/GDP (%)	0.026	-0.107	0.008	-0.055
	(0.023)	(0.077)	(0.016)	(0.072)
FTS (percent)			-0.020	0.012
			(0.024)	(0.082)
CPT (TEU)	0.166*	-0.348		
	(0.085)	(0.119)		
Chinese FDI/GDP * FTS			0.072**	0.055
			(0.031)	(0.055)
Chinese FDI/GDP * CPT	-0.002	0.055		
	(0.016)	(0.070)		
Inflation rate (%)	-0.019	-0.105**	0.003	0.047
	(0.029)	(0.051)	(0.025)	(0.052)
Trade openness (%)	0.038***	0.043	0.034***	-0.112
	(0.013)	(0.054)	(0.011)	(0.323)

CPI (point)	-0.110	0.276	-0.112	-0.112
	(0.095)	(0.374)	(0.090)	(0.323)
Education (year)	-0.030*	2.293	0.576	0.146
	(0.382)	(1.898)	(0.562)	(1.668)
Constant	2.344	-21.064	-1.274	-1.278
	(3.493)	(19.605)	(4.716)	(17.407)
Number of observations	1026	175	1402	201
R^2	0.053	0.003	0.003	0.026
Country FE	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES

Notes. Country fixed effects results for the effects of infrastructures on the relationship between Chinese FDI and GDP growth. Columns (1) and (2) present the results with seaport infrastructure, proxied by Container Port Traffic, in which column (1) shows results before crisis time and column (2) shows results during crisis time. Column (3) and (4) shows results with telecommunication infrastructure, proxied by Fixed Telephone Subscription, in which column (3) shows result before crisis time and column (4) shows result during crisis time. Standard errors are within parentheses. The significance levels are denoted as such: * p<0.01 Standard Errors are between the parenthesis; ***p<0.01, **p<0.05, *p<0.1

Table 5 presents the crisis robustness check for the moderator role of infrastructures on the relationship between Chinese FDI and economic growth. During the pre-crisis time, the magnitude and significance of the estimates are quite similar to the baseline results in Table 5. During crisis time, the interaction terms of both infrastructures with the share of Chinese FDI in GDP are statistically insignificant, meaning that infrastructures do not have impacts on the relationship between the share of Chinese FDI in GDP and economic growth during crisis time 2018-2020.

Heterogeneity check: Belt and Road Initiative (BRI)

In 2013, Chinese President Xi Jinping initiated the Belt and Road Initiative (BRI), which is a long-term investment project aiming at improving infrastructure, enhancing multinational trade and connectivity of the country members (Belt and Road Initiative, n.d.). BRI is expected to increase global real income by 0.7 to 2.9 per cent (Belt and Road Economics: Opportunities and Risks of Transport Corridors, n.d.). Statistics show that since 2013, the BRI countries on average have received more Chinese FDI than the non-BRI countries (Wang, 2020). Therefore, it is time to

investigate whether Chinese FDI has a more positive impact on the BRI countries than the non-BRI countries.

The sample is split to see whether the effects of Chinese FDI on economic growth differ between BRI and non-BRI countries. The time scope is from 2013 to 2020, the implementation time of the BRI. The list of BRI countries is in Appendix.

Table 6: Estimation of the effect of Chinese FDI on the economic growth of recipient countries before and after Belt and Road Initiative

	Dependent variable: Economic growth	
	(1)	(2)
	BRI	Non-BRI
Chinese FDI/GDP (%)	0.029	0.089
	(0.051)	(0.179)
Inflation rate (%)	-0.140***	-0.044
	(0.051)	(0.029)
Trade openness (%)	0.041**	0.033*
	(0.017)	(0.017)
CPI (point)	-0.228	-0.168
	(0.361)	(0.350)
Education (year)	-0.939	-0.128
	(0.754)	(1.170)
Constant	10.687	2.653
	(6.653)	(11.980)
Number of observations	514	254
R^2	0.0579	0.151
Country FE	YES	YES
Year Dummy	YES	YES

Notes. Country fixed effects results for the effect of the share of Chinese FDI in GDP on GDP growth. Column (1) presents results considering BRI countries during 2013-2020, while Column (2) shows results considering non-BRI countries during 2013-2020. Standard errors are within parentheses. The significance levels are denoted as such: * p<0.01 Standard Errors are between the parenthesis; ***p<0.01, **p<0.05, *p<0.1

Table 6 shows the effects of Chinese FDI on the growths of the BRI and non-BRI countries. The effect of the share of Chinese FDI in GDP on the growth of the non-BRI countries is on average higher than that of BRI countries. However, both estimates are statistically insignificant. Thus, it can be concluded that Chinese FDI does not have effects on the growths of the recipient countries, no matter whether a country is BRI or non-BRI.

Table 7: Estimation of the effects of seaport and telecommunication infrastructures on the relationship between Chinese FDI and economic growth countries before and after Belt and Road Initiative

	Dependent variable: Economic growth			
	(1)	(2)	(3)	(4)
	BRI	Non-BRI	BRI	Non-BRI
Chinese FDI/GDP (%)	0.051	0.077	0.015	0.120
	(0.055)	(0.175)	(0.056)	(0.185)
FTS (percent)			-0.080	-0.061
			(0.073)	(0.050)
CPT (TEU)	-0.010	0.063		
	(0.018)	(0.149)		
Chinese FDI/GDP * FTS			0.065	-0.030
			(0.066)	(0.038)
Chinese FDI/GDP * CPT	0.014**	0.020		
	(0.007)	(0.105)		
Inflation rate (%)	-0.179***	-0.039	-0.142***	-0.041
	(0.052)	(0.030)	(0.053)	(0.030)
Trade openness (%)	0.042*	0.028	0.041**	0.035**
	(0.025)	(0.017)	(0.020)	(0.015)
CPI (point)	0.072	-0.320	-0.273	-0.226
	(0.401)	(0.344)	(0.389)	(0.356)
Education (year)	-1.220	-0.227	-0.807	0.013
	(0.950)	(1.233)	(0.752)	(1.209)
Constant	10.533	4.351	10.330	2.344
	(8.220)	(13.063)	(6.679)	(12.307)

Number of observations	377	235	500	248
R^2	0.100	0.211	0.067	0.119
Country FE	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES

Notes. Country fixed effects results for the effects of infrastructures on the relationship between Chinese FDI and GDP growth during 2013-2020. Columns (1) and (2) present the results with seaport infrastructure, proxied by Container Port Traffic, in which column (1) shows results of BRI countries and column (2) shows results of non-BRI countries. Column (3) and (4) shows results with telecommunication infrastructure, proxied by Fixed Telephone Subscription, in which column (3) shows results of BRI countries and column (4) shows results of non-BRI countries. Standard errors are within parentheses. The significance levels are denoted as such: * p<0.01 Standard Errors are between the parenthesis; ***p<0.01, **p<0.05, *p<0.1

Table 7 shows the effects of the moderating role of infrastructures in the Chinese FDI – economic growth relationship in BRI and non-BRI countries. Regarding seaport infrastructure, in BRI countries, with one more TEU container port traffic, the effect of the share of Chinese FDI in GDP on growth will increase by 0,014 percentage points on average, at the 5% significant level. However, container port traffic (CPT) does not play a role for the non-BRI countries as the interaction term between CPT, and the share of Chinese FDI in GDP is statistically insignificant. Regarding telecommunication infrastructure, fixed telephone subscription does not play a role in both BRI and non-BRI countries as the interaction terms are both statistically insignificant. These findings are in contrast to the baseline results in Table 4. The baseline results show that for all recipient countries during the 2005-2020 period, the moderating role of seaport infrastructure is insignificant; meanwhile, the moderating role of telecommunication is positive and significant.

Discussion and conclusion

Discussion

This paper investigates the effects of Chinese FDI outbound on the economic growth of the recipient countries and the role of infrastructures in this relationship. Two hypotheses are formulated and evaluated via the country fixed effects model. The robustness check with the crisis time and the incident of Belt and Road is also conducted.

The first hypothesis stating that Chinese FDI increases the economic growth of the recipient countries can be rejected. The analysis shows that on average, there is no relationship between the

share of Chinese FDI in GDP and the economic growth of the host countries. The estimate remains insignificant both before and during the crisis time (US-China tension and Covid-19 from 2018-2020). The estimate also remains insignificant for both BRI and non-BRI countries during the BRI implementation (2013-2020).

Hypothesis 1' result is conflicting with the majority of research that finds the strictly positive or negative effect of Chinese FDI on economic growth. This is because the other papers focus on specific countries or a group of countries sharing similar characteristics. For instance, Anwar and Nguyen (2016) focus on Vietnam, Cuadros et al. (2004) focus on Mexico, Argentina, Neuhause (2006) analyze Central and Eastern European countries, Borensztein et al. (1998) study 69 developing countries. By contrast, I investigate the effect on the aggregate countries in the world; thus, there are large variations found in variables because countries have different development stages and characteristics. Furthermore, other papers investigate the effect of total FDI inflows; meanwhile, I focus on Chinese FDI inflow only. As shown in the descriptive statistics, the average value of the share of Chinese FDI in GDP across all recipient countries throughout the 2005-2020 period is 0.66%. Meanwhile, the average share of total inflow FDI in GDP for all countries during the same is around 3.1% (World Bank Group, 1970–2019). This implicates that the relatively small share of Chinese FDI in GDP potentially leads the coefficient of the independent variable to be indistinguishable from 0 and insignificant. On the other hand, the finding of this paper is in line with Stockmann (2019). Stockman finds the insignificant relationship between Chinese FDI economic growth of the BRI countries in two periods, 2005-2012 and 2013-2020. The insignificant results are explained by the fact that the GDP growth rates largely vary in both periods; meanwhile, the shares of Chinese FDI in GDP do not vary considerably from the first period to the second.

The second hypothesis states that the effect of Chinese FDI on the economic growth of the recipient countries is driven by seaport and telecommunication infrastructures. That the effect of Chinese FDI on the economic growth of the recipient countries is driven by seaport infrastructures can be rejected; however, the estimates are not robust to the heterogeneity check. The analysis shows that seaport infrastructure does not play a role in the relationship between Chinese FDI and the economic growth of the host countries. In addition, the insignificant role is present both before and during the crisis time. However, during the implementation of BRI, in BRI countries, with one more TEU container port traffic, the effect of the share of Chinese FDI in GDP on growth increases

by 0,014 percentage points on average. By contrast, the moderating role of seaport infrastructure in non-BRI countries remains absent. The difference found in BRI and non-BRI countries can be possibly explained by the fact that the BRI countries also receive BRI construction contracts and construction contracts play a more important role than FDI. Furthermore, seaport traffic links with the "Road" part in the BRI, which is the sea route, explaining the effect in BRI countries.

On the other hand, that the effect of Chinese FDI on the economic growth of the recipient countries is driven by telecommunication infrastructure cannot be rejected. The analysis shows that during the period 2005-2020, with one more per cent of fixed telephone subscriptions, the effect of Chinese FDI on the economic growth of the host countries on average increases by 0.069 percentage points. The estimate slightly grows to 0.071 when considering the pre-crisis period (before 2018) solely. However, during the crisis period, the moderating role of telecommunication infrastructure becomes insignificant. Furthermore, during the implementation of BRI (2013-2020), the moderating role of telecommunication infrastructure is insignificant for both BRI and non-BRI countries. Since BRI focuses on transport infrastructure, digital infrastructure plays a less important role. The findings imply that the role of telecommunication infrastructure is only visible before the start of the BRI (2013).

There are implications from these findings. Firstly, according to the analysis, Chinese FDI has no impact on the economic growth of the recipient countries. China is practising the dominant role all over the globe, and this country is accused of the tactics that pose political and financial threats to other countries (*Belt and Road Economics: Opportunities and Risks of Transport Corridors*, n.d.). However, China claims the positive externalities this country has on other countries in the world via FDI (*Belt and Road Initiative*, n.d.). Therefore, with the finding of the insignificant role of Chinese FDI on growth, countries should take more careful considerations when taking investment offers from China. Secondly, telecommunication infrastructure is found to positively influence the relationship between Chinese FDI and growth only before 2013, so that the role of telecommunication infrastructure in the future needs more investigation. In the light of Belt and Road, participating countries should improve their seaport infrastructure to enjoy more economic growth out of Chinese FDI. This is not the case for non-BRI countries.

There are other limitations of this research. Firstly, the proxies for infrastructure may not be sufficient. The measures for the quality of infrastructures are absent. Secondly, there are many

missing values in the dataset, meaning that the data on dependent variables and control variables is not available for all countries in all years, which possibly result in imprecise estimation. The value of zero is frequently found on the Chinese FDI dataset, leading to the small ratio of Chinese FDI-to-GDP, thus the insignificant effect of Chinese FDI on growth. Thirdly, the reliability of Chinese FDI statistics is questionable because the Chinese government is known to highly censor data sources and is likely to modify some economic statistics to polish the national balance sheet, which may imprecisely affect the estimates. In addition, for some host countries, China invests more in terms of construction contracts rather than FDI. This is because the existing infrastructure systems are undeveloped, and the transportation costs are relatively high in such countries. However, the data for Chinese construction contracts is inadequate (Stockmann, 2019), resulting in the underestimation of the effects. The reverse causality can also be a culprit for the insignificant relationships. However, despite the full acknowledgement of reverse causality and the solution of instrumental variables, Stockmann (2019) still found the insignificant impacts of Chinese FDI and the role of transport infrastructure on the growth of the recipient countries. Lastly, there may exist other time-varying unobserved variables that are correlated to the independent variables (growth) and also affect the dependent variables (Chinese FDI), which may cause a bias in the estimation.

Conclusion

This paper investigates the effects of Chinese FDI outbound on the economic growth of the recipient countries and the role of infrastructures in this relationship. From the result, I conclude that there is no relationship between Chinese FDI and the economic growth of the host countries. The reason is possible that the Chinese FDI is only a small part of all FDI inflows that a country takes. The presence of large variations when taking all countries with different development stages into analysis is another reason. In addition, it is found that the moderating role of seaport infrastructure is only significant for BRI countries since 2013. During the 2013-2020 period, with one more TEU container port traffic, the effect of the share of Chinese FDI in GDP on the growth of BRI countries increases on average by 0,014 percentage points. With respect to telecommunication infrastructure, throughout the 2005-2020 period, with one more per cent of fixed telephone subscriptions, the effect of Chinese FDI on the economic growth of the host countries on average increases by 0.069 percentage points. However, the positive moderating role of telecommunication infrastructure is founded before the start of BRI.

It is recommended for future research in this aspect to investigate alternative sources of data, especially statistics on Chinese FDI outbound and Chinese construction contracts. Proxies for both quality and quantity of infrastructures should highly be improved. Different types of infrastructures such as air, road, railway transport infrastructures, energy infrastructures are recommended to study to deepen the insights into the role of infrastructure. The impacts of the Chinese construction contract on the growth of host countries are worth investigating. The classification of country groups is highly recommended to get better insights into the net impact of Chinese FDI in each country group. Finally, future research is suggested to explore the effects of Chinese FDI on other metrics of economic development such as human capital improvement and technological progress. This will add to a better understanding of the possible impacts of Chinese FDI in global development.

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Appendix

```
. hausman fixed random
```

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) Std. err.
y2	.0043554	.0089166	-.0045612	.0035802
y6	.0183671	.0267633	-.0083962	.0031512
y8	.0400096	.0133577	.0266519	.0051456
y9	-.130388	-.2100288	.0796408	.0281235
y10	-.8928399	-.3623255	-.5305144	.204598

b = Consistent under H0 and Ha; obtained from xtreg.
B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

```
Test of H0: Difference in coefficients not systematic

    chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
            =  36.61
Prob > chi2 = 0.0000
```

Figure 2: Hausman test result

```
Breusch and Pagan Lagrangian multiplier test for random effects

        y1[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     SD = sqrt(Var)
                ---------+-----------------------------
                      y1 |    15.86176       3.982683
                       e |    11.32435       3.365167
                       u |    2.949105       1.717296

        Test: Var(u) = 0
                                  chibar2(01) =   298.45
                              Prob > chibar2 =   0.0000

.
```

Figure 3: LM test result

Table 8: List of 125 recipient countries of Chinese FDI [8]

Arab Middle East and Africa	**Pacific Asia**	**North America and Europe**	**South America**
Arab Middle East and North Africa	*East Asia*	*Europe*	*South America*
Algeria	Brunei	Austria	Argentina
Bahrain	Cambodia	Belarus	Bolivia
Egypt	Fiji	Belgium	Brazil
Iraq	Indonesia	Bosnia	Chile
Jordan	Japan	Britain	Colombia
Kuwait	Laos	Bulgaria	Ecuador
Libya	Malaysia	Croatia	Guyana
Mauritania	Mongolia	Cyprus	Peru
Morocco	Myanmar	Czech Republic	Venezuela
Oman	New Zealand	Denmark	
Qatar	North Korea	Finland	
Saudi Arabia	Papua New Guinea	France	
Sudan	Philippines	Germany	
Syria	Samoa	Greece	
Tunisia	Singapore	Hungary	
UAE	Solomon Islands	Ireland	
Yemen	South Korea	Israel	
Sub-Saharan Africa	Taiwan	Italy	
Angola	Thailand	Latvia	
Benin	Timor-Leste	Luxembourg	
Botswana	Vietnam	Macedonia	
Cameroon	*Australia*	Malta	
Cape Verde	Australia	Moldova	
Chad	*West Asia*	Montenegro	
Congo	Afghanistan	Netherlands	
Democratic Republic of the Congo	Azerbaijan	Norway	
Djibouti	Bangladesh	Poland	
Equatorial Guinea	Georgia	Portugal	
Eritrea	India	Romania	

8 https://www.aei.org/china-global-investment-tracker/

Ethiopia
Gabon
Ghana
Guinea
Guinea-Bissau
Ivory Coast
Kenya
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritius
Mozambique
Namibia
Niger
Nigeria
Rwanda
Sao Tome
Senegal
Sierra Leone
South Africa
South Sudan
Tanzania
Togo
Uganda
Zambia
Zimbabwe

Iran
Kazakhstan
Kyrgyzstan
Maldives
Nepal
Pakistan
Russian Federation
Sri Lanka
Tajikistan
Turkey
Turkmenistan
Uzbekistan

Serbia
Slovenia
Spain
Sweden
Switzerland
Ukraine

North America

Antigua and Barbuda
Bahamas
Barbados
Canada
Costa Rica
Cuba
Guatemala
Honduras
Jamaica
Mexico
Nicaragua
Panama
Trinidad-Tobago

USA

USA

Table 8: List of 81 BRI countries [9]

Angola	Guinea	Mongolia	Serbia
Antigua and Barbuda	Guyana	Morocco	Sierra Leone
Austria	Hungary	Mozambique	Singapore
Azerbaijan	Indonesia	Myanmar	Slovenia
Bangladesh	Iran	Namibia	Solomon Islands
Belarus	Iraq	Nepal	South Africa
Bosnia	Israel	New Zealand	South Korea
Brunei	Italy	Nigeria	Sri Lanka
Cambodia	Jamaica	Oman	Tanzania
Cameroon	Jordan	Pakistan	Thailand
Chad	Kazakhstan	Panama	Turkey
Chile	Kenya	Papua New Guinea	Turkmenistan
Congo	Kuwait	Peru	UAE
Croatia	Kyrgyzstan	Philippines	Uganda
Czech Republic	Laos	Poland	Ukraine
Ecuador	Liberia	Portugal	Uzbekistan
Egypt	Luxembourg	Russian Federation	Venezuela
Ethiopia	Malaysia	Rwanda	Vietnam
Ghana	Maldives	Samoa	Zambia
Greece	Malta	Saudi Arabia	Zimbabwe

9 https://www.aei.org/china-global-investment-tracker/