WHAT AFFECTS FDI? EMPIRICAL EVIDENCE FROM CHINA

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DECLARATION

We hereby declare that:

(1) This undergraduate FYP is the end result of our own work and due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the FYP.

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LIST OF ABBREVIATIONS

Abbreviations	Meanings
ADF	Augmented Dickey Fuller
AIC	Akaike's Information Criteria
BPG	Breusch Pagan Godfrey
BTA	Bilateral Trade Agreement
CJV	Contractual Joint Venture
CO2	Carbon Dioxide Emissions
EJV	Equity Joint Venture
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
INF	Inflation Rates
IR	Interest Rates
JB	Jacque Bera
MNC	Multinational Corporation
MNEs	Multinational Enterprises
OLS	Ordinary Least Square
PHH	Pollution Haven Hypothesis
RTB	Race to The Bottom
SCFI	Sino-Foreign Cooperative Joint Stock Limited Company
SEZ	Special Economic Zone

SSA	Sub-Saharan African
TRADE	Trade Openness
VIF	Variance Inflation Factors
WFOE	Wholly Foreign-Owned Enterprises
WTO	World Trade Organization

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ABSTRACT

The group had put effort to conduct a study on the fascinating concepts regarding foreign direct investment (FDI). The reason to chose to study this topic is because FDI plays a vital role in shaping a country's economic growth and development. However, the FDI inflow had declined due to economic and political instability, internal and external factors, and China was affected by it. Hence, the study decided to examine how CO2 emissions, inflation rate, interest rate, and trade openness affect the FDI in China. We conducted secondary research and collected time series data from the World Bank Data. The study used OLS Regression Analysis to perform data analysis in this study. We conducted the Variance Inflation Factor (VIF), Jacque-Bera Test, Breusch-Pagan-Godfrey Test, and Augmented Dickey-Fuller Test to test the relationship between the independent variables, CO2 emissions, inflation rate, interest rate, trade openness, and the dependent variable, foreign direct investment. Throughout the results, we discovered that there is a positive significant relationship between CO2 emissions, inflation rate, interest rate, and foreign direct investment. However, we also found that insignificant relationship between trade openness and foreign direct investment. The results from our study might be useful for stakeholders such as the government, and policymakers to increase the interest rate, maintain the inflation rate, and focus on infrastructure and technology development. The limitations and recommendations of the study also can help future researchers take precautions and improve the findings in future research.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

Chapter 1 provides an overview of the research background of foreign direct investment (FDI) in China. Then, we can better understand the problem of FDI in China and the factors affecting the FDI in China. Moreover, the research objectives, research questions, and hypotheses are presented in this chapter. The significance of the study and the structure of the study will also be discussed, and a summary of the content of each chapter will be provided.

1.1 Research Background

Foreign Direct Investment (FDI) refers to a situation when foreign investors gain significant control over the operational and managerial decision-making process of an entity. This sort of investment is usually characterized by the infusion of equity capital, indicating a long-term commitment to the host economy (Jaiblai & Shenai, 2019). Prior to 1979, strong resistance and resentment of FDI existed within various developing countries due to the majority of host governments believing that FDI was detrimental to their local economy. The same goes for China, where FDI activity was nearly non-existent. However, one captivating development was then happened in China after embracing foreign investment. China's ex-former president "Deng Xiaoping" reformed the economy through initiating a paradigm change from a restricted approach to liberal approach in order to achieve an exclusive economic free trade zone.

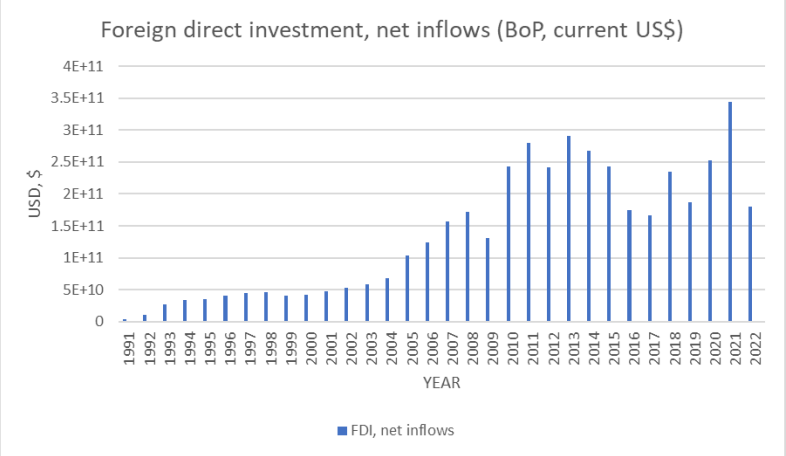
First of all, China developed a structural legal system accordingly to attract foreign investors by issuing the "Law of the People's Republic of China" on Sino-Foreign Equity Joint Ventures, Foreign Capital Enterprises, and Sino-Foreign Equity Joint Ventures in 1979, 1986, and 1988 (Zhao, 2019). This system not only to protect foreign investors' interests and rights but also to ensure the effective utilization of foreign capital and country openness maximization. However, China has amended the law imposed on foreign-invested companies to adhere to global trade regulations in order to facilitate China's admission to the World Trade Organization (WTO) in 2001. This modification is mainly to standardize the evaluation and authorization process for foreign investment (Zhao, 2019). Foreign-invested firms are no longer required for prioritization domestic procurement or submission of operation and construction plans to the authorities. This improvement expedited China's trade openness to the globe.

Nevertheless, Special Economic Zones (SEZ) was formed within the year of 1979 to 1984 as part of the open policy and economic reform to enhance a socialist market economy which included Shenzhen, Zhuhai, Shantou, Xiamen, and Hainan. After that, 14 coastal cities were followed to open to foreign investment. As a result, the specific zone surged up significantly and made China became top leading beneficiary of FDI among developing countries. All the foreign investors were successfully attracted by the overall policy in term of its regulations, restrictions, protection, benefits, and managements. However, a dilemma of disproportionate development of infrastructure, technology and human capital in coastal and inland provinces was formed (Albrecht et al., 2018). The improvement of managerial skills and opportunity for economies of scale generated more appealing social and economic environment in coastal provinces. In addition, Chinese government still conducted substantial changes with State-Owned Enterprises (SOEs), resulting in high levels of unemployment. Meanwhile, the role of the north-east and western areas was strengthening to support the demands of the rich coastal regions (Albrecht, 2018). Thus, disparity was increased in inland provinces due to lack of FDI inflow and immature labour market especially during reduction of output in 1995.

Hence, Western Development Strategy (WDS) and Central and Northeastern Revitalization programs were then established in the early 2000s. Both of the strategies having same goal which is to minimizing economies disparities and elevating stable economic growth. For example, the western strategy was divided into three phases from 2000 – 2050. Phase 1 and 2 placing strong emphasis on infrastructure, education, social and industrial development in order to create environmentally friendly for investment while third phase aim to promote country modernization by adding more projects in rural areas (Wang, 2022). Furthermore, Central and Northeast policies prioritised in industrial acceleration, technological innovation as well as overcoming the legacies of SOEs (Wanxia et al., 2020). Moreover, Chinese government also taking this opportunity to emerge all the relevant regions into tangible legislation, programmes, regulations and financial investments in order to attract for FDI inflow and create a balance regional economic growth (Wang, 2022).

Thereafter, belt and road initiative (BRI) was launched in 2013 with the target to form mutual beneficial relationship with countries in East Asian and Europe under open framework. One of the notable achievements was Sino-European direct rail freight transport, it connected 33 cities from China to 33 cities in 12 countries of Europe yet there are already over 5000 cargoes operating in 2017. Moreover, the trade between China and BRI countries constituted 26.5% of China’s overall export and import which amounted to RMB7.37 trillion (Ohashi,

2019). Meanwhile, China also becomes the biggest trading partner with 16 neighbouring countries. In the same year, Chinese corporation completed 62 mergers and acquisition (M&A) totalling 8.8$ billion in BRI nations which is 32.5% increase compared to previous year (Ohashi, 2019). This encompassed the acquisition of 12% stake in UAE's Abu Dhabi Oil by PetroChina and China Huaxin Investment (Ohashi, 2019). In the context, China slowly created a multilateral relationship with those BRI countries in the framework of BRI. As of the end of 2022, there is an accumulated of 1.12 million FIEs in china with a total accumulation of 19.7 trillion yuan of fund directed from foreign investment. According to world bank, 2020, a significant growth of China FDI inflow from 1990 to 2020 was shown the graph below.



Sources: World Bank (2023)

Based on the data from the Ministry of Commerce People's Republic of China (MOFCOM) cited by Interesse, 2024, shows that the **majority source of FDI** is from Hong Kong. The newly established foreign-invested companies (FIEs) in 2022 owned 15,814 (41.1%) while realized FDI value was amounted to over 137 billion USD (72.1%).

Country	Newly Established FIEs	Share, %	Realized FDI value (US100million$)	Share, %
Total	38,497	100	1,891.30	100
Hong Kong	15,814	41.1	1,372.40	72.1
Singapore	1,176	3.1	106	5.6
British Virgin Islands	218	0.6	66.3	3.5
South Korea	1,593	4.1	66	3.5
Japan	828	2.2	46.1	2.4
Netherlands	103	0.3	44.9	2.4
Germany	422	1.1	25.7	1.4
Cayman Islands	157	0.4	24.2	1.3
United States	1,583	4.1	22.1	1.2
United Kingdom	609	1.6	16	0.8

Sources: Ministry of Commerce People's Republic of China (2024)

In detail, China's total import and export of goods have amounted to 42,067.8 billion yuan, a rise of 7.7% compared to the previous year; the total import and export of services have amounted to 5,980.2 billion yuan which is 12.9% higher than in 2021. Moreover, China's actual utilization of FDI in 2022 was up to 1232.68 billion yuan, an increase of 6.3% on a comparable basis which is equivalent to 189.13 billion USD. Among them, the actual utilization of FDI in high-tech industries were accounted to the highest percentage in China which was 36.1%, an increase of 28.3% (MOFCOM, 2023). Moreover, 222.52billion yuan of foreign funds (18.1%) was invested in the 21-pilot free trade zone while 259.64 billion yuan of foreign funds (21.1%) were invested in 230 national economic and technological development zones scattered at 31 provincial-level regions (MOFCOM, 2023).

According to MOFCOM (2023), China's economic performance has been relatively stable with ongoing economic structural optimization in terms of their economic growth, scientific and technological advancement, as well as overall national strength. For instance, China's GDP expanded at an average annual rate of 6.6% from 2013 to 2021 which is higher than the global average growth rate of 2.6% and the average growth rate of developing nations, 3.7% over the same period (MOFCOM, 2023). Yet, China's annual GDP still achieved a higher high in 2022 amounting to 121020.7 billion yuan, an increase of 3.0% compared to 2021 (MOFCOM, 2023). Annual per capita GDP even reached 85,698 yuan, 3% higher than in previous years; the gross national income was 119.7215 billion yuan, a rise of 2.8% over 2021 (MOFCOM, 2023).

Sources: Ministry of Commerce People's Republic of China (2024)

China was maintaining an optimistic approach toward its 1.4 billion potential consumer market. In 2022, China's retailed sales of consumer goods achieved a total of RMB43,973.3 billion while per capita consumption increased by 1.8% annually (MOFCOM, 2023). According to statistics, multinational companies also keep adapting to Chinese market changes

and actively integrating into China's industrial, supply, and innovation chain. To cope with market demand, China launched the 14th Five-Year Plan included the outlook for commerce development by 2035 (MOFCOM, 2023). The plan mainly emphasized market connection, industrial integration, innovation acceleration, and rules correlation in order to create new development paradigms to encounter new trends such as AI, digital, and green development. It aims to maintain a strong competitive advantage in global economic cooperation as well as market competition. Among the plan, a few critical measurements are mentioned such as enhancing BRI trade cooperation, optimizing risk and management systems, encouraging high-quality growth of free trade zones, and so forth.

Lastly, China also reorganized the foreign investment legal framework into more comprehensive fundamental basis in terms of incentives and protection, specifying the management system of "pre-establishment national treatment plus a negative list". In the policy, it revealed preferential measures taken by the government to improve the business environment and attract FDI such as streamlining administration and delegating authority, optimizing regulatory rules and efficiency of government services, promoting international trade as well as reducing tax imposed. For example, as of the end of 2022, the tax-and-fee policies package included tax and fee reduction, deferrals, incentives as well as value-added tax credit refunds. The accumulated tax and fee reduction even attained to RMB13trillion from 2013 to 2022 which effectively minimized the corporation's financial challenges and promoted high-quality development (MOFCOM, 2023). In the context of protection, the Chinese government strengthened the law against 5 main foreign investors' concerns such as expropriation protection, fund transfer, intellectual property protection, government credibility and responsibility as well as criticism mechanism. For instance, one of the policies mandates that technological cooperation must be voluntary while serious penalties will be imposed on infringements of intellectual property rights (MOFCOM, 2023). This is to prohibit administrative forces from forcing technology transfer and ensure that trade confidentiality is well protected by the government.

1.2 Research Problem

Sources: World Bank (2023)

From the table above, it shows that Foreign direct investment (FDI) inflows have significantly decreased since Xi Jinping took office in 2013 and launched major economic reforms in China. The FDI inflow dropped gradually from 2013 to 2017 and started to fluctuate in the following year. This is because Mr. Xi administration's emphasis on centralized control and political conformity has overshadowed the initiatives toward economic liberalization, which has raised concern for foreign investors (Buckley and Bradsher, 2017). Major economic reforms have created an uncertain business environment in the aspect of policy uncertainty, market volatility, and political instability. This increases the risks for foreign investors doing business in China, coupled with concerns about limited market access and regulatory transparency, which has deterred foreign investors (Prasad, 2023). This trend has prompted many foreign companies to downsize their operations or even to disinvest from their existing direct investments and move to other countries, resulting in a notable decrease in FDI inflows into China. Therefore, the disinvestment from foreign companies resulted in low levels of FDI inflow into China has become a major problem for the country. The low FDI levels in China could adversely impact the country and slow down its overall growth and development (Kawate and Tabeta, 2024). If the government fails to execute some effective policies to potentially reverse the trends in FDI by drawing in more FDI from various perspectives and still maintaining it at a low level, it will directly bring some detrimental consequences to the country and society.

Low levels of Foreign Direct Investment (FDI) in China can significantly hinder its economic development across various sectors. Besides, insufficient FDI will restrict the

technological advancement of domestic firms and limit their ability to compete globally (Calimanu, 2021). For instance, foreign investors often bring advanced technologies and management practices, fostering innovation and competitiveness through joint ventures or technology licensing agreements (Wang et al., 2023). Without sufficient FDI, Chinese industries may struggle to acquire cutting-edge manufacturing technologies, affecting their production efficiency and quality compared to their foreign counterparts. Furthermore, low levels of FDI also will pose a challenge to job creation in China, as multinational companies may be discouraged from investing, leading to fewer employment opportunities, and will potentially increase the unemployment rate in China and heighten social tensions (Stepanok, 2022). Moreover, China's export-driven economy relies heavily on foreign direct investment for production upgrades. A low FDI level might cause the country to face the risk of stagnation and reduced export revenue (Calimanu, 2021). In addition, China's central role in global supply chains makes it vulnerable to disruptions caused by a decrease in FDI. Declines in FDI can trigger disruptions in production schedules, affecting both domestic businesses and global companies reliant on Chinese suppliers (Ahn et al., 2023).

Against this backdrop, understanding the determinants that attract FDI to China is crucial for its continued economic growth. Based on the prior research, we realize a gap in their research where they used traditional determinants such as market size and growth prospects to show China's attractiveness as an FDI destination. However, the problem has not yet been solved, and FDI is still declining and fluctuating, indicating that the factors used by previous research are too general and only touch upon the surface of China's complex FDI environment. This makes it difficult to address the real issue faced by China. There is still a need for a comprehensive review of the factors attracting FDI into China. With the evolving economic, regulatory, and environmental landscape over time, understanding these multifaceted factors is paramount. Hence, there is a need for deeper exploration into some other factors influencing FDI such as CO2 emissions and trade openness.

The Chinese government can attract FDI through liberalization and market-opening initiatives (Chen, 2023). Reforms in finance, technology, manufacturing, and other fields highlighted proactive efforts made by China. In addition. initiatives such as free trade zones and the "One Belt One Road" initiative provide strategic avenues for foreign investors. Free trade zones provide tax incentives, simplified trade, intellectual property protection, and easy market access, making doing business in China more attractive (Cremailh, 2023).

On the other hand, China can capitalize on its commitment to environmental responsibility, including reducing carbon dioxide emissions, to attract foreign direct investment (Maizland, 2021). This is because many multinational companies are increasingly focusing on sustainable development, which makes China's efforts and commitment attractive (Evenett & Fritz, 2021). Additionally, by investing in green technologies and renewable energy, China can provide foreign companies with more opportunities for cooperation and technology transfer, making it easier to attract FDI (Myllvvirta, 2024).

In light of the above, our study aims to contribute to this understanding by analyzing existing research on FDI determinants in China, identifying trends, addressing gaps, and suggesting areas for further study. By doing so, we seek to deepen the understanding of the factors influencing China's ability to attract FDI and support its continued economic development.

1.3 Research Objectives

In this research, we aim to analyze Foreign Direct Investment (FDI) in China as well as investigate the factors affecting FDI in China such as CO2 emissions, trade openness, interest rate, and inflation. Therefore, we classified the research objectives into two categories which are general research objectives and specific research objectives.

1.3.1. General Research Objectives

1. To investigate the factors that affect FDI in China.

1.3.2 Specific Research Objectives

1. To examine the relationship between CO2 emissions and FDI in China.
2. To investigate the relationship between trade openness and FDI in China.
3. To study the relationship between interest rates and FDI in China.
4. To investigate the relationship between inflation and FDI in China.

1.4 Research Questions

Based on the research objectives above, we prepared several questions to examine the factors that affect FDI in China. The questions are created in conjunction with the research objectives since both must be consistent for this research to be efficient. Hence, the research questions are also classified into two categories such as general research questions and specific research questions.

1.4.1 General Research Question

1. What are the factors that affect FDI in China?

1.4.2 Specific Research Questions

1. What is the relationship between CO2 emissions and FDI in China?
2. What is the relationship between inflation rates and FDI in China?
3. What is the relationship between interest rates and FDI in China?
4. What is the relationship between trade openness and FDI in China?

1.5 Significance of Study

Why was China the second-largest economy with the second-highest GDP per capita and FDI inflow but still considered as a developing country? There is an interrelated relationship between FDI, and GDP per capita to economic growth. Therefore, we are going to investigate the determinants of FDI in China and the relationship between both independent variables and FDI inflow in this research. The key independent variables included CO2 emission and trade openness followed by the secondary independent variables of interest rate and inflation. FDI inflow is always the key element to assist in strengthening a country into a more developed country since it not only introduces advanced technologies but also knowledge, skills, expertise, job opportunities, and other benefits to a country. Thus, the purpose of this study is to enhance the comprehension of the government, decision-makers, and stakeholders regarding the factors affecting FDI inflow in China, especially CO2 emission due to an ambiguous analysis made in the empirical study to investigate the effect of CO2 emission on FDI inflow.

Besides that, China is believed to be the most attractive market to foreign investors particularly because of its huge market capacity, population, consumer power, and advanced technology (Froese et al., 2019). Therefore, this research might further heat up the desire of foreign investor by answering their curiosity gradually by uncovering and exposing the truth of China in terms of FDI and economic conditions from its history, policy, effects, factors, and all other details. Yet, opportunities are believed to be created in terms of increasing investment in China and better trading relationships after disclosing the magnificence of history and all the useful components. Moreover, investors might gain some useful information from this study for better decision-making and risk portfolio management in the future.

Lastly, this study can contribute to all the policymakers in China. This study might decrease the uncertainty and risk of FDI flows while providing some suggestions on controlling factors such as CO2 emission, trade openness, interest rate, as well as inflation to stabilize the FDI in China, particularly during the trade war or any financial crisis. This is because these factors can lower FDI resulting in an economic downturn and, a high unemployment rate. Therefore, the investors will lose confidence and shift their investment out of the country while China faces more difficulty in attracting FDI flow although it has high innovation (Kapustina et al., 2020). The policymakers in China such as the government may control the CO2 emission from factories, implement effective trade policy, as well as adjust interest rates and inflation altering with the situation by referring to the significance of independent variables in this study.

1.6 Structure of Study

This study comprises five chapters. The first chapter introduces the background, and research problem and outlines the objectives, questions, and hypotheses of the study. Next, the theoretical framework, dependent and independent variables, and prior research on factors affecting FDI in China are all reviewed in Chapter 2. This chapter rationally presents the findings of other researchers in the field of study. Then, Chapter 3 describes the research methodology, including study design, and data analysis procedures. Followed by Chapter 4 presents the research findings, including descriptive and inferential analysis. The study's last chapter, which is Chapter 5 draws to a close by summarizing the findings and providing recommendations. Additionally, the limitations and suggestions of the study are discussed.

Chapter 2: Literature Review

2.0 Introduction

Chapter 2 is arranged in the following order with the first section constructing the literature review on Foreign Direct Investment with inflation, exchange rate, trade openness, and CO2 emission. The second section describes the underlying theories that will be discussed to study the variables. Then, we will describe the relationships between the FDI and the variables. The theoretical framework is then examined in the next section followed by the conceptual framework. Lastly, a hypothesis development will be carried out to investigate the relationship between a dependent variable and independent variables.

2.1 Underlying Theories

2.1.1 Pollution Haven Hypothesis

This theory was introduced by Walter and Ugelow in 1979 and modified by Baumol and Oates in 1988 to investigate the relationship between FDI and CO2 emission. The Pollution Haven Hypothesis (PHH) is also referred to as "pollution havens" or "pollution refuges". Then, the theory proposed that the industries with high pollution levels (High CO2 emitter) will relocate from the country that enforced strict environmental regulations to those with lower standards, making the latter countries a "shelter" for such industries (Yi et al., 2023). In addition, the PHH is defined as "countries with less stringent environmental regulation (high CO2 emission) can attract the foreign direct investment of multinational enterprises (MNEs) relocating their pollution industries to reduce production cost and enhance their competitive in the global market" (Dong et al., 2012).

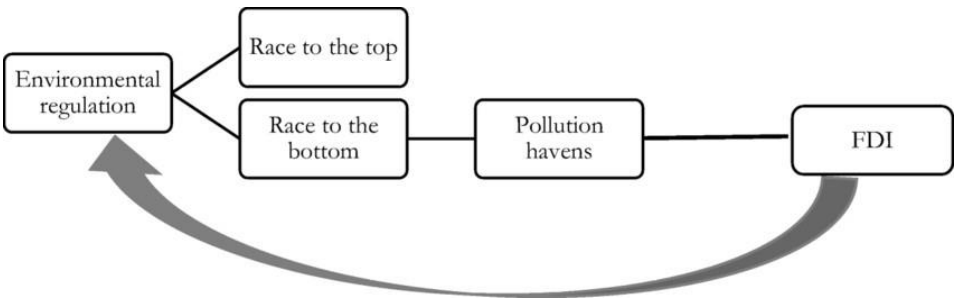


Figure 2.1
Sources: (Santos and Forte, 2020)

The diagram above shows the relationship between environmental regulation andFDI. According to PHH, it claimed that a negative relationship between environmental regulation

with FDI as lax regulation attracts more FDI inflow. However, it also indicates a positive relationship between CO2 emission and FDI because of lax environmental regulation related to higher CO2 emission and then appeals to higher FDI inflow in a country. The theory examined those countries often strategically modify regulations affecting investment trends in order to attract FDI inflows. Then, experts believed that global regulatory competition would emerge as existing trade barriers lessened particularly in the area of environmental regulations related to CO2 emission. Therefore, countries tend to weaken their environmental standard (high CO2 emission occurs) to encourage the MNEs investment known as the Race to the Bottom (RTB) effect. According to Madsen (2009), research stated that the drive to attract FDI can lead to government, especially in those developing countries, to transform their country into "pollution havens". This implied accepting long-term environmental harm (high CO2 emissions) in exchange for short-term economic gains (increase in FDI inflows). Moreover, due to the correlation between the PHH and RTB. It may be difficult to distinguish them in thestudy. Based on the diagram above, it evidenced that The PHH suggested that lax environmental regulations connected with high CO2 emission led to FDI inflows, whereas the RTB happened when reduced regulations which means the countries had high CO2 emissions to attract and retain investment from high pollution foreign industries into these countries (Santos and Forte, 2020).

Other than that, another study supported the theory that there are two ways of relationships between foreign direct investment and environmental deterioration in the country. This occurs when industries with high pollution levels relocate and invest in countries that offer lower labor costs, abundant resources, and loose environmental regulation. Consequently, those countries are viewed as "pollution havens". This theory can evidence the lenient environmental regulation which can assist the dirty industries in releasing more carbon dioxide (high CO2 emission) and attract the country's FDI inflow (Rahman et al., 2019). In addition, another similar theory which is the Pollution Halo Hypothesis argues that the MNEs transfer greener technologies including renewable energy as well as energy-saving technologies to host countries. Consequently, MNEs, through FDI, contribute to lower emissions in host countries as a whole (Duan and Jiang, 2021).

2.1.2 Interest Rate Parity Theory

According to interest rate parity theory, this theory showed a positive relationship between interest rate and FDI. It indicates that the interest rate and exchange rate should be moved to equilibrium between the countries. When the interest rate in a country is higher, investors are more likely to invest in that country's assets which can lead to more capital inflows. A higher

interest rate also can result in a higher exchange rate for a country and signal a stronger economy and attractive expected returns for investment purposes. Therefore, this theory suggests high interest rates tend to attract more FDI (Gali, 2020). For example, Chen et al. (2022) mentioned the interest rate of China was high, averaging 4.30% from 2013 to 2022, therefore, foreign investors were attracted to relocate their investment because of higher returns and stable currency value compared to home countries. Higher interest rates can increase foreign investment looking for opportunities for long-term research and development. This can lead to higher FDI inflows at higher interest rates.

2.1.3 Modern Portfolio Theory

According to modern portfolio theory, this theory was published by Harry Markowitz in 1952 and it explains how inflation influences FDI by allowing foreign investors to hedge the investment in favorable periods during inflationary periods. MPT theory emphasizes on trade-off between risk and return which inflation is more correlated to high risk, but it also offers higher returns. Hence, FDI investment can be a way of generating better returns in an inflation environment because of the higher possibility for capital appreciation and income generation. This theory indicates that foreign investors can hedge their FDI through inflation due to investments like real estate, and infrastructure can be maintained or rise in value during inflation to enjoy more return (Wen, 2023). For example, China experienced a global inflation environment that surged to 7.5% during the Covid-19 pandemic, there is much foreign capital allocated to China's A-share market to hedge against inflation to seek higher long-term returns instead of short-term returns. Therefore, more FDI inflows can be attracted during the inflationary period. The MPT proved the positive relationship between the inflation rate and FDI (Liu et al., 2024).

2.2 Review of Variables

2.2.1 CO2 Emissions and Foreign Direct Investment

Based on past studies, China has experienced a remarkable increase in Foreign Direct Investment (FDI) since the initiation of economic reforms in 1978. Based on the findings, carbon dioxide (CO2) acts as the most important anthropogenic greenhouse gas because of its high levels and capacity to remain in the atmosphere over thousands of decades. CO2 can come from natural and human sources that emit it into the atmosphere (Ali et al., 2020). According to Pan et al. (2023), the research indicates the environment's condition significantly influences the site selection of multinational enterprises (MNEs), as a polluted environment

can impact the workers' health, production efficiency, and MNEs' market image. Environmental factors can also indirectly shape MNEs' production and foreign investment through policy implementation, Nevertheless, the MNEs might opt to relocate and invest in regions that are less polluted and have lax environmental regulations for lowering their production expenses.

In the case of China, the country was the world's largest emitter of greenhouse gas emissions because of many economic and non-economic activities including trade, income growth, industrialization, urbanization as well as deforestation over the past three decades. For example, urbanization and the usage of fossil fuel energy in China are significant contributors to environmental challenges due to greater waste and pollution generators (Hoa et al., 2023). Then, China embraced the path of industrialization since introducing the notion of new industrialization in 2002. Industrialization emphasized advanced technology, economic gains, resource efficiency, environmental responsibility, and effective human resource utilization. Therefore, China has emerged as the foremost industrial nation globally, experiencing a substantial increase in industrial added value from 1621.4 billion yuan in 1978 to 313071.1 billion yuan in 2020. However, the production and growth development of the leading industries in China had a direct impact on higher energyconsumption and energy consumption primarily influenced higher carbon emissions in the country (Li et al., 2023). Especially China's industrial sector accounted for over 70% of the energy-related CO2 emissions and has utilized more than 70% of the country's energy since 1996 leading to bad environmental quality in China (Sung et al., 2017). As a result, the FDI inflows of China had been heavily impacted, which influenced China's environmental standing and the perception of MNEs' investment in China as well as this situation also increased the potential future regulatory risks in China.

According to Zhang and Zhou (2016), the study constructed a simultaneous model to investigate the correlation between FDI and carbon emissions. The model revealed that FDI inflows were linked to CO2 emissions. Then, it stated that CO2 emissions influenced FDI inflows in China with the environmental quality in 112 major cities of China and had a significant positive impact on water and air pollution. As a result, the relocation of foreign companies' investment in China is reduced for risk avoidance. This study lends support to the concept that FDI and pollution have a negative relationship. Then, past studies reported a negative relationship between the FDI and CO2 emissions in the short run and long run in Malaysia by using the nonlinear autoregressive distributed lag model (Faheem et al., 2022). Furthermore, Zhang et al. (2023) also mentioned that the negative relationship between the

CO2 and FDI because of the degradation of the environment may not attract FDI.

According to Ahmad (2019), the research conducted an analysis of FDI, CO2 emission, and renewable energy consumption in China from 1991 to 2017 and showed that FDI was neutral by changes in CO2 emission in the long run based on the conditional ARDL model. While in the short run, the research used a VECM-based dynamics model to test the short-run impacts of the FDI model, as a result, FDI remained neutral to changes in CO2 emission. This is because the Chinese government focused on new technologies and energy conservation to attract FDI by ignoring changes in CO2 emission. Moreover, the study involved 17 Asian countries (India, Indonesia, and so on) to test the relationship between FDI inflow and CO2 emission by using the FMOLS approach for the period 1980 to 2014. The findings indicated a positive relationship between CO2 emissions and FDI inflows. The higher CO2 emissions leading to high pollution encourage FDI inflows because of the lax environmental regulations in these nations, the investors tend to take advantage of lenient environmental policy and invest more (Khan and Ozturk, 2019). In addition, the study suggested that CO2 emission and FDI have a positive relationship, which an increase in CO2 emissions can enhance the FDI inflows due to industrial investment opportunities (Farooq, 2022). Moreover, past studies indicate that high CO2 emissions in developing countries especially Philippines due to lax regulations can be a determinant in attracting FDI inwards (Sharmiladevi, 2024).

2.2.2 Inflation Rate and Foreign Direct Investment

Inflation, a significant economic phenomenon, refers to the long-term consistent and steady escalation in the overall price levels of goods and services throughout an economy, which is often expressed as an annual percentage rate (Ha et al., 2019). Inflation is typically assessed through the utilization of the Consumer Price Index (CPI) which pertains to a fixed-weight index reflecting the cost of living for households and is used to quantify changes in the price of a basket of goods and services (Bibi et al., 2014). Furthermore, this complex phenomenon is intimately influenced by several variables, including growing consumer demand, rising production costs, salary adjustments that increase labour costs, and changes in the money supply that are controlled by central banking institutions (Totonchi, 2011). According to Mallik and Chowdhury (2001), moderate inflation is widely recognized as a natural facet of a well-functioning economic framework while some economists believe that low and moderate inflation helps stimulate the economic growth of a country.

Moderate inflation can foster economic growth by influencing diverse aspects of the economy such as promoting spending and investment due to the expectation of higher prices in the future, reducing the unemployment rate due to higher profit earned and escalating workforce recruitment, and alleviating the real burden of debt that facilitate borrowing and spending. However, excessive and rapid economic expansion can feed back to a phenomenon known as hyperinflation, characterized by a substantial surge in prices occurring within a compressed timeframe. Hyperinflation will destabilize the economy, reducing purchasing power and resulting in the reduction of investment regardless of domestic or foreign investment (Haffert et al., 2021). Therefore, upholding an appropriate inflation rate would facilitate the attraction of foreign investment to a nation and serve as a driver for economic growth, as opposed to high inflationary.

In empirical studies, various macroeconomic factors have been recognized as key influencers in luring inflows of Foreign Direct Investment (FDI). However, one of the most contentious and passionately contested topics has been the role of inflation. The impact of inflation on FDI attraction has been the subject of numerous studies in the prior literature. This research has made the argument that inflation is crucial in attracting FDI. While claiming the substantive importance of inflation for FDI, these investigations have produced mixed results regarding the impact of inflation on the amount of FDI inflows to a country. For instance, studies such as Tsaurai (2018), Valli and Masih (2014), and Ajide and Ibrah (2022) have reported a negative significant relationship between inflation and FDI. On the contrary, the study such as Mason and Vracheva (2017) and Agudze and Ibhagui (2021) have provided proof to support a positive significant relationship between inflation and FDI. Still, some research such as Alshamsi et al., (2015) and Tsaurai (2018) have concluded that there is no significant relationship between inflation and FDI with the evidence provided in their studies.

Certain explanations have been put forth for the discrepancies in the empirical data pertaining to the inflation-FDI relationship. According to the research of Tsaurai (2018), the studies used panel data to investigate the effect of inflation on foreign direct investment (FDI) in Southern Africa. The results demonstrated that inflation is found to have a significant relationship with FDI under the adoption of the pooled OLS method. In addition, the research of Valli and Masih (2014) also obtained the same result in South Africa. The studies employed time series techniques to conduct the studies on the nexus between inflation and foreign direct investment, encompassing data from the period spanning 1970 to 2012. The research findings demonstrated a long-run negative relationship between inflation levels and the FDI inflow in the context of South Africa. For instance, a rise in the inflation rate will

have a negative impact on the inflow of FDI into a country.

Furthermore, the studies of Ajide and Ibrah (2022) underscored a notable inverse relationship between inflation and foreign direct investment (FDI) whereby high inflation will discourage and reduce FDI inflows into the African continent. This is because Inflation has been contended to induce distortions within the tax system, subsequently discouraging long-term investors due to the influence of monetary illusion. In addition, high rates of inflation combined with risk-averse international investors tend to inhibit long-term FDI inflow. This is because such investors are reluctant to place at risk the expected earnings return from their investments. Moreover, Djokoto (2023) also highlighted a negative relationship between inflation and FDI. The studies indicated that the increase in the inflation rate leads to a decline in consumer purchasing power and it will reduce the consumption of the products in a country, which implies a reduction in the demand of consumers. Hence, when the demand reduces, it will in turn reduce the inflow of FDI. Consequently, a contraction in demand leads to a commensurate reduction in FDI inflow, as it heightens both the risk and likelihood of losing profits associated with investments in the face of subdued consumer demand in China.

On the contrary, recent studies exemplified by Mason and Vracheva (2017), have presented substantiating findings for a positive impact of inflation on the inflow of foreign direct investment (FDI). Additionally, the tendency to draw FDI is expected to be greater in well-developed countries as well as low-to-middle-income economies in the process of development. The studies of Hong and Ali (2020) also highlighted that FDI and inflation rate were negatively associated because an increase in the price level will obstruct inflow in the countries. Furthermore, Agudze and Ibhagui (2021) research provided additional justification for the possibility that inflation and FDI inflows may be positively correlated, grounded in the notion of achieving elevated profits and returns. This can be explained by the notion that inflation elevates aggregate product prices, consequently enhancing the profitability and returns realized from investments.

Still, there is some empirical research that found no significant relationship between inflation and foreign direct investment (FDI). The studies of Alshamsi et al., (2015) have provided findings that proved that inflation has no significant effect on FDI inflows using the ADRL model. The study is focused on the United Arab Emirates, employing data spanning from 1980 to 2013 for their analytical framework. Tsaurai (2018) also obtained the same result to present that there is no significant nexus between inflation and FDI when using the fixed effect and random effect under the panel data analysis.

2.2.3 Interest Rate and Foreign Direct Investment

As mentioned, foreign direct investment (FDI) can be defined as a type of international collaboration between firms that involves owning an extensive ownership interest in a foreign business or possessing substantial executive power over it (Jaiblai and Shenai, 2019). FDI is intended to promote economic growth by increasing investment volumes or improving investment efficiency. Thus, each country is attempting to attract FDI to reap greater benefits. Multiple literature and various research papers highlight the importance of determinants towards the influx of FDI in different countries including interest rate.

Interest rate is the amount paid or received in return for utilizing money or savings, and it essentially represents the cost of borrowing as well. In specific, the real interest rate is the interest rate after inflation adjustment which is a more relevant indicator and influential variable toward FDI inflows in each country. This is because investors will search for cheaper funding sources to generate greater returns on investment in foreign countries (Grui et al., 2018). This simply implies that if the interest rate in return is greater and the interest rate at which money can be borrowed in foreign countries is lower will attract FDI inflows (Suhendra et al., 2022). Moreover, interest rate encompasses beyond the projection of inflation such as factors related to country-specific risk which vary significantly throughout economic cycles. Thus, it can directly affect the investment decisions of foreign investors. However, there is multiple studies made in the past that make different conclusions about the relationship between interest rates and FDI, some denoted it is significant while some believed it is insignificant.

According to Siddiqui and Aumeboonsuke, 2014, mentioned there are controversial issues in determining the relationship between interest rates and FDI inflows since the outcome might be different based on different countries. They found that a low interest rate does not attract FDI inflow in Singapore and Malaysia, but the result of their study showed an empirical relationship between both of them in Indonesia, Thailand, and the Philippines. A similar statement was also made by Brauning & Ivashina, 2020 who stated the impact of the US real interest rate toward FDI is notably strong in the Western Hemisphere, whereas the impact is relatively weaker in Africa. Such indication showed a potential dynamic that countries among emerging markets like countries in Asia and Latin America which uphold a certain degree of access to the international capital market exhibit greater indebtedness and interconnectedness. This might indicate that borrowing practices and financial linkages of certain Latin American countries make them more susceptible to

changes in US real interest rates than other regions.

Moreover, Faroh and Shen (2015) claimed that a relatively high interest rate in a host country possesses a positive effect on inbound FDI in advance. Yet, they found an insignificant relationship between interest rate and FDI in Sierra Leone at the significant level of 0.01 which means a high interest rate is not a critical factor in attracting FDI in the country. The same insignificant result was also indicated by Anna et al., 2012, who discovered interest rates do not possess a substantial influence on FDI inflows in Zimbabwe and are unable to be utilized as a basis for policy-making functions. In addition, past research found that a rise in interest rate results in a rise in the exchange rate can attract FDI, especially for developing countries like Nigeria (Nzeh et al., 2024). Additionally, foreign investors are more likely to expand their investment in the host country for potential gains if the domestic interest rate is greater than the foreign interest rate (Nguyen, 2023).

In contrast, the conclusion was indicated by Kumari and Sharma (2017), who noticed a rise of 0.008% in FDI inflow and when 1%drop in the interest rate of developing countries such as China, Cambodia, Indonesia, Malaysia, and so forth. However, Kerner, 2014, mentioned that although a negative relationship exists between both of the variables in the financial aspect of FDI, but it does not indicate that it necessarily existed in terms of commercial parts of FDI. Besides that, there are different conclusions made by other researchers in different scenarios and perceptions. This is shown in the study conducted by Majeed and Ahmad (2008) who stated FDI is usually funded in the originating country. Thus, firms from the home country might obtain a cost advantage over their rival in the host country if borrowing costs in the host country exceed those in the home country. Firms like multinational corporations (MNC) might strategically enter the host nation market through FDI since they are in a favorable position.

2.2.4 Trade Openness and Foreign Direct Investment

A practical metric for trade openness is used in various international macroeconomics research and it has been defined as the proportion of GDP comprised by the sum of exports and imports (Fujii, 2018). Trade openness is an effective tool for not only measuring the equilibrium between a country's imports and exports, but it is also a key variable affecting the FDI inflow. Globalization's transformational forces and the adoption of liberalized trade policies possess a significant effect on the amplitude of economic output as well as entire economic activity, subsequently functioning as a magnet attracting foreign investors (Mudiyanselage et al., 2021).

As a result, determining the extent to which trade policies have been liberalized is crucial. In an attempt to attract more FDI, several countries have increased their economic openness by strategically implementing a variety of progressive policies. However, the repercussions of trade liberalization on FDI inflows seem to be complex and multifaceted. This is because the relationship between trade openness and FDI is poised to emerge either favorably or adversely in accordance with the host country's specific trade policies (Liargovas & Skandalis, 2011). In addition, a study mentioned that trade openness is more attractive towards export-oriented FDI, whereas implementation of trade restrictions is more enticing towards FDI known as "tariff-jumping". This type of FDI is mainly driven by the desire to capitalize on domestic markets (Dalaseng et al., 2022).

A lot of countries have attempted to attract more FDI inflows by promoting greater economic openness and executing a variety of progressive policies. Theoretically, trade openness might have a positive or negative impact on FDI inflow, but multiple past empirical studies showed mixed results. For instance, Zaman et al. (2018) utilized panel data to capture time and country effects and investigated a positive relationship between trade openness and FDI inflows in India, Iran, and Pakistan. They found that total FDI inflows increased by 4.78 for every 1% increase in trade openness. Then, Ismail and Ismail (2023) imply that E7 economic countries including Brazil, China, Russia, Indonesia, India, Turkey, and Mexico showed that trade openness has a strong positive relationship with FDI by using Random Impact Model analysis. Therefore, Foreign investors take this uncertainty into account and thus refrain from considerably raising their investment during the period of liberalization. The similar conclusion was made by Lien and Kim, 2021, who found significant positive relationship and indicate that FDI in Vietnam is deliberately focused on industries that benefit from progressive lowering of tariffs and the investment incentives delineated in Free Trade Agreement (FTA) commitments while utilising nation's extensive trade liberalisation. In addition, Zhao et al., 2024, stated that countries like China and United States (first and second largest economy in the world) with enormous territories, regional trade openness and FDI is varied by provinces or regions. In the study, a significant threshold effects of trade openness were found on examining trade liberalization and FDI. It mentioned trade openness directly affect trade liberalization and lead to encourage of FDI inflow when degree of trade openness falls between first and second threshold values. This is due to economic climate could be enhanced at the same time and foster FDI inflow.

Nevertheless, the effect of trade openness on FDI inflows might be different depending on the motivation for engaging in FDI activities. According to Asiedu (2002), the majority of FDI entering SSA countries are considered non-market seeking which means they are most likely involved in the import and export of raw materials or natural resources. Specifically, non-market-seeking FDI tends to produce goods in the host country (SSA country) and export to foreign countries. Thus, the motivation for FDI in SSA countries is tariff jumping and an inverse relationship was shown between both variables in SSA countries (Cantah et al., 2018b). According to the similar sentiment, Abdella (2018) also highlighted that trade openness in the context of exports is more likely to attract FDI in emerging countries. Multinational enterprises are drawn to these countries by the prospects of greater opportunities for exporting products, lease government restriction and competitive advantage gained. Moreover, Luo et al., 2018, discovered that changes of tax policy were found to be insignificant in determining the effect of FDI inflow, as foreign investors in China were more concerned about friendly and competitive investment environment that fosters resource allocation and productivity. In a similar vein, Khan and Hye (2014) also found an inverse relationship between both variables in Pakistan due to lack of credibility and policy uncertainty that create a bad investment environment. Furthermore, Mudiyanselage et al., 2021, found a significant but negative relationship between trade openness and FDI inflows in Romania. They believed Romania's trade openness might be ineffective in attracting FDI when compared to other countries.

In contrast, there is also study proving an insignificant relationship between trade openness and FDI as indicated by Wickramarachchi, 2019. He mentioned investors may not have considered trade openness in Sri Lanka as a crucial criterion during investment decision making. On a different note, export-oriented manufacturing multinational enterprises (MNEs) frequently obtain advantages such as concessions for importing raw materials or machinery, especially in the early stages. Therefore, a good domestic trade policy might not own a significant weight in the context of foreign investors' concerns. Others than that, Ho et al., 2013; Vijayakumar and Sridharan, 2010, also found an insignificant relationship between both variables in the emerging countries like Brazil, Russia, India, China, as well as South Africa (BRICS).

2.3 Proposed Theoretical / Conceptual Framework

Figure 2.2

Conceptual Framework

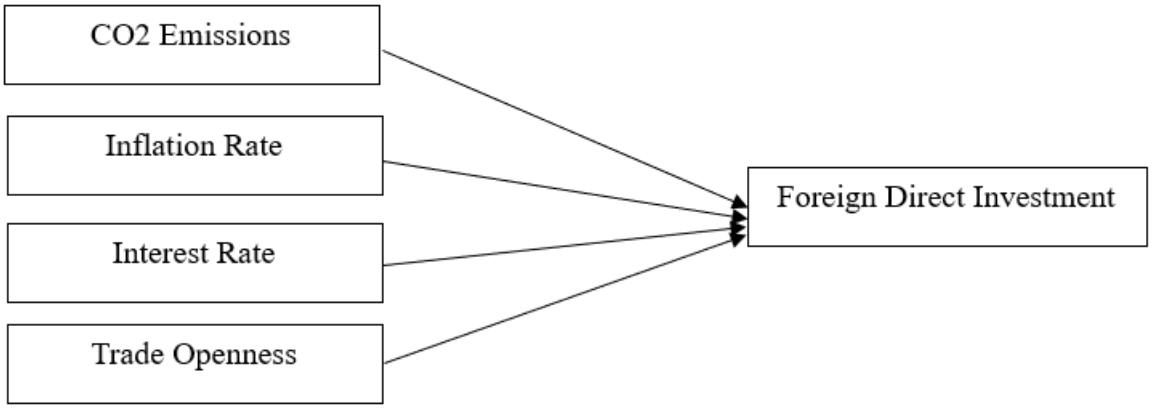


Figure 2.2 above introduced a conceptual framework to examine the factors affecting FDI in the case of China. Then, the goal of our study is to investigate the relationship between Foreign Direct Investment (FDI) and CO2 emission, Inflation rate, Interest rate as well as Trade openness.The hypothesis will be discussed based on this framework in the next section.

2.4 Hypothesis Development

According to Kell and Oliver (2003), the term “hypothesis” refers to a specific assertion describing the behavior of a system, it can be biological, economical, or otherwise. This statement is derived from logical reasoning, which normally leads to a prognostication that can be tested through a procedure of assessment. The result can either match with the prediction, verify its alignment with hypothesis testing, or reject it.

However, a solid and well-constructed research study is highly dependent on the development of a research hypothesis. This research hypothesis is critical to tackling the research problem found in the study. Thus, an excellent research hypothesis contributes to the clarification of statistical measurement detail within the framework of the entire study (Toledo et al., 2011). There are a number of research hypotheses such as null and alternative hypotheses, inductive and deductive hypotheses as well as directional and non-directional hypotheses. In our study, we are going to apply null and alternative hypotheses.

The process to reject the null hypothesis in favor of accepting the alternative hypothesisis essential to the development of a strong research study. This serves as the foundation for an adequate and effective research endeavor (Toledo et al., 2011). In the framework of this study, a thorough investigation is conducted to dive into important factors involved in building and

developing an effective and complete research hypothesis.

2.4.2 Hypothesis 1

H_1: There is a positive relationship between CO2 emission and Foreign Direct Investment in China.

2.4.1 Hypothesis 2

H_1: There is a positive relationship between Inflation rate and Foreign Direct Investment in China.

2.4.1 Hypothesis 3

H_1: There is a positive relationship between Interest rate and Foreign Direct Investment in China.

2.4.1 Hypothesis 4

H_1: There is a positive relationship between Trade Openness and Foreign Direct Investment in China.

2.5 Gap of Literature Review

After evaluating all of the previous studies, various gaps were determined to demonstrate the weaknesses of the literature review. First, a lack of studies focusing on CO2 emissions affecting the FDI in China because the review of the relationship between the two variables is not conclusive. Based on the prior studies from Khan and Ozturk, (2019) and Faheem et al. (2022), these studies mainly focus on the CO2 emission of Southeast Asian and European countries' effect on FDI. For instance, there are lack of studies about China considering how CO2 emission impacted the FDI inflow. Hence, our study can cover the gap by focusing on CO2 emission in China and find out how it impacted the FDI inflow in China.

Moreover, the majority of past research was conducted using panel data that compare different countries in a given period such as Tsaurai (2018), Kumari and Sharma (2017), and Zaman et al. (2018). In these prior studies, the relationship between variables like CO2 emission, trade openness, interest rate, inflation, and FDI is ambiguous due to different levels and measurements of variables between developed countries and developing countries. Therefore, our research aims to fill the gap by applying time series analysis with

specific 30 years of data to determine the long-run influence of these variables on FDI in China.

2.6 Conclusion

Chapter 2 provided the relevant theories that can be used to explain the relationship between the dependent variable (Foreign Direct Investment) and the independent variables (CO2 emission, trade openness, interest rate, and inflation). Then, Chapter 2 conducted to review of the literature on the relationship of independent variables affecting dependent variables in China. In addition, the study's conceptual framework and hypotheses are constructed. Lastly, the gap that was found in the literature reviews was provided. In the upcoming chapter, we will conduct an investigation to determine the correlation between FDI and the independent variables.

Chapter 3 Methodology

3.0 Introduction

We examine the methodology of the study in Chapter 3. First of all, we focus on the research design and explanation of the data collection method followed by the sources of data. After that, the econometric model for the study is addressed to investigate the relationship between the variables. Additionally, some economic techniques are used for data analysis in the study. Diagnostic checking was applied to test the stationarity and autocorrelation of the model.

3.1 Research Design

The research is classified into two types which are quantitative and qualitative. In our study, we use the quantitative method, which makes use of mathematical methods and statistical data to evaluate the relationship between dependent and independent variables.

3.2 Data Collection Method

This study investigates factors affecting FDI in China such as CO2 emission, trade openness, interest rate, and inflation. Yet, secondary data applied in this study is obtained from The World Bank. The data frequency will be taken on a yearly basis which is from 1990 to 2020. Besides that, the type of data applied is time series data because it is more appropriate for forecasting and identifying the effect of variables on FDI over time.

3.3 Data Processing

Initially, we gathered relevant data for each variable from the World Bank. Then, the data was examined and checked by using Microsoft Excel to ensure the accuracy and comprehensiveness of the 30 years of dataset acquired. Then, a series of tests are applied to analyze the data by using E-views software while the results generated will be interpreted.

3.4 Source of Data

Variables	Indicator	Unit Measurement	Definition
Foreign Direct Investment	FDI	Net Inflow (BoP, current US$)	The total inflows of equity capital, earnings from reinvestment and other types of capital directly invest in host country's economy.
CO2 Emissions	CO2	CO2 emissions (metric tons per capita)	CO2 generated from the consumption of solid, liquid and gas fuels.
Trade Openness	TRADE	Trade (% of GDP)	The combined value of good and services imported and exported as a percentage of GDP.
Interest Rates	IR	Real Interest Rate (%)	Lending interest rate adjusted for inflation as determined by GDP deflator.
Inflation	INF	GDP Deflator (annual %)	The yearly growth rate of the GDP implicit deflator represents the price changes in the economy.

Sources: The World Bank (n.d.)

3.5 Model Specification

Functional Form Model:

$$\boldsymbol{FDI_t} = Q_0 + Q_1\boldsymbol{CO^2}_{\boldsymbol{t}} + Q_2\boldsymbol{TRADE_t} + Q_3\boldsymbol{IR_t} + Q_4\boldsymbol{INF_t} + \boldsymbol{\mu_t}$$

Where:

$\boldsymbol{FDI_t}$ = Foreign Direct Investment in China

$\boldsymbol{CO^2}_{\boldsymbol{t}}$ = CO^2 emission

$\boldsymbol{TRADE_t}$ = Trade Openness

$\boldsymbol{IR_t}$ = Interest rate

$\boldsymbol{INF_t}$ = Inflation
$\boldsymbol{\mu_t}$ = Error terms

The model constructed above is primarily to investigate the significance of CO^2 emission (CO^2),Trade Openness (TRADE), Interest rate (IR), and Inflation (INF) towards the Foreign Direct Investment (FDI) inflow in China. Besides that, the t stated in the model refers to the period of1,2,3…, 30.

Econometric Model:

$$\boldsymbol{LogFDI_t} = Q_0 + Q_1\boldsymbol{LogCO^2}_{\ t} + Q_2\boldsymbol{LogTRADE_t} + Q_3\boldsymbol{LogIR_t} + Q_4\boldsymbol{LogINF_t} + \boldsymbol{\mu_t}$$

Log-log model is a statistical model usually used in data and regression analysis. It can make the data analysis easier, particularly when correlations between variables tend to become comprehensible when stated logarithmically. Yet, this model also served as a valuable tool in a variety of domains, allowing for modeling and explanation of complex interactions as well as facilitating predictions based on these relationships.

Based on the model above, changes in the coefficient may result in different relationships between both variables either positively and negatively. For example, if $Q_1 > \mathbf{0}$ while others remain constant then a linear relationship will exist between the independent and dependent variables. In simpler terms, the value of the dependent variable will follow to increase if the independent variable increases and this relationship is proportional. Based on our expectation, the sign for Q_2 is likely to be positive while Q_3 and Q_4 are expected to be positive. We will remain Q_1 as ambiguous and tend to explore the result in further part.

3.6 Data Analysis

This section focuses on the econometric model that applies to examine the relationship between independent variables and dependent variables.

Multiple Ordinary Least Square (OLS) Model

OLS model examines linear regression equation coefficients that reflect the effect of independent variables for a dependent variable. Based on the OLS analysis, t-test is used to measure whether the estimated individual coefficient is significant to the dependent variable. A p-value of t-statistic less than 5% significance level indicates a relationship between the variables. In addition, F-test is another statistical test that examines the significance of the

model. A p-value of F-statistic less than 0.05 indicates the model is significant. Additionally, R-square will be employed to determine the proportion of variance in the dependent variable that can be explainedby the independent variables. In simpler terms, the R-square reflects how well the data fits the model.

3.7 Diagnostic Testing

3.7.1 Unit Root Test

Unit root tests are tests for stationarity in time series data. A unit root shows a stochastic trend, and it is one cause of non-stationary. As time series data relies heavily on the concept of stationarity because the mean and variance remain constant over a period. Because of this consistency, it is easier to make forecasts and develop significant conclusions based on the time series data. It also can be used to analyze the variables' behaviour and econometric models to prevent the problems like affecting the statistical result in hypothesis testing (Rath and Akram, 2021). Therefore, the Augmented Dickey-Fuller (ADF) test can be applied to test the stationary of the model.

3.7.1.1 Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979)

ADF test is a unit root test to determine whether the time series data is stationary or not. The ADF test contains lagged values of the variable in the regression model and can detect serial correlation. Then, it is stronger and able to handle more complex models. Before running the ADF test, the lag length required to be chosen to avoid the autocorrelation between residuals, therefore, Akaike's information criteria (AIC) will be conducted to measure the suitable lag length (Otero and Baum, 2018). In the ADF test, the null hypothesis is time series has a unit root (non-stationary) while the alternative hypothesis is time series has no unit root (stationary). If the p-value is less than 1%/5%/10% significance level, we reject the null hypothesis, and it indicates the data is stationary. Otherwise, we do not reject the null hypothesis and the data is non-stationary if the p-value is greater than the significance level.

3.7.2 Variance Inflation Factors (VIF)

VIF can be used to measure the level of multicollinearity of the regression model. In a multiple regression model, multicollinearity occurs when there is a correlation between multiple independent variables, thus affecting the regression result. Therefore, the VIF can determine how much a regression coefficient's variance increases from multicollinearity. Additionally, the higher the VIF, the greater the possibility that a multicollinearity problem

exists. When VIF exceeds 10, there is a significant multicollinearity problem that must be corrected.

3.7.3 Jarque-Bera test

The Jarque-Bera test is used to test the normality of the test. The test is commonly applied to large time series data sets. Moreover, the test specifically matches the skewness and kurtosis of data to check whether it resembles a normal distribution (Jarque, 2014). In the JB test, the null hypothesis is the residuals are normally distributed while the alternative hypothesis is the residuals are not normally distributed. If the p-value of the JB statistic is less than 0.05 significancelevel, we reject the null hypothesis, and it indicates the residuals are not normally distributed. However, we do not reject the null hypothesis which indicates the residuals are normally distributed when the p-value is greater than 0.05 significance level.

3.7.4 Breusch-Pagan-Godfrey test (Breusch, Pagan and Godfrey, 1978)

The test is a combination of the Breusch-Pagan test with Godfrey's LM test. It can be tested for whetherthe time series data is both heteroscedasticity and serial correlation in the regression model or not. In the regression model, homoscedasticity and autocorrelation are crucial because the results cannot be used if they are violated (Astivia and Zumbo, 2019). In the BPG test, the null hypothesis will be the residuals are not heteroscedastic and autocorrelation, while the alternative hypothesis will be the residuals are heteroscedastic and autocorrelation. The decision rule concluded that we reject the null hypothesis means the residuals are heteroscedastic and autocorrelation if the p-value is smaller than the 5% significance level. Otherwise, we do not reject the null hypothesis when the p-value is greater than the 5% significance level which means the residuals are not heteroscedastic and serial correlation.

3.8 Conclusion

Overall, Chapter 3 discusses about the methods used to conduct the study. In this study, a quantitative research method is conducted and obtained secondary time series data from The World Bank. After that, the data are processed by using Microsoft Excel and E-views software. Lastly, there are several econometric techniques used to measure the model such as the Unit root test, Augmented Dickey-Fuller (ADF) test, Variance Inflation Factors (VIF), Jarque-Bera test as well as Breusch-Pagan-Godfrey test.

Chapter 4: Data Analysis

4.0 Introduction

In chapter 4, we will perform and analyze the results of the tests. First of all, we will carry out the multiple regression model test to evaluate the significance of the independent variables and the overall model. Then, we conduct the Variance Inflation Factor (VIF) used for the testing of multicollinearity. Moreover, the normality of the model will be tested by using the Jacque-Bera test. The Breusch-Pagan-Godfrey Test is used to examine the heteroscedasticity of the variables while the stationary of the variables is conducted by the Augmented Dickey-Fuller (ADF) test.

4.1 Multiple Regression Analysis

Table 4.1

	Coefficients	Coefficient Std. Error	t-statistic	P-value
(Constant)	-1.95E + 11	5.51E + 10	-3.5402	0.0016
INF	9.05E + 09	4.12E + 09	2.2003	0.0372 **
IR	1.18E + 10	5/.76E + 09	2.0563	0.0503 *
CO2	4.62E + 10	3.57E + 09	12.9442	0.0000 ***
TRADE	8.98E + 08	5.59E + 08	1.6072	0.1206
R-Squared	0.9204			
F-stat	72.2406			
Prob (F-stat)	0.0000			

Source: Eviews 12

***, ** and * represents the significant level of 1%, 5% and 10%

Based on Table 4.1, the result shows the relationship between the independent variables, inflation rate, interest rate, CO2 emissions as well as trade openness, and the dependent variable, foreign direct investment in China. The table above shows that the INF, IR, and CO2 are significant at a t-statistic of 2.2003. 2.0563 and 12.9442 as well since their p-values (0.0372, 0.0503, and 0.0000) are equal and less than the significance level of 5%. However, there is only one variable, TRADE is insignificant in this result as its p-value (0.1206) is larger than the significance level of 1%, 5%, and 10%.

The first independent variable we discussed is CO2 emissions (CO2), which is significant at the significance level of 1% and showed a positive relationship with FDI. The result showed that its p-value equal to 0.000 is less than 0.05 and it is consistent with various past studies by Khan and Ozturk (2019), Farooq (2022) as well as Sharmiladevi (2024). The studies verify that there is a positive significant result between CO2 and FDI same as our research. Past studies

indicate that the higher CO2 emissions due to the countries' lax environmental regulations encourage FDI inflows. Therefore, foreign investors can invest more in the higher CO2 emission industry of host countries, and the FDI of those countries will increase as well.

Moreover, the second variable, the inflation rate (INF) obtains a positive significant result with the FDI because its p-value of 0.0372 is less than the 5% significance level. This result aligns with the conclusion drawn by Djokoto (2023) as well as Ajide and Ibrah (2022), which also agree with the study's expectations of the significant relationship between INF and FDI. These studies provided evidence that inflation has a positive impact on the inflow of FDI which can be explained by how inflation affects the aggregate product price, consequently increasing the excess profit and rate of return realized from the foreign investment.

Other than that, interest rates (IR) also provided a positive significant result with FDI from the testing whose p-value, 0.0503 is less than a significant level of 10%. The outcomes conform to the research of Nguyen (2023) and Nzeh et al. (2024). Past research specifies that a high interest rate in a host country tends to affect the FDI inbound in advance positively.

However, there is only one independent variable, trade openness (TRADE), which showed an insignificant and positive relationship with the FDI. The p-value of TRADE is 0.1206 greater than the significance level of 1%, 5%, and 10%. The result is consistent with the past studies from Wickramararhchi (2019) and Ho et al. (2013). These studies support the finding of an insignificant relationship between TRADE and FDI which trade openness has no influence on FDI inflows. If there is high trade and barrier entry in a country, trade openness might be ineffective in attracting FDI when compared to countries that have low trade barriers.

Furthermore, the results also performed the R-squared (R^2) and the significance of the overall model. R^2 is a statistical measure to interpret that the percentage of change in the dependent variable can be explained by the independent variables (Figueiredo et al., 2011). Based on the test, we can conclude that 92.04% of the changes in FDI in China can be explained by the changes in the inflation rate, interest rate, CO2 emissions, and trade openness. Lastly, the overall regression model of variables is significant at the 95% confidence interval since the p-value of F-statistic, 0.00 is less than the significance level of 0.05. Therefore, we can use the results of the model because the significance of the model can be used for forecasting purposes and validating the reliability of the results (Ng et al., 2018).

4.2 Multicollinearity Test

Table 4.2

Independent variables	Collinearity Statistic: VIF
Inflation rates	14.9466
Interest rates	13.5122
CO2 Emissions	2.0856
Trade Openness	1.3592

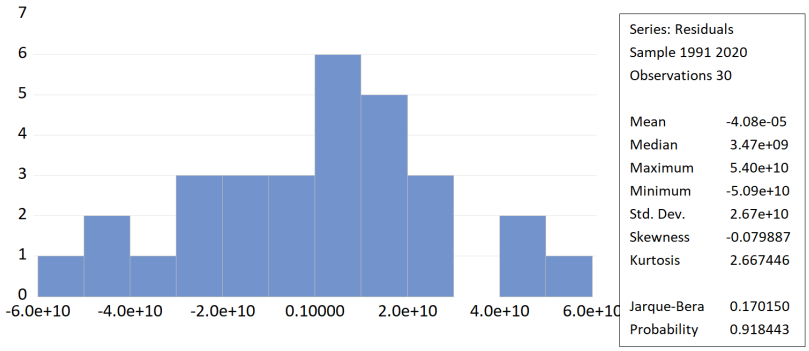
Source: Eviews 12

In the diagnostic checking, we use the VIF method to test the multicollinearity of the variables. According to Shrestha (2020), multicollinearity indicates a significant correlation between the factors not only with the dependent variable but also with one another. It may lead to large standard errors and unreliable results. The study stated that if the VIF is more than 10, it is more likely the multicollinearity problem occurs among the variables. Based on Table 4.2, we observe that two variables, CO2 emissions, and trade openness' VIF are 2.0856 and 1.3592 which means there is no multicollinearity. However, inflation rates and interest rates have a VIF of more than 10 indicating that there are multicollinearity problems among these variables. This is because of the adjustment of monetary policies always associated together with these two variables.

4.3 Normality Test

Figure 4. 1

Jacque-Bera Test



Source: Eviews 12

Normality is an essential element of reliable results of analysis, and it is determined by assessing its skewness and kurtosis. Given out study has a small sample size of 30 years, therefore, the data is considered normally distributed if the skewness is between -2 and 2 while the kurtosis is between -7 and 7 (Sovey et al., 2021). According to Figure 4.1, we can see the skewness and kurtosis of the overall variables are – 0.08 and 2.657, which is aligned with the normality standard. Other than that, we can observe that the probability of the Jarque-Bera test, 0.9184, is greater than the significance of 0.05. Hence, we can conclude that the model is normally distributed as well and all variables are goodness of fit based on the testing result.

4.4 Heteroscedasticity Test

Table 4.3

Breusch-Pagan-Godfrey Test

Independent variables	P-value
Inflation rates	0.9929
Interest rates	0.8487
CO2 Emissions	0.8928
Trade Openness	0.0220 **

Source: Eviews 12

***, ** and * represent 1%, 5% and 10%

In addition, we use the Breusch-Pagan-Godfrey test to test whether the heteroscedasticity problem of variables exists or not. Heteroscedasticity is important in influencing the regression model because it can better estimate and impact the significance of the overall model (Astivia and Zumbo, 2019). According to Table 4.3, the decision-making of the BFG test is if the p-value of variables is greater than the significance level of 0.05, there is no heteroscedasticity problem exists. As there is the p-value of three variables, INF, IR, and TRADE (0.993, 0.848, 0.893) greater than 0.05, therefore, there is no hetero. However, we observe that the p-value of CO2, 0.022 is less than 0.05, which may cause the hetero issue. CO2 has the hetero problem because of variety of carbon-neutral policies and interventions result in different responses from different industries leading to inconsistent results.

4.5 Stationary Test

Augmented Dickey-Fuller Test Result

	Level form with trend and intercept	The first difference with trend and intercept
FDI	0.7273	0.0000 ***
CO2	0.8454	0.1300 *
INF	0.2344	0.0002 ***
IR	0.0656 *	0.0005 ***
TRADE	0.4029	0.0043 ***

Source: Eviews 12

***, ** and * represents the significant level of 1%, 5% and 10%

Based on Table 4.4, FDI, CO2, INF, and TRADE are not stationary at level form with trend and intercept with significant levels of 1%, 5%, and 10% while only IR is stationary at the significant level of 1%. But we need to reject the null hypothesis that the variables have a unit root. Then, we applied the first difference with trend and intercept for all variables, we observed that all dependent and independent variables have no unit root and are stationary at first differencing at significance levels of 1%, 5%, and 10%. According to Greunen et al. (2014), the study mentioned that stationary variables can have a significant impact on their properties and estimation purposes, where the inability to adapt the variables into the correct form of stationary might result in spurious results. Therefore, the stationary of all the variables provided reliable and efficient results on how independent variables, CO2, INF, IR, and TRADE influence the FDI in China.

Chapter 5: Discussions, Conclusion and Implications

5.0 Introduction

This chapter focuses on the variables, Co2 emissions, inflation rate, interest rate, and trade openness that affect the FDI in China. This chapter will provide a summary and discussion of the main findings, as well as discuss several limitations of the study and propose recommendations for future research.

5.1 Summary of Findings

	Multiple Regression Test	Multicollinearity Test	Normality Test	Heteroscedasticity Test	Stationary Test
CO2	Positive Significant	No	Yes	Yes	Yes
INF	Positive Significant	Yes	Yes	No	Yes
IR	Positive Significant	Yes	Yes	No	Yes
TRADE	Insignificant	No	Yes	No	Yes

5.2 Discussion on Major Findings

5.2.1 Co2 emissions and foreign direct investment

The level of CO2 emissions in China has shown a positive significant relationship with the FDI in China which CO2 has affected the FDI inflows in terms of growing industrialization resulting in higher carbon dioxide emission and further leading to attraction of FDI inflows. The results are consistent with past studies by Khan and Ozturk (2019), Farooq (2022) as well as Sharmiladevi (2024). For instance, foreign investors can ignore the higher CO2 emissions due to lax regulations and boost the FDI inflows of the host countries. CO2 emission is normality distributed and stationary and the relationship between CO2 and FDI is valid and predictable. However, CO2 has a heteroscedastic problem because of various adoption and effectiveness of policy interventions to control CO2 emission resulting in the heteroscedasticity problem. In the

case of China, it implemented many different policies such as the CO2 reduction policy (CETP), “Dual Carbon” Goals, 1+N policy system to reduce emissions (Shahid et al., 2022). These actions may have varying effects on different industries and regions providing diverse responses contributing to heteroscedasticity in CO2 statistics.

5.2.2 Inflation rate and foreign direct investment

Based on the result, the inflation rate and foreign direct investment have a positive significant relationship in which inflation can influence the flows of FDI depending on external shocks. The outcomes conform to the findings of Djokoto (2023) and Ajide and Ibrah (2022). For instance, the inflation rate in China may increase the FDI flows in terms of rising inflation will improve the real earnings from investment, and lead to a rise in FDI. Inflation was tested normally distributed, with no heteroscedasticity problem as well as a reliable variable in evaluating how it directly and indirectly impacts the FDI flows. Nevertheless, it has a multicollinearity problem with interest rates due to monetary policy decisions made by the People’s Bank of China (PBOC). The PBOC always adjusts the contractionary interest rate associated with inflation to encourage economic growth and stabilize the currency (Jones and Bowman, 2019). Hence, the correlation of changes in the inflation rate and interest rates results in multicollinearity.

5.2.3 Interest rate and foreign direct investment

The outcome of the study revealed that there is a significant relationship between interest rate and FDI. This means that interest rates can affect the FDI flows by adjusting to changes in circumstances. This result aligns with the conclusions drawn by Nguyen (2023) and Nzeh et al. (2024). For example, China can increase the interest rate based on the situation and further impact the changes in FDI in terms of stronger currency value and profit from investment. The interest rate is also the same as the inflation rate with normality, no heteroscedasticity, and stationary to link with FDI. But interest rates also correlate with inflation rates because of their data measurement. Based on the World Bank, interest rates and inflation rates are frequently calculated using the same underlying data such as price indices and GDP benchmarks. Therefore, this might result in intrinsic correlations between these two variables, particularly when using time series data.

5.2.4 Trade openness and foreign direct investment

Trade openness was the only variable that showed insignificant results with the FDI. This proved that trade openness may not be a significant factor driving FDI inflows. The outcome of the testing is similar to past research of Wickramarachchi (2019) and Ho et al. (2013). Although trade openness has an indirect impact on FDI, this does not imply that trade and FDI are unrelated. Other channels in which trade openness might have an indirect influence on FDI include technology transfer or knowledge spillovers. The study can be conducted on these alternative ways to deeper insight into the connection between trade and FDI. In addition, trade openness provided normally distributed, no heteroscedasticity, and stationary results through the testing in Chapter 4.

5.3 Implications of Study

According to the preceding chapter, the result shows that CO2 emission has a positive significant relationship with FDI in China. In the industrialization revolution, China was an advanced industrialized country with efficient production and development; therefore, it emits the most CO2 in the world based on BP's World Energy Statistics Yearbook 2021 (Yang et al., 2022). China's rapidly growing economy may emit higher CO2 due to increased economic activity. This may attract FDI as investors seek higher CO2 emissions as indicative of increased economic activity and market potential. Therefore, when carbon dioxide emissions are high, foreign investors will take the opportunity to invest in China and expand their market base. However, it's essential to acknowledge that high CO2 emissions will lead to pollution, which may pose long-term challenges for sustainable development and FDI attraction. While China's commitment to achieving carbon neutrality by 2060 necessitates stricter environmental regulations and policies. Therefore, while leveraging the positive relationship between CO2 emissions and FDI, the government must balance economic growth with environmental sustainability by implementing other stricter environmental regulations and policies to encourage carbon neutrality while also attracting higher FDI inflows.

Besides that, it also found that there is a positive significant relationship between inflation rate and FDI. A moderate level of inflation rate can stimulate the economy and lead to increased consumer demand, which foreign investors may see as an opportunity to enter an expanding market and invest in a productive capital industry with growth potential (Haffert et al., 2021). To attract more FDI, the government is recommended to implement some of the policies in China, such as appropriately tight monetary policy by controlling interest rate and borrowing rate to maintain an appropriate positive level of inflation rate in the country, especially during the

economic recession period (Berger, 2022). It is because a moderate inflation rate can encourage consumers to spend now rather than saving, when they anticipated that prices would rise in the future, leading to increased aggregate demand and economic activity (Ross, 2024). Thus, this can be an attractive strategy to encourage more FDI inflows.

Moreover, the result in the preceding chapter showed that interest rate has a positive significant relationship with FDI, while the high interest rate can improve the FDI. A high interest rate provides higher returns on investments, and it will attract more foreign investors to invest, thereby earning higher returns (Faroh and Shen, 2015). In China, the governments always take action to adjust the monetary policies regarding increased interest rates to solve high inflation issues. The adjustment of high-interest rates can stimulate foreign investment by increasing the rate of return of foreign companies, thereby promoting China's capital expenditure and expansion growth. Hence, the government is suggested to adjust a higher interest rate to attract foreign investors to make investments by providing a greater return on their investment (Sun and Daniel, 2021).

Last but not least, the results show that trade openness is insignificant in attracting FDI. China has implemented the "One Belt One Road" initiative to trade with other countries and enter into many bilateral and regional trade agreements to strengthen multilateral cooperation. Although this project has been successfully ongoing, but the FDI inflows do not have major changes because China invests more in foreign countries instead of other countries investing in China through this project. (Hao, 2023). This can conclude that trade openness with other countries may not have a direct impact on the FDI inflow. This initiative may indirectly impact FDI patterns by promoting infrastructure development, market access, and investment opportunities from trade openness. Therefore, the government could further investigate alternative factors with high FDI attraction such as infrastructure and technological development. For illustration, the Chinese investment in the BRI in the form of the railway industry allows the investors to link with European and Asian markets efficiently. Additionally, Chinese companies perform joint ventures and partnerships with SAP, Cisco, and Oracle to create an enhanced-tech component. These can be more effectively to attract the FDI inflows in the China (Mehmood et al., 2022)

5.4 Limitations of Studies

Generally, limitations exist in every research, basically due to knowledge acquisition being a complex, multifaceted process confined by restrictions in terms of practical, methodological as well as theoretical. These restrictions are not only barriers to success but also vital to define the nature of any research and provide a synopsis of the scope and reliability of the results. Yet, there is no exception in our study, one of the limitations was the omission of significant variables. The absence of significant micro and macro variables measurement could generate deficient results that lead to credibility issues. For instance, the outbreak of COVID-19 in 2019 is one of the critical macroeconomic factors that dragged down FDI and the global economy. According to Hayakawa et al., 2022, global economic and global trade decreased by 3.2% and 8.3% respectively in 2020, while global FDI flows even decreased by 35% to $1 trillion. This pandemic causing a serious downturn in each macroeconomic and microeconomic factor and variables, yet it is not explained and measured in detail regarding the relationship in our study due to insufficient data for reference. This could weaken the credibility of the results and affect the overall nature of the study because it is a coherent causal effect. Furthermore, theoretical, or methodological issues could exist without sufficient research. For instance, appropriate benchmarking is difficult to define without a valid foundation of study which then impacts the overall study direction.

Besides that, the nature of the data is our second limitation since time series data was applied in the study and only 30 years of data were collected. First of all, the range of the dataset is potentially constituted to a restriction that drives weak results reliability. This is due to the small dataset being overwhelmed by noise and unable to seize long-term trends or cyclical structures while the large dataset includes structural changes in rudimentary processes that may cause assumptions of constant relationships across the period to be invalid. Thus, outliers could exist if there is an error in data collection or an uncommon event is revealed. As a result, overfitting or underfitting scenarios might happened in our model that led to the model’s accuracy and robustness being questionable.

5.5 Recommendations for Future Researchers

In this section, there are a few suggestions provided so that the aspect of research about this topic by upcoming researchers can be improved and the understanding of this topic can be more comprehensive.

To enhance the findings' credibility and reliability, it is imperative to include more pertinent micro-microeconomic parameters. For instance, contemporary issues like covid-19 pandemic, cybersecurity indices, environmental, social, and Governance (ESG) scores, and so forth. These are the relevant variables with insufficient data in the current stage which are worth investigating in future dates. Furthermore, a thorough review of the relevant literature is essential to identify the relationship between all potential independent variables and FDI followed by the development of a sound theoretical framework to justify the addition of particular variables by showing supporting established theories and empirical evidence. This not only strengthened the overall fundamental theoretical framework of the study but also minimized the potential bias caused by omitted variables.

Moreover, we can also use the panel data to address the limitations of a relatively short time series dataset. Using panel data can help to increase the sample size which involved larger observations on multiple countries over multiple periods. For instance, other different countries and longer periods can be included in future research to make the research more attractive. This is because observing changes over cross-sectional and time series can help the study or research capture long-term trends and cyclical patterns over time more effectively. It can also reduce the risk of overfitting and improve the reliability of estimates. By leveraging panel data, we can have a more comprehensive understanding of the relationship between the variables in different countries, shedding light on the true factors influencing FDI inflows across countries which is beneficial and referenceable to most countries' economists and investors.

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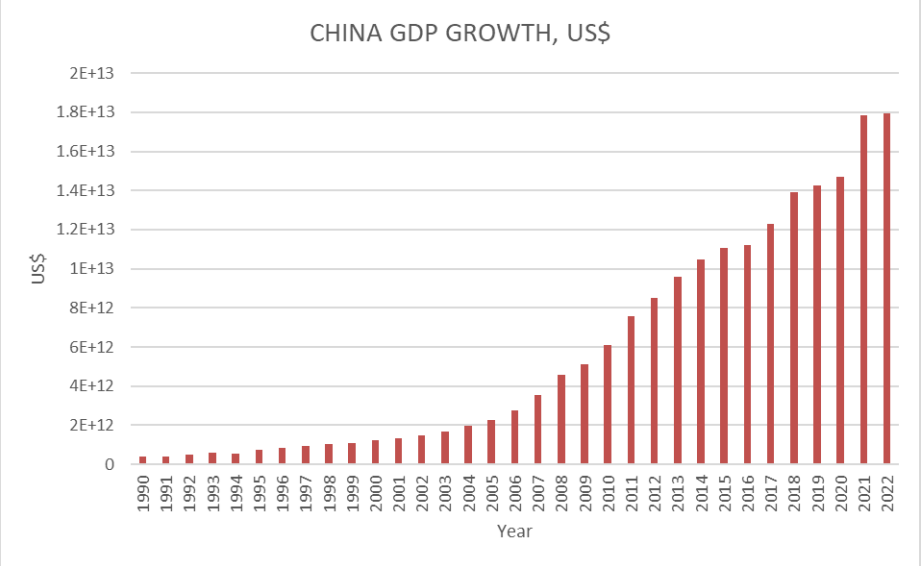
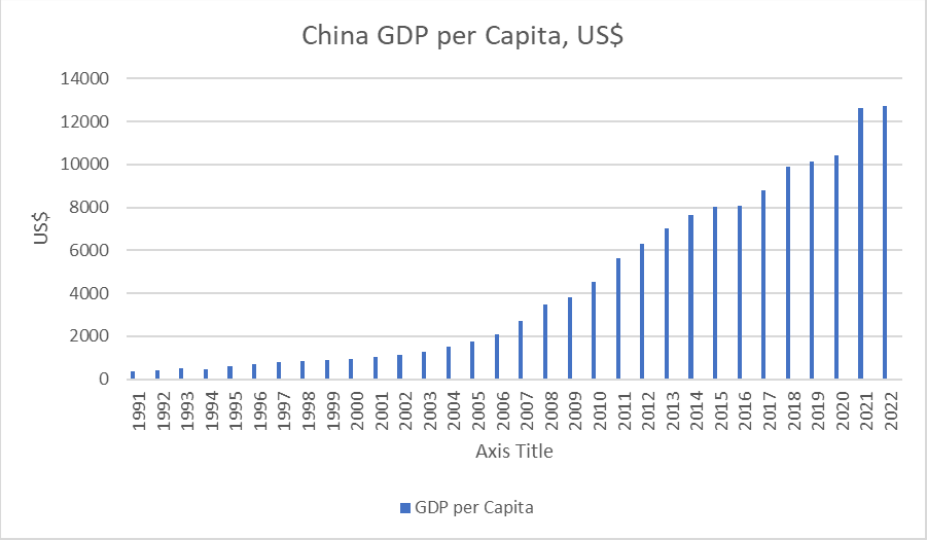
Appendixes

Appendix 1: China's Real GDP Growth (%)



Appendix 2: GDP per Capita



Appendix 3: Multiple Regression Model Test

Dependent Variable: FDI
Method: Least Squares
Date: 02/28/24 Time: 22:05
Sample: 1991 2020
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.95E+11	5.51E+10	-3.540191	0.0016
INFLATION	9.05E+09	4.12E+09	2.200329	0.0372
REAL_INTEREST_RATE	1.18E+10	5.76E+09	2.056273	0.0503
CO2	4.62E+10	3.57E+09	12.94417	0.0000
TRADE_OPENNESS	8.98E+08	5.59E+08	1.607233	0.1206

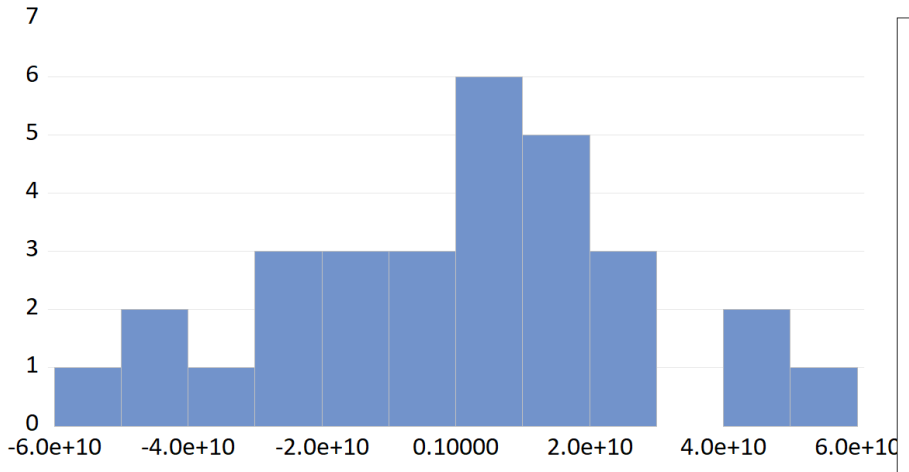
R-squared	0.920373	Mean dependent var	1.27E+11
Adjusted R-squared	0.907632	S.D. dependent var	9.46E+10
S.E. of regression	2.88E+10	Akaike info criterion	51.15278
Sum squared resid	2.07E+22	Schwarz criterion	51.38631
Log likelihood	-762.2916	Hannan-Quinn criter.	51.22749
F-statistic	72.24060	Durbin-Watson stat	1.672560
Prob(F-statistic)	0.000000		

Appendix 4: Variance Inflation Factor Test

Variance Inflation Factors
Date: 02/28/24 Time: 22:06
Sample: 1991 2020
Included observations: 30

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	3.04E+21	110.3673	NA
INFLATION	1.69E+19	28.17137	14.94658
REAL_INTEREST_...	3.32E+19	18.11977	13.51215
CO2	1.28E+19	12.52546	2.085608
TRADE_OPENNESS	3.12E+17	21.59746	1.359188

Appendix 5: Jarque-Bera Test



Series: Residuals
Sample 1991 2020
Observations 30

Mean	-4.08e-05
Median	3.47e+09
Maximum	5.40e+10
Minimum	-5.09e+10
Std. Dev.	2.67e+10
Skewness	-0.079887
Kurtosis	2.667446
Jarque-Bera	0.170150
Probability	0.918443

Appendix 6: Breusch-Pagan-Godfrey Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	3.068908	Prob. F(4,25)	0.0347
Obs*R-squared	9.879616	Prob. Chi-Square(4)	0.0425
Scaled explained SS	5.720043	Prob. Chi-Square(4)	0.2211

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 02/28/24 Time: 22:37
Sample: 1991 2020
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.07E+20	1.53E+21	-0.200320	0.8429
CO2	2.42E+20	9.92E+19	2.442399	0.0220
INFLATION	-1.02E+18	1.14E+20	-0.008966	0.9929
REAL_INTEREST_RATE	-3.08E+19	1.60E+20	-0.192735	0.8487
TRADE_OPENNESS	-2.11E+18	1.55E+19	-0.136191	0.8928

R-squared	0.329321	Mean dependent var	6.89E+20
Adjusted R-squared	0.222012	S.D. dependent var	9.05E+20
S.E. of regression	7.98E+20	Akaike info criterion	99.24617
Sum squared resid	1.59E+43	Schwarz criterion	99.47970
Log likelihood	-1483.693	Hannan-Quinn criter.	99.32088
F-statistic	3.068908	Durbin-Watson stat	2.254245
Prob(F-statistic)	0.034707		

Appendix 7: Augmented Dickey Fuller Test on FDI

Appendix 7.1: Level form with trend and intercept

Null Hypothesis: FDI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.034217	0.7273
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDI)
Method: Least Squares
Date: 02/28/24 Time: 22:48
Sample (adjusted): 1992 2020
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI(-1)	-0.077553	0.074987	-1.034217	0.3102
C	1.81E+10	1.15E+10	1.575270	0.1268

R-squared	0.038105	Mean dependent var	8.58E+09
Adjusted R-squared	0.002480	S.D. dependent var	3.70E+10
S.E. of regression	3.70E+10	Akaike info criterion	51.57164
Sum squared resid	3.69E+22	Schwarz criterion	51.66593
Log likelihood	-745.7887	Hannan-Quinn criter.	51.60117
F-statistic	1.069604	Durbin-Watson stat	2.288731
Prob(F-statistic)	0.310210		

Appendix 7.2: First difference with trend and intercept

Null Hypothesis: D(FDI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.269259	0.0000
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDI,2)
Method: Least Squares
Date: 02/28/24 Time: 22:50
Sample (adjusted): 1993 2020
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FDI(-1))	-1.250542	0.199472	-6.269259	0.0000
C	1.03E+10	7.17E+09	1.433333	0.1637

R-squared	0.601860	Mean dependent var	2.11E+09
Adjusted R-squared	0.586547	S.D. dependent var	5.80E+10
S.E. of regression	3.73E+10	Akaike info criterion	51.59151
Sum squared resid	3.62E+22	Schwarz criterion	51.68667
Log likelihood	-720.2811	Hannan-Quinn criter.	51.62060
F-statistic	39.30360	Durbin-Watson stat	1.990380
Prob(F-statistic)	0.000001		

Appendix 8: Augmented Dickey Fuller Test on CO2

Appendix 8.1: Level form with trend and intercept

Null Hypothesis: CO2 has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.642096	0.8454
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CO2)
Method: Least Squares
Date: 02/28/24 Time: 22:47
Sample (adjusted): 1993 2020
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CO2(-1)	-0.009881	0.015389	-0.642096	0.5267
D(CO2(-1))	0.635991	0.155989	4.077147	0.0004
C	0.121465	0.081532	1.489789	0.1488

R-squared	0.399453	Mean dependent var	0.202871
Adjusted R-squared	0.351409	S.D. dependent var	0.205931
S.E. of regression	0.165847	Akaike info criterion	-0.654550
Sum squared resid	0.687627	Schwarz criterion	-0.511814
Log likelihood	12.16371	Hannan-Quinn criter.	-0.610915
F-statistic	8.314350	Durbin-Watson stat	2.037508
Prob(F-statistic)	0.001705		

Appendix 8.2: First difference with trend and intercept

Null Hypothesis: D(CO2) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.475031	0.1320
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CO2,2)
Method: Least Squares
Date: 02/28/24 Time: 22:48
Sample (adjusted): 1993 2020
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CO2(-1))	-0.377966	0.152712	-2.475031	0.0202
C	0.077467	0.043680	1.773505	0.0879

R-squared	0.190681	Mean dependent var	0.001268
Adjusted R-squared	0.159553	S.D. dependent var	0.178849
S.E. of regression	0.163961	Akaike info criterion	-0.709622
Sum squared resid	0.698967	Schwarz criterion	-0.614465
Log likelihood	11.93471	Hannan-Quinn criter.	-0.680531
F-statistic	6.125780	Durbin-Watson stat	1.995965
Prob(F-statistic)	0.020163		

Appendix 9: Augmented Dickey Fuller Test on Inflation

Appendix 9.1: Level Form with trend and intercept

Null Hypothesis: INFLATION has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.131650	0.2344
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLATION)
Method: Least Squares
Date: 02/28/24 Time: 22:51
Sample (adjusted): 1992 2020
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLATION(-1)	-0.297178	0.139412	-2.131650	0.0423
C	1.206494	0.959935	1.256849	0.2196

R-squared	0.144051	Mean dependent var	-0.214553
Adjusted R-squared	0.112349	S.D. dependent var	3.947903
S.E. of regression	3.719526	Akaike info criterion	5.531541
Sum squared resid	373.5415	Schwarz criterion	5.625838
Log likelihood	-78.20735	Hannan-Quinn criter.	5.561074
F-statistic	4.543930	Durbin-Watson stat	1.553239
Prob(F-statistic)	0.042287		

Appendix 9.2: First difference with trend and intercept

Null Hypothesis: D(INFLATION) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.249504	0.0002
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLATION,2)
Method: Least Squares
Date: 02/28/24 Time: 22:52
Sample (adjusted): 1994 2020
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLATION(-1))	-1.236385	0.235524	-5.249504	0.0000
D(INFLATION(-1),2)	0.361061	0.176797	2.042242	0.0523
C	-0.555311	0.704268	-0.788493	0.4381

R-squared	0.566803	Mean dependent var	-0.288509
Adjusted R-squared	0.530703	S.D. dependent var	5.329672
S.E. of regression	3.651106	Akaike info criterion	5.532376
Sum squared resid	319.9338	Schwarz criterion	5.676358
Log likelihood	-71.68708	Hannan-Quinn criter.	5.575190
F-statistic	15.70100	Durbin-Watson stat	2.052801
Prob(F-statistic)	0.000044		

Appendix 10: Augmented Dickey Fuller Test on interest rate

Appendix 10.1: Level Form with trend and intercept

Null Hypothesis: REAL_INTEREST_RATE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.836279	0.0656
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REAL_INTEREST_RATE)
Method: Least Squares
Date: 02/28/24 Time: 22:52
Sample (adjusted): 1992 2020
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REAL_INTEREST_RATE(-1)	-0.464514	0.163776	-2.836279	0.0085
C	0.948350	0.635332	1.492685	0.1471

R-squared	0.229551	Mean dependent var	0.070148
Adjusted R-squared	0.201015	S.D. dependent var	3.342307
S.E. of regression	2.987552	Akaike info criterion	5.093258
Sum squared resid	240.9876	Schwarz criterion	5.187554
Log likelihood	-71.85224	Hannan-Quinn criter.	5.122790
F-statistic	8.044480	Durbin-Watson stat	1.729660
Prob(F-statistic)	0.008549		

Appendix 10.2: First difference with trend and intercept

Null Hypothesis: D(REAL_INTEREST_RATE) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.950689	0.0005
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REAL_INTEREST_RATE,2)
Method: Least Squares
Date: 02/28/24 Time: 22:53
Sample (adjusted): 1994 2020
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(REAL_INTEREST_RATE(-1))	-1.366105	0.275942	-4.950689	0.0000
D(REAL_INTEREST_RATE(-1),2)	0.281201	0.190406	1.476853	0.1527
C	0.275374	0.641769	0.429086	0.6717

R-squared	0.586987	Mean dependent var	0.180786
Adjusted R-squared	0.552569	S.D. dependent var	4.983132
S.E. of regression	3.333231	Akaike info criterion	5.350201
Sum squared resid	266.6503	Schwarz criterion	5.494182
Log likelihood	-69.22771	Hannan-Quinn criter.	5.393014
F-statistic	17.05476	Durbin-Watson stat	2.079246
Prob(F-statistic)	0.000025		

Appendix 11: Augmented Dickey Fuller on trade openness

Appendix 11.1: Level form with trend and intercept

Null Hypothesis: TRADE_OPENNESS has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.736128	0.4029
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TRADE_OPENNESS)
Method: Least Squares
Date: 02/28/24 Time: 22:55
Sample (adjusted): 1993 2020
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TRADE_OPENNESS(-1)	-0.136177	0.078437	-1.736128	0.0949
D(TRADE_OPENNESS(-...	0.262040	0.184674	1.418934	0.1683
C	6.077640	3.480589	1.746153	0.0931

R-squared	0.154974	Mean dependent var	0.309169
Adjusted R-squared	0.087372	S.D. dependent var	4.612226
S.E. of regression	4.406131	Akaike info criterion	5.904828
Sum squared resid	485.3498	Schwarz criterion	6.047564
Log likelihood	-79.66760	Hannan-Quinn criter.	5.948464
F-statistic	2.292446	Durbin-Watson stat	2.063696
Prob(F-statistic)	0.121864		

Appendix 11.2: First differences with trend and intercept

Null Hypothesis: D(TRADE_OPENNESS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.034988	0.0043
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TRADE_OPENNESS,2)
Method: Least Squares
Date: 02/28/24 Time: 22:55
Sample (adjusted): 1993 2020
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TRADE_OPENNESS(-...	-0.769685	0.190753	-4.034988	0.0004
C	0.211912	0.868077	0.244116	0.8091

R-squared	0.385068	Mean dependent var	-0.113109
Adjusted R-squared	0.361417	S.D. dependent var	5.723357
S.E. of regression	4.573613	Akaike info criterion	5.947233
Sum squared resid	543.8663	Schwarz criterion	6.042391
Log likelihood	-81.26127	Hannan-Quinn criter.	5.976324
F-statistic	16.28113	Durbin-Watson stat	2.029689
Prob(F-statistic)	0.000427		