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ANALYZING THE IMPACT OF CHINA'S FOREIGN DIRECT INVESTMENT ON THE ECONOMIC GROWTH OF THE EASTERN AFRICA COUNTRIES

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DEDICATIONS

With love and gratitude, I dedicate this dissertation to my parents Mr. Okeng George and Mrs. Jane Okeng for their unwavering support along my entire academic journey. I also dedicate it to all my siblings and relatives for their support and advice in my academic endeavors. In a special way to my Grand Mother Atat Loy for her relentless prayers and motivation during my entire studies as she always referred to me as her hunting dog who must return home with a prey. Lastly to the Living Hope family for their love and spiritual trek.

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LIST OF ABBREVIATIONS AND ACRONYMS

- AfCFTA: African Continental Free Trade Area
- BRI: Belt and Road Initiative
- CARI: China Africa Research Initiative
- CFDI: China's Foreign Direct Investment
- FDI: Foreign Direct Investment
- FOCAC: Forum on China-Africa Co-operation
- GCF: Gross Capital formation
- GDP: Gross Domestic Product
- GNI: Gross National Income
- HDI: Human Domestic Index
- IMF: International Monetary Fund
- M & A: Mergers and Acquisition
- MNC: Multinational Corporation
- MPK: Marginal Product of Capital
- NPV: Net Present Value
- OECD: Organization for Economic Co-operation and Development
- OLS: Ordinary List Squares
- R & D: Research and Development
- SGR: Standard Gauge Railway
- UNDP: United Nations Development Program
- WTO: World Trade Organization

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GENERAL INTRODUCTION.

GENERAL INTRODUCTION

China's foreign direct investment (FDI) has grown massively since its economic reforms in 1978. Initially, China was mainly attracting FDI, but it shifted to actively investing abroad in December 2001, especially after joining the WTO. This was driven by a need for resources, new markets, and greater global influence. Early Chinese investments focused on natural resources and energy in developing countries. Later, they targeted developed regions like the US and Europe. Between 2000 and 2014, Europe received €46 billion in Chinese investment, with the UK, Germany, and France being the top recipients. Investment in Europe peaked in 2014 at €14 billion, concentrated in energy, automotive, food, and real estate. The Belt and Road Initiative (BRI) a global infrastructure and economic development program launched in 2013, further boosted China's outward FDI especially in Asia and Africa. By 2015, this reached roughly $100 billion annually. In 2023, China's outward FDI was about $177 billion, making it the third-largest global investor, even as global FDI flows declined. (Kwan, 2017) (Statista, 2024)

Moreover, China's investment in sub-Saharan Africa has grown significantly since 2003, driven by motivations like resource-seeking, efficiency-seeking, and internalization as per Dunning's FDI theory. Chinese FDI in Africa, called OFDI (Outward Foreign Direct Investment) in China, rose from $75 million in 2003 to $5 billion in 2021, though it dropped to $1.8 billion in 2022. A major investment in South Africa's Standard Bank in 2008 caused a peak of $5.5 billion that year. Since 2013, China has invested more in Africa than the US, whose FDI has been declining since 2010. In 2022, the top destinations for Chinese investment in Africa were South Africa, Niger, Democratic Republic of Congo, Egypt, and Cote d'Ivoire. The Eastern African countries on the other hand are working to improve their investment climate by focusing on infrastructure, industry, energy (including renewables), and oil. They're actively seeking foreign direct investment (FDI), which has traditionally gone to manufacturing, construction, and services and China has become the main FDI sources as Kenya, Rwanda, Tanzania, Zimbabwe and Uganda have all seen Chinese FDI increases since 2017. (CARI, 2025) (Dunning & Lundan, 2008).

While China's Foreign Direct Investment (FDI) has significantly contributed to Eastern Africa's economic growth, it faces several challenges such as the problem of Debt sustainability where some Eastern Africa nations have accumulated substantial debt due to Chinese loans for infrastructure projects and concerns exist about their ability to repay these loans, potentially

leading to economic hardship and payment difficulties (Freitas, 2023). Labor practices issues have also been raised regarding the employment of Chinese workers over local labor in some projects, as well as concerns about working conditions and labor rights. Lack of transparency in contract negotiations and concerns about corruption in some projects have created challenges for Chinese FDI (Freitas, 2023). In this context, this study aims at examining the impact of China's FDI on the economic growth of the Eastern Africa countries amidst all these challenges.

Basing on the existing literature on the FDI activities which deduces that the presence of the foreign multinational companies or firms, may have a profound impact on the structure of the host economy and the performance of the domestic firms which is not any different from the presence China's FDI in the Eastern Africa countries that has greatly impacted the GDP of this region (Alfaro, 2003). The question that arises therefore is:

What is the impact of China's Foreign Direct Investment on the economic growth of the Eastern Africa Countries?

To perfectly dive into this research upon establishing the principal question, we posed the following secondary questions which are answered in depth in three different chapters to come.

1. ***What is investment, its related concepts and its approach in conjunction to China's FDI?***
2. ***What is economic growth, its measurement, its theories and its related models?***
3. ***What are the different economic methods fitting to the available data that would aid in determining the impact of China's FDI in Eastern Africa?***

A substantial number of scholars have been examining the economic impact of FDI through macro, cross country analysis as well as micro and it's found evident that FDI could positively affect the economic growth when the recipient economies meet certain conditions such as sufficient human capital stock and substantial financial development. This is concrete enough to draw the following hypotheses based on our research;

H1: China's FDI has a positive impact on the GDP growth of the Eastern African Countries in long run.

H2: China's FDI contributes to Economic growth by increasing capital accumulation and capital output ratio which enhance productivity and output in Eastern African countries.

GENERAL INTRODUCTION.

Our research covers several theoretical frameworks such as; Neoclassical growth theory, Endogenous growth theory and many others that would be examined in great depth with their applications in this research in chapter two.

This study entails analytic and economic approach to investigate the relationship between the China's FDI and the economic growth of the Eastern Africa countries within different time frames. These analysis uses time series data from renowned and reputable sources including World Bank and China Africa Research Initiative (CARI). The core methodological framework is grounded on panel data analysis, a statistical method used to analyze data that contains observations on individuals which are the countries in this case, over multiple time periods. It combines cross-sectional data (data across different individuals at a single point in time) and time-series data (data for a given country over multiple years). This Analysis will provide us with a powerful tool necessary for understanding the complex relationships in data that vary across the Eastern Africa Countries and years, providing deeper insights than cross-sectional or time-series alone. This research employs R programming language, a powerful tool for data analysis with the aid of software packages like plm designed for estimation and tests, lm for general linear regression used for pooled OLS and Stargazer package designed for formatting regression tables.

This study is organized in three chapters with the general introduction and general conclusion. The general introduction gives a great insight on the global overview of China's FDI and its evolution in the past years. It also highlights the context of China's FDI in Eastern Africa which is the central focus of our study. Chapter one prime focus is the literature review linked to this research with section one that concentrates on the definition of investment, its types, its theories and its analysis on micro and macro level while section two on the other hand points out China's FDI and its descriptive approach in the world but majorly in Eastern Africa. Chapter two gives a deep insight on economic growth, theories and its measurements as well as its related models. Chapter three is a practical chapter which presents the necessary methods that aids in this analysis. This chapter also presents and interprets the findings of the econometric analyses, drawing connections to the theoretical framework and previous research. Finally, the general conclusion summarizes our findings bringing to light the impact of China's FDI in the economic growth (GDP) of the Eastern Africa countries with propositions of policy recommendations to enhance positive contribution of

China's FDI in these economies. It concludes by siting the areas for future research and acknowledging the limitations of the study.

Chapter One: LITERATURE REVIEW

Introduction

This chapter's prime focus is the literature review which will provide a comprehensive examination of the key concepts empirical and theoretical findings related to investments and China's Foreign Direct Investments on a global spectrum in Africa but more specifically in Eastern Africa countries. This chapter will explore the following key themes; the notion of investment from different perspectives, theoretical frameworks of investments applicable to our research, its view on microeconomic and macroeconomic levels. Additionally, this chapter will delve into multifarious nature of China's Foreign Direct Investments and its descriptive approach while highlighting its key trends globally and in Eastern Africa countries. Finally, this chapter will also examine the determinants of China's Foreign Direct Investments.

Section 1: The notion of investment

1.1 The definition of investment

The concept of "investment" varies somewhat depending on the economist and the context. However, there are core themes that run through most definitions. In broad terms, economists define investment as the acquisition of goods that are not consumed immediately but are used to produce other goods and services in the future. This emphasizes the idea of forgoing current consumption for future gain. This often includes: purchases of physical capital (machinery, equipment, and buildings), increases in inventories, investments in human capital (education, training).

John Maynard Keynes, in The General Theory of Employment, Interest and Money (1936), defines investment within a macroeconomic context, linking it to aggregate demand and economic fluctuations. He views investment as the purchase of real capital goods like machinery, buildings, and infrastructure as a key component of aggregate demand, impacting output, employment and short-term economic growth. Crucially, Keynes differentiates between financial investments (stocks, bonds) and economic investments, emphasizing the latter's role in creating physical capital for production capacity. (Keynes, 1936)

According to a prominent economist and author Gregory Mankiw, investment is also defined in the context of macroeconomics as the purchase of goods that will be used to produce other goods

and services in the future. In his book Principles of Economics (2014), Mankiw emphasizes that investment refers to the creation of capital stock such as machinery, buildings and tools used for the production of goods and services. Fundamentally, in everyday language, investments might refer to buying stocks or bonds but in economic terms this is considered saving or financial investment but not economic investment which specifically involves the accumulation of physical capital that contributes to production capacity. (Mankiw N. G., 2014)

1.1.1 Types of investment

Investment is a fundamental driver of economic growth that spans in diverse categories like physical capital investment which focuses on tangible assets like machinery and infrastructure to boost production capacity(Jorgenson, 1967) (Nicholson & Snyder, 2020); financial investment involving assets like stocks and bonds for income generation; human capital investment that involves enhancing skills and knowledge through education and training (Becker, 1993); research and development (R&D) investment that englobes fostering innovation and technological advancement (Dixit & pindyck, 1994) and public investment where governments fund infrastructure and public goods to benefit society (Gruber, 2005).Each type plays a distinct role in shaping economic landscapes, from enhancing productivity and competitiveness to improving societal well-being.

1.1.2 Microeconomic and Macroeconomic analysis of investment

Investment analysis spans micro and macroeconomic perspectives. Microeconomics focuses on individual or firm-level decisions regarding capital allocation and risk, emphasizing factors like opportunity cost and market competition. Macroeconomics examines investment's broader impact on GDP, employment, and economic growth, considering influences like interest rates and government policies. Combined, these views offer a holistic understanding of investment's role in shaping individual and economic prosperity.

(i) Microeconomic view on investment.

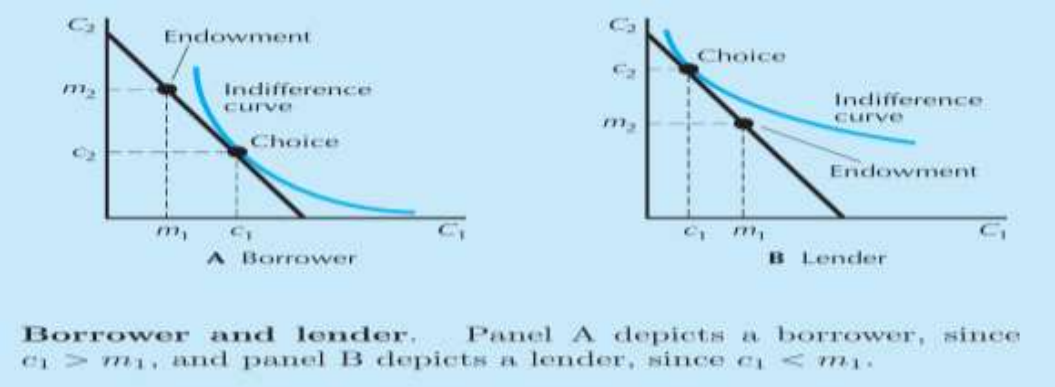
This view on investment focuses on the decision-making processes of consumers, producers and the interactions within markets. This perspective examines how individuals and firms allocate resources to maximize utility and profits, respectively, and how these decisions influence market dynamics.

a) Consumers and investment.

Consumer investment decisions, as explained by Varian (2010), are fundamentally inter-temporal choices, balancing present consumption against future consumption through saving and investment. These choices are significantly influenced by interest rates, which act as the "price" of current versus future consumption; higher rates encourage saving by increasing future purchasing power, while lower rates incentivize spending. Income levels also play a crucial role, with both current and expected future income shaping saving and investment capacities, aligning with the permanent income hypothesis. Consumer preferences, determined by time preferences, dictate the value placed on present versus future consumption, modeled using utility functions (Varian, 2010).

To illustrate these intertemporal choices, consumption in each period is denoted as (c1, c2), with prices assumed constant at 1, and income as (m1, m2), considering borrowing and lending at interest rate "r".

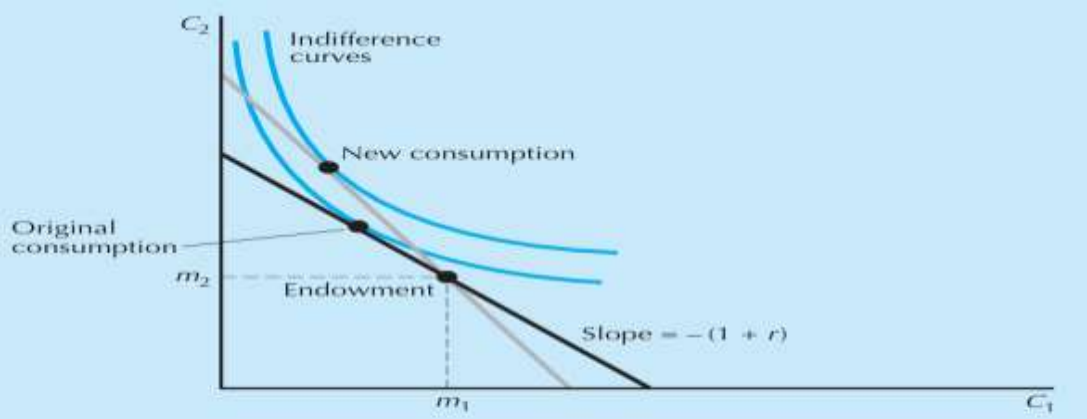
FIGURE 1 : CONSUMER'S PREFERENCE



Borrower and lender. Panel A depicts a borrower, since $c_1 > m_1$, and panel B depicts a lender, since $c_1 < m_1$.

Source: Intermediate Microeconomics eighth edition by Varian Hal. R (2010)

FIGURE 2*: THE EFFECT OF INTEREST RATE ON THE INVESTMENT DECISION OF A CONSUMER.*



If a person is a lender and the interest rate rises, he or she will remain a lender. Increasing the interest rate pivots the budget line around the endowment to a steeper position; revealed preference implies that the new consumption bundle must lie to the left of the endowment.

Source: Intermediate Microeconomics eighth edition by Varian Hal. R (2010)

The intertemporal budget constraint reflects the trade-offs between current and future consumption or returns, shaped by income, interest rates, and preferences. The optimal choice, maximizing utility, occurs where the marginal rate of substitution (MRS) equals the interest rate-determined slope of the budget constraint, balancing current investment costs against expected future returns. (Varian, 2010)

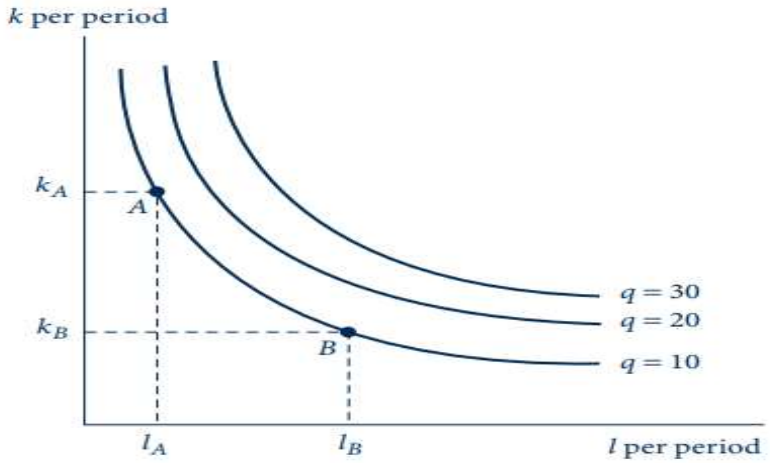
b) Producers and Investment

Producers invest in capital goods to maximize profits and minimize costs, crucial for efficient production and market competitiveness. The production function (equation 1.1) illustrates how capital (K) and labor (L) yield output (Q), guiding firms to optimize input combinations. Investment occurs when the marginal product of capital (MPK) exceeds the user cost of capital, but diminishes with added capital, stopping when MPK equals user cost. Isoquants, as shown in figure 1, represent input combinations for same output, aiding in cost-efficient choices where the marginal rate of technical substitution (MRTS) matches input price ratios. Returns to scale also influence investment, with increasing returns encouraging capital investment and decreasing returns discouraging it. Technological advancements and cost minimization drive further investment, though firms must consider obsolescence and implementation risks. Investment

decisions are dynamic, balancing current costs against future returns and adapting to evolving market and technological conditions. (Nicolson & Snyder, 2012)

$$\boldsymbol{Q = f(K, L) = AK^{\alpha}L^{1-\alpha}} \qquad (\mathbf{1.1})$$

FIGURE 3*: AN ISOQUANT MAP.*



Source: Microeconomic Theory: Basic principles and extensions by Nicolson Walter and Snyder Christopher (2012)

c) Market Dynamics and Investment

Market dynamics significantly influence investment decisions, coordinating consumer and producer actions through price signals in perfectly competitive markets. However, market imperfections like information asymmetry, leading to adverse selection and moral hazard, and monopolistic competition, where limited competition reduces innovation incentives, result in suboptimal investment levels. Government intervention via subsidies, taxes, and regulations can correct these failures, promoting efficient investment in areas with positive externalities, such as renewable energy and education. Financial markets also facilitate investment by connecting consumer savings with producer borrowing needs (Stiglitz, 2000) (Mishkin & Serletis, 2011)

(i) Macroeconomic view on investment.

The macroeconomic view of investment focuses on how investment decisions are influenced by broader economic factors such as savings, interest rates, economic growth, and government policies. Investment, in macroeconomics is a critical component of aggregate demand in short and long term. When businesses invest in new projects or expand operations, they create jobs and

increase income, which stimulates consumption and further economic activity. Similarly, it is a key driver of long-term economic growth since investment(I) is one of the four components of GDP(Y) alongside consumption(C), government expenditure(G), and net exports (NX), making it central to understanding economic performance as shown in equation (1.2) below. (Mankiw N. , 2010)

$$\boldsymbol{Y = C + I + G + NX} \qquad (\mathbf{1.2})$$

To explain the relationship between savings and investment, Mankiw introduces the concept of the loanable funds market. In this framework, savings represent the supply of funds available for borrowing, while investment represents the demand for those funds. The interest rate acts as the price that balances savings and investment. When savings increase, interest rates tend to fall, making borrowing cheaper and encouraging investment. Conversely, when savings decrease, interest rates rise, discouraging investment. In an open economy, investment can be financed not only by domestic savings but also by foreign capital inflows. For example, developing countries often rely on foreign direct investment (FDI) to supplement domestic savings and accelerate economic growth. However, this reliance on foreign capital can also expose economies to external shocks, such as sudden capital flight during financial crises.

1.1.3 The Theories of Investment

Investment theories aim to elucidate the drivers behind resource allocation for future returns, encompassing neoclassical profit maximization, accelerator theory's economic activity linkage, and Tobin's Q market valuation approach. These theories, considering interest rates, profits, technology, and market conditions, collectively offer a comprehensive view of investment behavior. Keynes and Fisher both advocated for investments until the net present value (NPV) reaches zero, equating future revenue present value with capital opportunity cost, but diverged on risk, uncertainty, and expectations; Keynes highlighted "animal spirits," while Fisher and Hayek emphasized rational capital stock adjustments. Despite these differences, both have significantly shaped modern investment theories, including neoclassical, accelerator, Tobin's Q, and portfolio choice models. (Eklund, 2013)

a) The Neoclassical Theory of Investment

The neoclassical theory of investment explains firm investment decisions through profit maximization and resource optimization. According to this theory, firms invest based on the user cost of capital, encompassing interest, depreciation, and maintenance, and compare it to the marginal product of capital (MPK), which is the additional output from an extra unit of capital. Investment continues until MPK equals the user cost, reflecting diminishing returns. Adjustment costs, such as installation or training, influence the speed of capital stock adjustment. The optimal capital stock is reached when MPK equals the user cost, expressed as equation (1.3) where "r" is the real interest rate and "ẟ" is the depreciation rate of capital.

Using the Cobb-Douglas production function (equation 1.1), MPK is derived (equation 1.4), and the optimal capital stock (equation 1.5) is determined by equating MPK to the user cost (c), considering financing and depreciation. This shows the optimal capital stock's dependence on output (Q), output prices (p), and the cost of capital. Investment is modeled as the change in capital stock (equation 1.6), reflecting adjustments towards the optimal level (Hirshleifer, 1970) (Eklund, 2013).

$$\boldsymbol{MPK = r + \delta} \qquad (\mathbf{1.3})$$

$$\boldsymbol{MPK = \frac{\alpha Y}{k}} \qquad (\mathbf{1.4})$$

$$\boldsymbol{K^* = \frac{p\alpha y}{c}} \qquad (\mathbf{1.5})$$

$$\boldsymbol{I(t) = K^*(t) - K^*(t-1)} \qquad (\mathbf{1.6})$$

b) The accelerator theory and the Q theory

It is also important to note that the accelerator theory of investment builds on the neoclassical framework by emphasizing the role of changes in output or demand in driving investment. According to this theory, firms increase investment when they expect higher future demand, creating a proportional relationship between investment and the rate of change in output. While the neoclassical theory focuses on the cost of capital and marginal productivity, the accelerator theory introduces the importance of expectations about future demand, offering a complementary perspective on investment behavior. (Ganti, 2024)

On the other hand, the Q theory of investment developed by James Tobin (1969), posits that investment decisions are driven by the ratio of the market value of assets to their replacement cost. If this ratio, known as Tobin's q, exceeds 1, it indicates that the market values assets higher than their replacement cost, incentivizing firms to invest in real, reproducible capital. This concept, inspired by Keynes, highlights the role of adjustment costs and the disparity between financial market valuations and the cost of capital goods. The Q theory expands the neoclassical framework by incorporating financial market signals, linking stock market valuations to investment behavior and reflecting expectations about future profitability. (Bhargave & Tandon, 2023)

Section 2: China's Foreign Direct Investment

2.1 Definition of Foreign Direct Investment

According to the International Monetary Fund (1993), Foreign Direct Investment (FDI) is an international investment by a resident entity (direct investor) to establish a lasting interest in an enterprise in another economy (direct investment enterprise). This "lasting interest" entails a long-term relationship and significant influence over the enterprise's management. FDI includes the initial transaction and all subsequent capital transactions between the entities and affiliated enterprises (IMF, 1993).

The OECD (2008), in its Benchmark publication, defines Foreign Direct Investment (FDI) as investment aimed at establishing a lasting interest by a resident enterprise in an enterprise of another economy. This "lasting interest" involves a long-term relationship and significant management influence, typically indicated by direct or indirect ownership of 10% or more of the enterprise's voting power. This 10% threshold is recommended for international comparability, establishing the necessary level of ownership for a direct investment interest (OECD, 2008) (UNCTAD, 2009)

Todaro and Smith (2020) define foreign Direct Investment as oversees equity investment by private Multinational Corporation (MNC). They also continue to define Multinational Corporation as an enterprise that conducts and controls productive activities in more than one country (Todaro & Smith, 2020). In this case, the direct investor may be an individual, a firm, a Multinational Corporation (MNC), a financial institution or a government. FDI is a key strategy for MNCs to globalize their operations, reduce costs, access new markets and enhance their competitive

advantage on a global scale. Furthermore, MNCs are the major source of FDI as they generate about ninety-five percent of world FDI flows.

Categorically, according to World Bank data, Inward FDI also known as Direct Investment in the reporting economy encompasses all asset and liability transfers between resident direct investment enterprises and their direct investors, including transfers with non-resident fellow enterprises under a non-resident ultimate controlling parent. Conversely, Outward FDI also known as Direct Investment abroad involves asset and liability transfers between resident direct investors and their direct investment enterprises, including transfers with non-resident fellow enterprises under a resident ultimate controlling parent. FDI net inflows represent non-resident investment into the reporting economy, while FDI net outflows represent resident investment into external economies.

2.1.1 Types of FDI

Foreign Direct investment can be classified into different types based on different criteria depending from which perspective is studied and other specific purposes. As per this research the major classification based on entry mode are: Greenfield investments, Mergers and Acquisitions (M&A) and Joint ventures.

a) Greenfield FDI's: These involve foreign companies establishing new operations in a host country, creating jobs and transferring technology. They are valued for reducing unemployment and enhancing human capital, though they may crowd out local businesses and profits may not always stay domestically.

b) Mergers and Acquisitions: M&A involves consolidating companies or assets through financial transactions. They often provide limited long-term benefits to local economies, particularly in less developed countries, and do not significantly boost employment, as proceeds may not benefit the local economy.

c) Joint Ventures: JVs involve partnerships between local and foreign companies or governments, facilitating technology and knowledge sharing. Their success depends on partner selection and trust, and they serve various strategic purposes, with varying impacts on human capital development in different economies. (Zeqiri & Bajrami, 2016) (Trakman & Ranieri, 2013).

2.1.2 Theories of FDI.

Foreign Direct Investment (FDI) has become a significant focus of economic research and policy at both national and international levels recognizing its crucial role in economic development, particularly in developing countries. Research by scholars such as Blomstrom (1994) and Smarzynska (2002) supports the idea that FDI can boost the competitiveness of local firms through technology spillovers and improved supply chains. Caves (1996) and Borensztein (1998) highlight FDI's potential to increase productivity, managerial skills and access to international production networks. However, the impact of FDI is not universally positive. Some studies, like those by Hanson (2001) and Greenwood (2002), suggest that FDI can crowd out local enterprises and have negative effects on economic development. Lipsey (2002) notes that while FDI can have positive effects, the relationship between FDI stock and economic growth is inconsistent. The sector in which FDI occurs also influences its impact, with Hirschman (1958) arguing that investments in agriculture and mining may have limited positive effects. (Caves, 2007) (Lipsey, 2002)

The motivations for FDI are complex and often tied to market imperfections. Kindleberger (1969) and Hymer argue that FDI arises due to distortions in perfect competition, with foreign firms needing specific advantages to compete in local markets. From a macroeconomic perspective, FDI represents cross-border capital flows, while from a microeconomic perspective, it involves the strategic decisions of multinational corporations (MNCs) to exploit their advantages in foreign markets.

Historically, FDI gained prominence after the Second World War, with early theories like Ricardo's comparative advantage failing to explain its rise. Subsequent theories, such as portfolio theory and Mundell's trade model, also fell short. Japanese researchers Kojima and Ozawa attempted to integrate trade and FDI theories, suggesting that FDI occurs in sectors where a country has a comparative disadvantage. Vernon's Product Cycle Theory (1966) explained FDI in the context of product life cycles, particularly U.S. investments in post-war Europe. The theory posits that as products mature, firms establish local production to maintain market share. (Kojima & Ozawa, 1984) (Mundell, 1957)

The Internalization Theory, developed by Buckley, Casson, and Hennart, explains the growth of MNCs and their FDI activities by focusing on the advantages of internalizing operations across borders. Hymer's work emphasized firm-specific advantages and the costs of operating abroad, laying the groundwork for understanding FDI as a strategic decision rather than a financial one.

Dunning's Eclectic Paradigm (OLI) integrates various theories, emphasizing Ownership, Location, and Internalization advantages. Ownership advantages refer to a firm's unique assets, such as technology or brand strength. Location advantages consider the benefits of operating in specific countries, while Internalization advantages focus on the efficiency gains from controlling operations internally rather than through market transactions. While no unified theory of FDI exists, the contributions of Hymer, Dunning, and others have provided valuable frameworks for understanding its complexities. (Dunning, 1988)

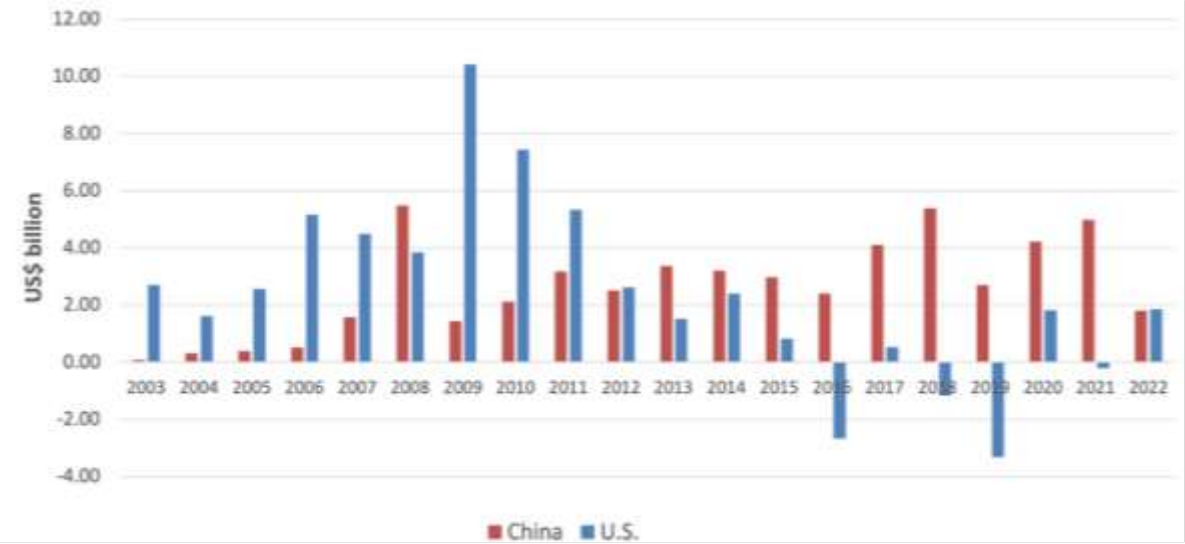
2.1.3 The History and Evolution of China's FDI in Africa

China-Africa relations, rooted in the 1950s independence movements and solidified by the 1955 Bandung Conference, have grown significantly. Consequently, this relation in Africa has evolved through three distinct phases: an initial period post-1978 marked by cautious, small-scale ventures in resource and agricultural sectors due to limited experience. The growth phase from the 1990s to 2005, where China's policy of non-interference and support for anti-colonial struggles-built trust. In 2000, the Forum on China-Africa Cooperation (FOCAC) formalized economic collaboration, driven by China's growing resource needs. Africa's wealth of natural resources made it a prime target for Chinese investment, leading to China becoming a major trading partner and financing extensive infrastructure projects across the continent. The Forum on China-Africa Cooperation (FOCAC) in 2000 marked a significant increase in trade and investment, with China's investment exceeding 200 million Yuan in 2000 alone. Finally, a strategic expansion phase from 2006 onward, characterized by active government promotion through policy support, tax treaties, and the establishment of the China-Africa Development Fund, resulting in a substantial diversification and increase in total investment reaching 2.7 billion by the end of 2019. (Xiong & Liu, 2021) (IMF, 2023).

Chinese FDI annual flows to Africa in Chinese official reports, have been increasing steadily since 2003.Flows surged from US$75 million in 2003 to US$5 billion in 2021, then dropped to US$1.8 billion in 2022. They peaked in 2008 at US$5.5 billion due to the purchase of 20% of the shares in Standard Bank of South Africa by the Industrial and Commercial Bank of China (ICBC).As shown in figure 4 below, U.S. FDI flows ($1.86 billion) in 2022 exceeded those of China ($1.81 billion) for the first time in the past decade. The top five African destinations for Chinese FDI in

2022 were South Africa, Niger, the Democratic Republic of Congo, Egypt, and Côte d'Ivoire. (CARI, 2025).

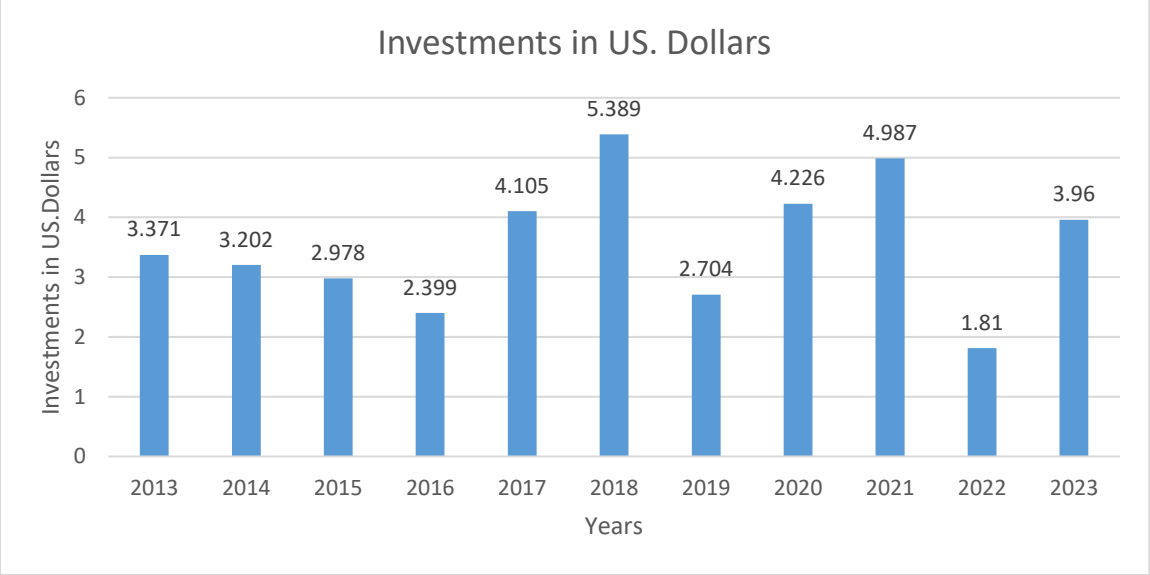
FIGURE 4*: THE FLOW OF CHINA'S FDI VS US FDI IN AFRICA*



Source: The Statistical Bulleting of China's Outward Foreign Direct Investment, U.S. Bureau of Economic Analysis.

According to Statista (2024), Chinese FDI into Africa went from 3.4 billion in 2013 to $5.4 billion in 2018. Inflows, however, declined to $2.7 billion in 2019. However, the investment level increased to $4.2 billion despite the COVID-19 pandemic in 2020. A notable recovery occurred in 2021, with FDI rising to $4, 9 billion but this was followed by another decline in 2022 and 2023 culminating in a low of $1, 81 billion in 2022 and $3.9 in 2023. These fluctuations reflect the dynamic nature of Africa's economic environment and varying global investment conditions over the decade. (Statista, 2025)

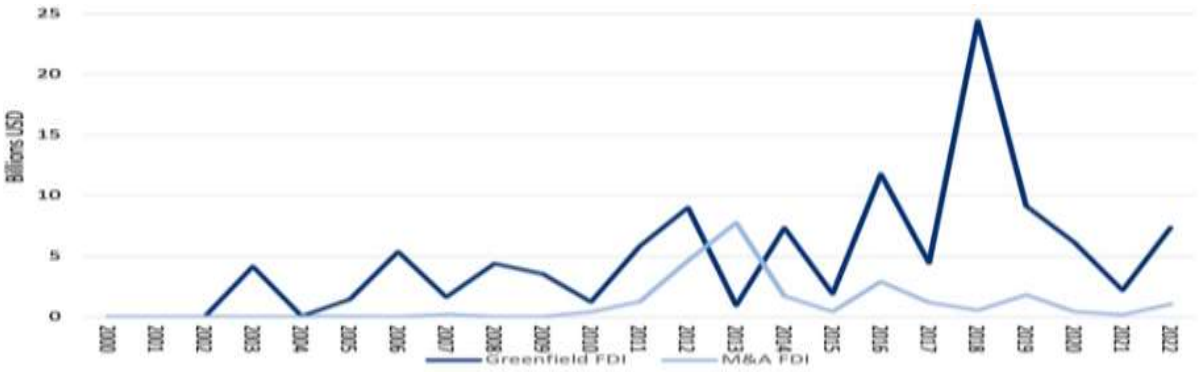
FIGURE 5*: ANNUAL FLOW OF FOREIGN DIRECT INVESTMENTS FROM CHINA TO AFRICA FROM 2013 TO 2023*



Source: Statista Published by C. Textor, Oct 2, 2024

From 2000 to 2022, Chinese companies announced $112.34 billion in Greenfield FDI and completed $24.60 billion in M&A FDI deals in Africa. Greenfield investments focused on industry, trade (services), energy, and non-energy mining and processing, while M&A activities were concentrated in non-energy mining, processing, and energy sectors. Most energy-related FDI supported fossil fuel projects, particularly oil and gas though Greenfield FDI allocated a higher share (8 percent) to renewable energy compared to FDI loans. Investments in copper, alumina, and iron ore dominated, reflecting Chinese involvement across the entire metals and minerals supply chain. Overall, Chinese FDI in Africa primarily targeted the exploration and extraction of energy sources and transition materials critical for industrial needs. (Statista, 2025)

FIGURE 6*: TREND IN CHINA'S GREENFIELD AND M&A FDI TO AFRICA, 2000-2022*



Source: Boston University Global Development Policy Center and African Economic Research Consortium, 2024.

2.1.4 The Determinants of China' FDI in Africa

China's FDI in Africa has historically been driven by resource-seeking motives, particularly in the early 2000s, to secure raw materials like oil and minerals, though the extent of this drive is debated due to varying methodologies. As African economies grow, market-seeking motives have gained prominence, with Chinese companies investing in local production, distribution networks, and consumer markets to tap into the continent's expanding population and middle class. Additionally, efficiency-seeking (leveraging lower labor costs) and strategic asset-seeking (acquiring technology and logistical advantages) play significant roles, often overlapping in infrastructure projects that support both resource extraction and market access.(Abadata & Ze, 2024) (Utesch-Xiong & Sarada Kambhampati, 2021)

FDI is influenced by a variety of locational determinants, with market size and economic development being the most significant. However, Education enrolment, particularly at higher levels, signals a skilled workforce, crucial for attracting FDI, especially in knowledge-intensive sectors, though its direct impact is debated, as Cheng & Kwan (2000) found education variables did not significantly influence FDI, suggesting alignment with industry needs is key. Additionally, infrastructure including transportation and energy systems, reduces costs and facilitates operations, making countries more attractive to investors, as highlighted by Head & Ries (1996) and Barrell & Pain (1999), with China exemplifying success through infrastructure investments. Furthermore, human capital development, encompassing education, training, and health, enhances productivity

and innovation, though Guntlach (1995) notes its impact is hard to measure due to externalities, emphasizing effective utilization over mere accumulation. Finally, trade openness, characterized by low tariffs and export promotion, significantly attracts FDI, as argued by Bhagwati (1978) and supported by Milner & Pentecost (1996). Chinese investors have been considering the trade openness in Africa countries for the aim of establishing effective trading activities. (Abadata & Ze, 2024) (Cheng & Kwan, 2000)

Conclusion

This chapter provided a comprehensive literature review on investments and China's Foreign Direct Investment (FDI) in Africa, particularly the Eastern Africa countries. It explored the concept of investment from microeconomic and macroeconomic perspectives, emphasizing its role in economic growth through capital accumulation, human capital development, and technological advancement. Key investment theories, such as the neoclassical theory, accelerator theory, and Tobin's Q theory, were discussed to explain investment behavior. The chapter also examined China's FDI in Africa, highlighting its evolution from resource-seeking motives to market-seeking and strategic asset-seeking investments, driven by factors like infrastructure development, trade openness, and human capital. The review underscored the importance of infrastructure, education, and economic policies in attracting FDI, while noting the varying impacts of Greenfield investments, mergers and acquisitions, and joint ventures. Overall, this chapter laid the theoretical and empirical foundation for understanding the determinants and implications of China's FDI in the East African countries, setting the stage for further analysis which will help us understand the relationship between investment and economic growth and development in the next chapter.

Chapter Two: ECONOMIC GROWTH THEORY

Introduction

Economic growth remains a central subject in development economics, particularly in analyzing the effects of Foreign Direct Investment (FDI) on developing economies. This chapter will establish the theoretical foundation for assessing the impact of China's FDI in Eastern Africa countries by examining key concepts, measurements, and growth models. The discussion will begin by defining economic growth and development, highlighting their distinctions. It will then explore the measurement of economic growth, distinguishing between quantitative and qualitative approaches. This dual approach ensures a comprehensive evaluation of how China's FDI influences not only macroeconomic expansion but also living standards in the Eastern Africa countries. Finally, the chapter will review growth theories and models and their hypothesis, contrasting the neoclassical growth theory with endogenous growth theory. These models provide a framework to analyze whether China's FDI fosters sustainable growth through knowledge spillovers and infrastructure development or merely generates short-term gains.

Section 1: The Notion of Economic Growth.

1.1 Definitions of Economic Growth and Economic Development

Foreign Direct Investment (FDI) plays a significant role in the economic progress of nations, influencing both economic growth and development. While these concepts are related, they represent distinct dimensions of a country's advancement. Economic growth, often driven by FDI inflows, centers on the quantitative expansion of nation's output of goods and services, typically measured by metrics like Gross Domestic Product (GDP). In contrast, economic development encompasses a broader, qualitative improvement in societal well-being, including advancements in living standards, health, and education. This distinction highlights the difference between simply producing "more" (growth), which FDI can stimulate, and achieving a state of "better" for the population (development), a more complex outcome that FDI can also influence. (Todaro & Smith, 2020)

1.2 Measuring Economic Growth; key indicators.

Economic growth is a fundamental measure of a nation's economic health. It is typically assessed using key indicators such as Gross Domestic Product (GDP), which represents the total monetary value of all goods and services produced within a country's borders over a specific period, typically a year. It serves as a primary indicator of the overall size and health of an economy. It is calculated using three approaches: production or output approach, income approach, and expenditure approach. It can be calculated in nominal terms (current prices) or real terms (adjusted for inflation). GDP is the real rate of growth in a country's total output of goods and services produced in a year. By analyzing changes in the GDP of the Eastern Africa countries over time, we can assess the impact of China's FDI on the countries' overall economic expansion. (Khan, 2020). Other important metrics include Gross National Income (GNI) and GDP per Capita, which divides the total GDP by the population, providing an average income level per person and is useful for assessing the standard of living and economic wellbeing of the population, allowing us to examine whether growth driven by China's FDI translates into improvements in Individual incomes in the Eastern Africa countries. Additionally, economists often examine real GDP growth (adjusted for inflation) to gauge true economic expansion by accounting for changes in the price level. Complementary indicators like Human Development index (HDI), unemployment rates, productivity levels and industrial output further help evaluate the sustainability and inclusiveness of growth. (Khan, 2020)

1.3 Approach of Economic Growth.

Economic growth can be analyzed through both qualitative and quantitative approaches, each offering distinct insights into development processes. The quantitative approach focuses on measurable indicators such as GDP growth, per capita income, industrial output, and employment rates, employing statistical and econometric models to assess performance. According to Simon Kuznets (1966), this approach emphasizes structural transformation and Robert Solow (1956), formalizes growth through capital accumulation and technological progress. Meanwhile, the qualitative approach examines non-tangible factors like institutional quality, governance, education, and social equity, arguing that sustainable growth requires more than just macroeconomic stability. Amartya Sen (1999) highlights human capabilities as central to progress, while Douglass North (1990) underscores the role of legal and political frameworks in shaping

long-term growth. Together, these approaches provide a holistic understanding as quantitative methods reveal trends and correlations, while qualitative analyses explain the underlying drivers and constraints of economic development. (Kuznet, 1973) (Solow, 1956) (Sen, 1999)

1.4 Factors Influencing Economic Growth in the Eastern Africa countries with a Focus on China's FDI

Economic growth in Eastern Africa is influenced by a mix of domestic and external factors, with China's Foreign Direct Investment (FDI) playing an increasingly significant role. Key factors include: Infrastructure Development as China's FDI has heavily targeted transport, energy, and telecommunications which can reduce logistical bottlenecks and boost productivity. Projects like Kenya's Standard Gauge Railway (SGR) and Ethiopia's Addis Ababa-Djibouti Railway exemplify this trend. Additionally, Natural resource exploitation for example, Chinese FDI in oil in South Sudan, minerals in DRC and agriculture in Tanzania could spur growth by increasing domestic production in these Eastern Africa countries. Political and Institutional Factors, Manufacturing and Industrialization, Trade and Market Access may be considered as other factors pivotal for the economic progress of the Eastern Africa countries as far as China's FDI is concerned.

Section 2: Models of Economic Growth.

Economic growth theory is anchored in two pivotal models: the neoclassical model Solow (1956), which emphasizes capital accumulation and exogenous technological progress, and the endogenous growth model; Romer (1990) and Lucas (1988), which treats innovation and human capital as internal drivers of sustained growth. This section explores their key assumptions, mechanisms and implications in relation to China's FDI in the Eastern African economies.

2.1 The Neoclassical Theory (Solow Model).

The neoclassical theory of economic growth, developed by Robert Solow (1956) and Trevor Swan (1956), offers a fundamental framework for analyzing long-term economic expansion through capital accumulation, labor growth, and exogenous technological progress. At its heart lies the steady-state hypothesis, which posits that economies eventually reach an equilibrium where output per capita stabilizes, determined by the interplay of savings, population growth, and depreciation (Solow, 1956). The model employs a Cobb-Douglas production function shown in equation (1.1) in chapter 1 where output (Y) depends on capital (K), labor (L), and technology (A).

A defining feature is diminishing marginal returns to capital meaning that, as capital stock increases, each additional unit contributes less to output, eventually halting growth unless offset by technological advancements. This framework also assumes constant returns to scale, meaning doubling inputs (K and L) doubles output (Y), and treats labor growth and technology as exogenous determined outside the model (Barro & Sala-i-Martin, 2004). The neoclassical theory also assumes that: firms aim to maximize profits (utility), they have full information meaning they can process all information, labor and capital are the only inputs, firms are rational and are price takers which means that markets are perfectly competitive (perfect competition) and there are no firms large enough to influence the markets.

From a macroeconomic perspective, the neoclassical model highlights the critical role of savings and investment in driving capital accumulation. The savings rate (s) influences the steady-state level of income, but not its long-run growth rate, which depends solely on exogenous technological progress (g). This leads to the conditional convergence hypothesis: poorer economies with similar savings rates and institutional quality will grow faster than richer ones, narrowing income gaps over time (Mankiw, Romer, & Weil, 1992).

$$\boldsymbol{s.f(k^*) = (n + g + \delta).k^*} \qquad \boldsymbol{(2.1)}$$

Where ***s*** is Savings rate (fraction of output invested), ***f(k*)*** is Output per effective worker, ***n*** is the Population growth rate (dilutes capital per worker), ***g*** is the technological growth rate (increases effective labor) and ***δ*** is depreciation rate (erodes capital over time).

The neoclassical growth theory paradoxically treats technology as both crucial for long-term growth and completely exogenous determined outside the economic system. In the model, technology enhances labor efficiency and grows at a fixed external rate. While this assumption helped analyze capital accumulation's diminishing returns, it became the theory's major weakness by failing to explain cross-country differences in technological progress, ultimately prompting the development of endogenous growth theories.

2.2 Endogenous Growth Theory: A Deeper Exploration of Romer, Lucas, and Barro's Contributions.

Paul Romer's (1990) endogenous technological change model fundamentally redefined growth theory by internalizing innovation as a product of deliberate economic activity, rather than an exogenous force. In his seminal paper (Romer, 1990), Romer introduced three key elements: non-

rivalrous knowledge meaning ideas can be reused infinitely without depletion, partial excludability pointing that firms profit from patents but cannot fully prevent spillovers, and increasing returns to scale due to these spillovers. His model formalized how profit-driven R&D investments by firms fueled by monopolistic competition generate self-sustaining growth. Unlike Solow's exogenous technology, Romer's framework explained why advanced economies like the U.S and South Korea maintain growth through continuous innovation, while also highlighting the role of public policy in subsidizing research (Aghion & Howitt, 2009).

Robert Lucas (1988), in *"On the Mechanics of Economic Development"* (Journal of Monetary Economics) shifted the focus to human capital externalities. His model posited that individual investments in education and skills yield societal benefits, as skilled workers enhance overall productivity through interactions and learning-by-doing. Lucas critiqued the neoclassical assumption of diminishing returns to physical capital, demonstrating that human capital accumulation could lead to constant or even increasing returns. This explained the rapid growth of East Asian economies like Singapore where heavy investments in education and export-oriented industries created virtuous cycles of productivity. Lucas also introduced the idea of human capital spillovers where concentrated talent in cities like Silicon Valley accelerates innovation a concept later expanded by urban economists (Robert E. Lucas, 1988).

Robert Barro and Xavier Sala-I-Martin (2004) empirically tested and expanded endogenous growth theory by integrating institutions and policy. Their work showed that while Romer and Lucas identified the engines of growth (innovation and human capital), institutional quality determines whether these engines ignite. Barro's cross-country analyses revealed that factors like property rights, stable governance, and efficient taxation are prerequisites for sustained growth. His conditional convergence hypothesis of refining Solow's framework argued that poor nations only catch up to rich ones if they adopt similar institutions and policies. For example, Botswana's growth surge (vs. Zimbabwe's decline) underscored how institutions channel endogenous forces (Acemoglu & Robinson, 2012). Barro also emphasized threshold effects meaning democracies and market reforms only boost growth after reaching a minimum development level. (Barro & Sala-i-Martin, 2004)

2.3 Neoclassical vs. Endogenous Growth Theories:

The fundamental distinction between these growth theories lies in their treatment of technology and growth mechanisms. Neoclassical theory posits technology as an exogenous factor growing at a fixed, external rate while endogenous theory frames technological progress as an internal outcome of deliberate R&D investments and innovation activities. This core difference leads to divergent views on capital returns: neoclassical models assume diminishing returns to physical capital accumulation whereas endogenous models allow for constant or increasing returns through human capital spillovers and the non-rivalrous nature of knowledge (Solow, 1956) (Robert E. Lucas, 1988).

Their explanations of growth drivers differ substantially. The neoclassical framework attributes long-term growth solely to exogenous technological change, while endogenous theory identifies multiple internal drivers: purposeful innovation, education-driven human capital development, and institutional quality. These contrasting perspectives yield different policy implications - neoclassical theory suggests only temporary growth benefits from capital accumulation (Solow, 1956), whereas endogenous theory demonstrates how permanent growth can be achieved through education policies, R&D support and institutional reforms.

The theories also diverge in their convergence predictions. Neoclassical models anticipate conditional convergence among economies with similar savings rates, while endogenous models explain why nations may diverge due to innovation clustering and institutional path dependence (Helpman, 2004). This reflects their deeper philosophical difference: neoclassical theory views growth as externally constrained, while endogenous theory sees it as an internally-generated process that economies can actively shape through strategic investments and policy choices.

Conclusion

This chapter has outlined the theoretical framework for assessing China's FDI impact in Eastern Africa through neoclassical and endogenous growth perspectives. While Solow's (1956) model emphasizes capital accumulation and exogenous technology, endogenous theory Romer (1990) Lucas (1988) highlights human capital, innovation, and institutions as internal growth drivers. This suggests China's FDI could spur short-term growth but requires complementary policies to achieve sustainable development. The analysis indicates infrastructure projects like Kenya's SGR may boost productivity, but long-term success depends on institutional quality and skills transfer.

CHAPTER TWO: ECONOMIC GROWTH THEORY.

The Solow Growth Model (1956) is particularly effective for analyzing the impact of China's Foreign Direct Investment (CFDI) in Eastern Africa because China's FDI directly increases capital stock like infrastructure, factories and technology, accelerating growth in capital-scarce Eastern Africa. The model also emphasizes that physical capital boosts GDP per capita until economies reach steady-state equilibrium and this resonates with the fact that poorer economies like Eastern African countries grow faster when they receive foreign capital inflows (CFDI), as they are far from their steady state. The next chapter will empirically test these propositions, evaluating whether China's investments deliver transformative growth or limited gains in Easten Africa.

Chapter Three: RESEARCH METHODOLOGY, FINDINGS AND ANALYSIS.

Introduction.

This chapter will establish the methodological framework for an empirical study examining how CFDI influences the economic output (GDP) of Eastern Africa nations. It will offer a thorough and clear description of the research approach and the statistical methods utilized. The chapter begins by stating the underlying research philosophy and the specific type of investigation undertaken. It then provides reasons for the chosen study duration and explains why particular data sources were selected. Following this, the chapter offers an in-depth explanation of each factor (variable) included in the analysis, along with the reasons for their relevance to the central research question. The chapter subsequently reviews software tools for data analysis and the panel regression methods with focus on pooled OLS, the fixed effects, random effects models and the generalized method of moments (GMM), which are used to analyze combined economic data collected across time. By clearly outlining these methodological decisions, this chapter intends to enable the reader to critically assess the statistical link between CFDI and GDP in Eastern Africa countries, setting the stage for dependable and trustworthy results

Section 1: Methodology of Study.

1.1 Research Design and Type.

This study employs a positivist philosophy, grounded in Durkheim's (1895) scientific approach, to examine objective and measurable relationships between economic variables. Specifically, it investigates the impact of China's FDI on economic growth in Eastern African countries using quantitative data, statistical analysis, and econometric modeling to test hypotheses and derive generalizable conclusions. This research employs a deductive and quantitative approach which involves using general economic theories and then applying them to specific situations. This study specifically draws upon the endogenous growth theory which points out that CFDI brings technology transfer, knowledge spillovers, and human capital development, which enhance long-term productivity a key driver of endogenous growth. (Durkheim, 1982) (Pindyck & Rubinfeld, 2013).

1.2 Time Scope And Data Collection.

This research uses annual economic data sourced from the World Bank's Development Indicators (World Bank 2025) and data covering Chinese foreign direct investment is obtained from the

China Africa Research Initiative (CARI) for the years 2003-2022 for eleven Eastern Africa countries of Kenya, Uganda, Tanzania, Rwanda, Burundi, Mozambique, Seychelles, Mauritius, Zimbabwe, Madagascar and The Democratic Republic of Congo. This 20-year time frame was deliberately chosen to capture the long-term impact of China's FDI on the economic growth of Eastern Africa countries. (The World Bank, 2025) (CARI, 2025)

1.3 Variables.

The two key variables in this analysis are GDP per capita as the dependent variable and CFDI as the central independent variable. In order to examine the relationship between CFDI and economic growth more closely, other explanatory variables such as Trade openness, Inflation deflator and Gross Capital Formation (GCF) were included as control variables. According to world bank (2025) these variables are briefly defined as follows;

a) GDP per capita -Dependent variable.

GDP per capita, expressed in constant 2015 U.S. dollars, represents the average economic output per person in a country, adjusted for inflation using 2015 as the base year for comparison, and it's used in studies to gauge average living standards and economic well-being across different countries or over time in a way that accounts for price changes.

b) China Foreign Direct Investment (CFDI).

This is the main independent variable in our model. According to the Ministry of Commerce (MOFCOM), China's Foreign Direct Investment outflow (also referred to as Outbound Direct Investment or ODI) represents the value of investments made by Chinese domestic entities (companies, individuals, or government bodies) into businesses or assets located outside of mainland China.

c) Trade Openness.

Trade openness acting as one of the control variables, is defined as the sum of exports and imports of goods and services measured as a share of gross domestic product. This variable is expected to have a positive relationship with GDP growth.

d) Inflation Deflator.

Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current

local currency to GDP in constant local currency. This variable is another control variable in our model and is expected to have a negative relationship with GDP growth.

e) **Gross Capital Formation (GCF)**.

Gross capital formation is the total investment in new fixed assets (like buildings and machines) and changes in inventories (stockpiled goods) that will contribute to future production. This variable being a control variable is expected to have a positive relationship with GDP growth.

TABLE 1*:* IDENTIFICATION OF VARIABLES, THEIR ABBREVIATIONS AND EXPECTED SIGNS

Variables	Abbreviations	Source of data	Expected Sign
Gross Domestic Product Per capita	**GDP_{pc}**	**World bank**	+
Chinas Foreign Direct Investment	**CFDI**	**CARI**	+
Trade Openness	**TradeOP**	**World Bank**	+
Inflation Deflator	**InflDefl**	**World Bank**	-
Gross Capital Formation percentage of GDP	**GCFpGDP**	**World Bank**	+

Source: Authors

To meet the assumptions of the econometric model, variables such as GDP, CFDI and Inflation, were transformed using natural logarithms. Log transformation is widely used in practice to transform non-normal data into normally distributed data and also helps to address the problem of stability.

1.4 Panel Data Analysis.

Panel data is the type of data that combines cross-sectional or multiple entities like firms and countries and time-series (observations over time) dimensions, allowing researchers to study dynamic effects while controlling for unobserved heterogeneity. This methodology analyzes relationships between dependent and independent variables through regression techniques, tracking multiple individuals over identical or varying time periods. The data can be balanced where all individuals are observed equally or unbalanced with missing observations, enabling both

longitudinal tracking of individual entities and cross-sectional comparisons across entities at specific time points (Reyna, 2007). In this research, the eleven Eastern African countries are the entities in the model and the time period is from 2003 to 2022, making use of annual data for the 20 years yielding a panel of 220. Given the information collected for the 5 variables yields a total sample of 1100 observations.

Panel data by nature allows the user to pool observations from different individual over several time periods and this will give more variability and limit the chances of collinearity among the variables. This also increases the number of degrees of freedom and makes it more efficient than other methods like time series analysis. However, individual heterogeneity, which is the variation of a trait within an individual entity (Gimenez, Cam, & Gaillard, 2017) can be a source of concern in a panel regression. But panel regression methods enable individual heterogeneity to be controlled for to avoid the risk of producing biased results. This can be achieved by identifying and dealing with individual-invariant and time invariant variables (Baltagi, 2005).

1.4.1 Pooled OLS (Ordinary Least Squares).

Pooled OLS treats panel data as a single cross-sectional dataset by ignoring the time and individual dimensions, estimating a common regression line for all observations. This method assumes no unobserved heterogeneity across individuals or time periods, leading to potential bias if omitted variables correlate with regressors. While simple to implement, it often produces inefficient estimates in the presence of unobserved effects (Baltagi, 2021).

$$\boldsymbol{Y_{it} = \beta_0 + \beta_1 X_{it} + \varepsilon_{it}} \qquad (\mathbf{3.1})$$

Where:

i=1,2, 3……..., N and t=1,2,3……, T

Y_{it} represents the dependent variable which is **logGDPpc**, $\beta_0$is the intercept for the ith entity, $\beta_1$is a k x 1 vector of parameters to be estimated, X_{it} is a 1 x k vector of observations of the explanatory variables which are **logCFDI**, **InflDefl**, **GCFpGDP**, **TradeOp**, and ε_{it} is the remainder disturbance ie the error term without the effect of the time invariant variables.

1.4.2 Fixed Effects Model (FEM)

The Fixed Effects Model accounts for unobserved time-invariant heterogeneity by allowing each entity (or time period) to have its own intercept. It can be implemented in three ways:

a) Least Squares Dummy Variables (LSDV)

The LSDV approach incorporates dummy variables for each entity in the dataset, effectively assigning a unique intercept to each unit. This method explicitly captures time-invariant, unobserved heterogeneity by allowing the baseline value of the dependent variable to vary across entities. LSDV is useful when researchers need to directly compare fixed effects across groups or when the number of entities is small (Greene, 2002).

$$\boldsymbol{Y_{it} = \beta_0 + \beta_1 X_{it} + \sum_{i=1}^{N-1} \alpha_i D_i + \varepsilon_{it}} \qquad (\mathbf{3.2})$$

Where: D_i is the Dummy for individual(country) i and α_i is the individual(country) specific intercept.

b) Within Estimator (Fixed Effects Regression)

The Within Estimator, also known as the fixed effects regression, eliminates unobserved time-invariant heterogeneity by subtracting entity-specific means from all variables (a process called demeaning). Instead of estimating individual intercepts, this method mathematically removes the influence of fixed effects by focusing solely on within-entity variation over time. This makes it computationally efficient, especially for datasets with many entities, and avoids the dummy variable trap. The Within Estimator is the most commonly used FEM approach in applied research, particularly when the primary interest lies in analyzing how changes in independent variables affect changes in the dependent variable over time (Wooldridge, 2016).

$$\boldsymbol{(Y_{it} - \overline{Y_\iota}) = \beta_1 (X_{it} - \overline{X_\iota}) + (\varepsilon_{it} - \overline{\varepsilon_\iota})} \qquad (\mathbf{3.3})$$

Where: $\overline{Y_\iota}$, $\overline{X_\iota}$ and $\overline{\varepsilon_\iota}$ are individual(country) means over time.

c) Between Estimator

Unlike LSDV and the Within Estimator, the Between Estimator collapses the panel data into a cross-section by averaging observations over time for each entity. It then estimates the model using only these between-entity variations, effectively ignoring all within-entity dynamics. While this

approach allows for the inclusion of time-invariant variables, it discards valuable information contained in the time-series dimension of the data (Baltagi, 2021).

$$\bar{Y}_i = \beta_0 + \beta_1 \bar{X}_i + u_i + \bar{\varepsilon}_i \quad (3.4)$$

Where: u_i is unobserved heterogeneity

1.4.3 Random Effects Model (REM)

This method treats unobserved individual-specific heterogeneity as uncorrelated with the independent variables, incorporating these effects into the error term as random variables (Baltagi, 2021). Using Generalized Least Squares (GLS), REM efficiently estimates parameters while accounting for both individual-specific and time-varying errors, making it more suitable than pooled OLS when its assumptions hold (Wooldridge, 2016). Unlike fixed effects models, REM retains time-invariant variables and is ideal for large, heterogeneous samples where individual effects are assumed random. However, its consistency depends on the absence of correlation between unobserved effects and regressors, tested via the Hausman test.

$$Y_{it} = \beta_0 + \beta_1 X_{it} + (u_i + \varepsilon_{it}) \quad (3.5)$$

Where: Composite error term $v_{it} = u_i + \varepsilon_{it}$ $\quad u_i \sim N(0, \sigma_u^2), \varepsilon_{it} \sim N(0, \sigma_\varepsilon^2)$

1.4.4 Diagnostic Tests

In panel data analysis, diagnostic tests are essential for selecting the appropriate model and addressing potential issues. The Poolability F-test compares fixed effects (FE) and pooled OLS, where rejecting the null hypothesis (H_0) suggests FE is preferred due to individual-specific intercepts. The Breusch-Pagan LM test evaluates random effects (RE) against pooled OLS, with rejection of H_0 indicating RE is more suitable. The Hausman test further distinguishes between FE and RE, favoring FE if H_0 (RE consistency) is rejected. Serial correlation is assessed using the Wooldridge test for first-order autocorrelation or the Breusch-Godfrey test for higher-order lags, with rejection of H_0 necessitating corrections like clustered standard errors. Heteroskedasticity is examined via the Breusch-Pagan test, where rejection of homoskedasticity (H_0) requires robust standard errors or weighted estimation. These tests collectively ensure model robustness and reliability in empirical analysis.

1.4.5 Generalized Method of Moments (GMM).

GMM is an estimation technique widely used in panel data analysis, particularly for models with endogeneity, dynamic effects, or unobserved heterogeneity**.** It is especially useful for dynamic panel models where the lagged dependent variable appears as a regressor. GMM estimators are classified into difference GMM which transforms the model into first differences to eliminate fixed effects and system GMM which combines differenced and level equations for greater efficiency, both of which use instrumental variables (IVs) to address endogeneity. The key assumption is that instruments are valid (exogenous) and satisfy the orthogonality condition, which can be tested using the Hansen J-test for overidentifying restrictions. This estimation technique will be used in this research to address the issue of autocorrelation by introducing dynamic lags in the model (Baltagi, 2021).

Section 2: The Empirical Data Analysis.

2.1 Descriptive Statistics.

A descriptive summary of data in the table below provides a concise overview of the characteristics of this research's panel data.

Table 2: Descriptive summary of the data.

	Log GDPpc	LogCFDI	GCFpGDP	INFLDEFL	TradeOp
Min	5.536	4.120	1.525	-2.851	11.98
1st Quartile	6.129	5.781	16.489	2.855	36.30
Median	6.667	5.828	21.685	6.281	45.32
Mean	6.985	5.942	22.572	13.265	64.86
3rd Quartile	7.228	6.023	26.651	9.534	81.00
Maximum	9.877	7.222	56.396	540.734	213.31

Source: Authors from the R programming language using data from World Bank and CARI (2025)

According to table 2, the Gross Domestic Product per capita in its natural logarithm (LogGDPpc) records a mean value of 6.985 reflecting a generally positive growth trajectory over the period of study, the mean is slightly greater than the median (6.667) thereby exhibiting right skewed distribution which means the distribution is relatively symmetrical indicating significant income

inequality with few rich countries like Seychelles dragging the mean above the median. Meanwhile, China's Foreign Direct Investment in its natural logarithm expressed as LogCFDI exhibits a mean of 5.942 indicating a positive growth pattern over time. The mean is approximately equal to the median (5.828) showing a fair symmetric distribution meaning most countries have moderate CFDI levels with no extreme skewness. Additionally, Gross Capital Formation percentage of Gross Domestic Product expressed as GCFpGDP records a minimum percentage value of 1.525% and maximum of 56.396% meaning some countries such as Zimbabwe invest very little (1.5%) while others like Mozambique invest so heavily (56.4%). There's a slight skewness since the mean (22.572%) slightly exceeds the median (21.685%). Most countries invest around 20% of GDP exhibited by the 1st Quartile (16.489%) and the 3rd Quartile (26.651%). Inflation measured by the annual growth rate of the GDP implicit deflator noted as InflDefl shows extreme outliers with a minimum percentage value of -2.85% (deflation) and a maximum of 540.734%(hyperinflation) particularly in Zimbabwe reason being the introduction of Zimbabwe Dollars (ZWL) in 2019 by the central bank which led to abandoning of the multicurrency system. This reintroduction of a local currency without fiscal discipline led to rapid devaluation, while most countries have moderate inflation. As for Trade Openness (TradeOp) which is the percentage of GDP, records a maximum value of 213.31% in Seychelles in the year 2014.The mean (64.86%) is greater than the median (45.32%) indicating right skewness meaning there are few highly trade dependent economies like Seychelles that pull the mean up.

2.2 The Panel Models

TABLE 3: ***ESTIMATION OUTPUT TABLE FOR PANEL MODELS***

Dependant variable (LogGDPpc)				
Independent variables	**POOLED OLS**	**BETWEEN(FEM)**	**WITHIN(FEM)**	**REM**
LogCFDI	0.096 (0.172)	0.029 (2.255)	0.147 (0.038)	0.145 (0.039)
GCFpGDP	-0.020 (0.006)	-0.026 (0.050)	0.006 (0.002)	0.006 (0.002)
InflDefl	0.0003 (0.001)	-0.0001 (0.018)	0.0001 (0.0002)	0.0001 (0.0002)
TradeOp	0.023 (0.001)	0.024 (0.007)	0.003 (0.001)	0.003 (0.001)
Constant	5.387 (1.013)	5.849 (13.279)		5.796 (0.362)
Observations	220	11	220	220
R2	0.622	0.663	0.238	0.233
Adjusted R2	0.615	0.438	0.186	0.218
F statistics	88.280(df=4;215)	2.950(df=4;6)	15.997(df=4;205)	65.169

Source: Authors from the R programming language using data from World Bank and CARI (2025)

2.2.1 Results of the Tests

In the Poolability test (**Appendix: B1**) which is the F test whereby we differentiate between the pooled OLS model and the within Model (FEM), the null hypothesis is rejected meaning that there is significant effect since the calculated p-value (2.2e-16) is less than 0.05. This confirms that Pooled OLS is not appropriate and we need to use a panel data model that accounts for individual effects (either Fixed Effects or Random Effects). In Breusch Pagan test (**Appendix: B2**) which helps to determine the choice between Random Effect Model and Pooled OLS, the null hypothesis

was rejected all because the p value (2.2e-16) is extremely less than 0.05 signifying that the Random Effects model is more appropriate than Pooled OLS. In the Hausman Test (**Appendix: B3**), which is a crucial step in panel data analysis to help decide between a Fixed Effects model and a Random Effects model, the p value is a very small number (4.528e-06) less than 0.05 thereby we accept the alternative hypotheses which state that the Random Effects estimator is inconsistent and therefore Fixed Effects Model (FEM) is the appropriate choice for our analysis. With focus on Fixed Effects Model (FEM) and the Between model in this case, the key coefficients of LogCFDI, GCFpGDP and the constant are statistically insignificant ($p > 0.05$) at 95% confidence level, rendering it unsuitable. The Within model as shown in equation (3.6) below emerges as the best choice, with all coefficients significant ($p < 0.05$), though its low R^2 (0.238) implies that 23.8% of the within-country variation in Log GDPpc is explained by the included variables while the remaining 76.2% of variation is due to unobserved factors or random noise. Further diagnostic tests like Wooldridge test (**Appendix:B4**) for serial correlation and the studentized Breusch-Pagan(**Appendix:B5**) test for heteroscedasticity are carried out in our fitting regression model which is the within model (FEM).These test exhibits an extremely small p-value(2.2e-16) and (0.000305) respectively which are less than 0.05 meaning we reject the null hypothesis for both tests concluding significant serial correlation and heteroskedasticity exists in the idiosyncratic errors of this model. This evidence indicates the inability to use this model for our analysis therefore justifies the need to introduce dynamics into the model.

$$(\boldsymbol{logGDPpc_{it}} - \overline{\boldsymbol{logGDPpc_{\iota}}}) = \mathbf{0.147}(\boldsymbol{logCFDI_{it}} - \overline{\boldsymbol{logCFDI_{\iota}}}) + \mathbf{0.006}(\boldsymbol{GCFpGDP_{it}} - \overline{\boldsymbol{GCFpGDP_{\iota}}}) + \mathbf{0.0001}(\boldsymbol{InflDefl_{it}} - \overline{\boldsymbol{InflDefl_{\iota}}}) + \mathbf{0.003}(\boldsymbol{TradeOp_{it}} - \overline{\boldsymbol{TradeOp_{\iota}}}) + (\boldsymbol{\varepsilon_{it}} - \overline{\boldsymbol{\varepsilon_{\iota}}}) \quad (\mathbf{3.6})$$

2.3 GMM Model

TABLE 4:*GMM ESTIMATION MODEL*

Dependent Variable: (ΔlogGDPpc)	
(ΔlogGDPpc) $_{t-1}$	**0.278*** (0.0000001)**
(ΔlogCFDI) $_{t-1}$	**0.027*** (0.0004)**
(GCFpGDP)$_{t-1}$	**0.001*** (0.0007)**
(InflDefl)$_{t}$	**-0.0001*** (7.510e-13)**
(TradeOp) $_{t-1}$	**0.00004 (0.1899)**
Sargan Test (p-value)	**0.23**
AR (1) Test (p-value)	**0.017**
AR (2) Test (p-value)	**0.488**
Observations	**11**
***** p < 0.01, ** p < 0.05, * p < 0.1. Robust standard errors in parentheses.**	

Source: Authors from the R programming language using data from World Bank and CARI (2025)

2.3.1 Interpretation of the GMM model.

This dynamic panel GMM model examines the drivers of GDP per capita growth ΔlogGDPpc as shown in the equation (3.7) below.

$$\boldsymbol{\Delta LogGDPpc_t = 0.278(\Delta LogGDPpc)_{t-1} + 0.027(\Delta LogCFDI)_{t-1} + 0.001(GCFpGDP)_{t-1} - 0.0001InflDefl_t + 0.00004(TradeOp)_{t-1}} \quad (3.7)$$

The lagged dependent variable ((ΔlogGDPpc), t-1) is statistically significant at 99% confidence level(p-value<0.01) which suggests that a 1% increase in prior-year GDP per capita is associated with a 0.278% rise in current growth, confirming strong path dependence. The coefficient of lagged dependent variable $(\Delta logGDPpc)_{t-1}$ (0.278) is positive and close to zero which means that there is no cointegration in the long run hence validating the model.

Lagged CFDI ((ΔlogCFDI), t-1) shows a positive and statistically significant impact(p-value<0.01) at 99% confidence level, indicating that China's foreign direct investment contributes to growth and this implies that a 1% increase in CFDI in a given year induces 0.027% rise of GDP per capita in the following year.

Lagged Gross Capital Formation (GCFpGDP, t-1) also displays a positive and statistically significant effect(p-value<0.01) and the coefficient (0.001) implies that a 1% increase in prior year domestic capital formation implies 0.001% rise in GDP per capita in the current year.

Inflation (InflDefl) has a small but significant negative impact(p-value<0.01), this implies that a 1% increase on inflation leads to 0.0001% fall on GDP per capita in that given year. This agrees with the theoretical expectation of a negative impact of inflation on economic growth for this research.

Lagged TradOp ((TradeOp)t-1) is statistically insignificant(p-value>0.01). This implies that trade openness has no measurable impact in this model and no impact on GDP per capita for the Eastern African countries.

The Sargan test p-value (0.23) is greater than 0.05, so we accept the null hypothesis. This suggests no evidence of invalid instruments, supporting the assumption that our instruments are exogenous and correctly specified. The AR (1) test (p=0.017<0.05) detects first-order serial correlation while the AR (2) test (p=0.488>0.05) finds no second-order correlation, supporting the

model's consistency. For the Wald test (Appendix:C1) the p-value is extremely smaller than 0.05 this implies that we reject the null hypothesis and therefore the independent variables in this model are jointly different from zero confirming its joint significance.

Conclusion

This chapter has systematically outlined the methodological framework and empirical analysis employed to investigate the impact of China's Foreign Direct Investment (CFDI) on GDP per capita growth in Eastern Africa countries. Adopting a *positivist research philosophy*, the study utilized panel data econometrics with a sample size of 11 countries covering 20 years' time period from 2003 to 2022, comparing Pooled OLS, Fixed Effects, Random Effects, and Generalized Method of Moments (GMM) models to account for unobserved heterogeneity, endogeneity, and dynamic effects. The GMM approach effectively addressed endogeneity and dynamic biases, providing credible evidence that CFDI and domestic capital formation positively drive growth, while inflation exerts a slight drag. The chapter concludes that 1% increase in CFDI in a given year induces 0.027% rise of GDP per capita in the following year confirming a positive impact of CFDI inflows on the economic growth of the Eastern African countries. This chapter also empirically confirms that a 1% increase in prior year domestic capital formation implies 0.001% rise in GDP per capita in the current year and a 1% increase on inflation leads to 0.0001% fall on GDP per capita in that given year.

GENERAL CONCLUSION

This research has examined the impact of China's Foreign Direct Investment (FDI) on the economic growth of Eastern Africa countries, focusing on GDP per capita as the primary indicator. By employing a panel data analysis of 11 Eastern Africa nations from 2003 to 2022, the study utilized econometric techniques including Pooled OLS, Fixed Effects, Random Effects, and Generalized Method of Moments (GMM) to assess both short-term and long-term effects.

Chapter one examined investment theories and China's FDI in Eastern Africa, analyzing both microeconomic and macroeconomic perspectives through frameworks like neoclassical and Tobin's Q theories. It traced China's FDI evolution from resource-focused (2000s) to market-driven (post-2010) investments, identifying key determinants including infrastructure, trade openness, and human capital. While acknowledging FDI's potential to boost productivity and capital accumulation, it concluded that benefits hinge on host-country factors like institutional quality and absorptive capacity, highlighting ongoing debates about FDI's growth versus dependency effects.

Chapter two analyzed CFDI's growth impact through two theoretical lenses: the neoclassical Solow model, which views CFDI as boosting short-term growth through capital accumulation but requiring exogenous innovation for long-term gains, and endogenous growth theory (Romer, Lucas), which emphasizes human capital, knowledge spillovers, and institutions as sustainable growth drivers where CFDI adds value through technology transfer. The Solow model which assumes economic growth through capital accumulation stood to be the central theory for this research due to the fact that CFDI directly increases the capital stocks like infrastructure, technology and factories. This was made evident by the coefficient of the lagged Gross Capital Formation as a percentage of GDPpc $\mathbf{(GCFpGDP)_{t-1}}$ being statistically significant hence confirming the theory's assumption.

Chapter 3 employed panel data analysis utilizing GMM modeling and the results showed China's FDI had a small but significant positive effect (0.027%) on growth (supporting **H1**) which implies that 1% increase in CFDI in a given year induces 0.027% rise of GDP per capita in the following year with domestic investment (0.001%) also contributing (validating **H2**), while inflation exerted minimal negative influence and trade openness proved insignificant. The Trade Openness insignificance in the GMM model compared to its significance in the static panel models could be

because of data system problem which means statistical systems (data collection and its availability) differ from country to country . The strong path dependence (0.278% lagged effect) highlighted historical growth patterns' importance, leading to the conclusion that while China's FDI contributes to Eastern African growth, its limited magnitude necessitates complementary policies to improve investment quality, domestic capital efficiency, and macroeconomic stability for greater developmental impact.

Policy Recommendations Summary

To maximize the benefits of China's FDI in Eastern Africa, governments should implement targeted policies to enhance investment quality and economic stability. First, attracting high-value CFDI in manufacturing and technology sectors rather than just resource extraction can create stronger domestic linkages. Implementing local content requirements would further ensure CFDI generates employment, skills transfer, and backward linkages to local firms.

Improving domestic investment efficiency is equally critical. While domestic capital formation (GCFpGDP) contributes to growth, its impact remains limited. Policymakers should focus on optimizing capital allocation, reducing bureaucratic inefficiencies and strengthening financial systems. Public-private partnerships (PPPs) can play a key role in infrastructure development, lowering business costs and boosting productivity.

Macroeconomic stability must also be prioritized. Central banks should adopt balanced monetary policies to curb inflation without stifling investment, while fiscal discipline and exchange rate management can help mitigate imported inflation, especially in import-dependent economies.

To boost trade openness benefits, Eastern Africa countries should reduce trade barriers, improve infrastructure, and deepen regional integration under African Continental Free Trade Area (AfCFTA). Policies must support export diversification, help local firms enter global markets, and protect emerging industries during transition

GENERAL CONCLUSION.

Limitations and Future Research

The study faced limitations due to its reliance on macroeconomic data, which may obscure sector-specific and regional variations in CFDI's effects. Future research could overcome this by utilizing firm-level analyses to better understand how CFDI influences local businesses and supply chains. Additionally, while the GMM model accounted for endogeneity, extending the timeframe or employing nonlinear approaches could provide deeper insights into whether CFDI's growth impact evolves, strengthens or weakens over longer periods.

Further research should expand beyond traditional economic metrics to examine CFDI's broader developmental outcomes. Incorporating indicators like poverty reduction, income inequality, and environmental sustainability would offer a more comprehensive assessment of whether CFDI contributes to inclusive and sustainable growth. Such multidimensional analysis could better inform policies that maximize CFDI's benefits while mitigating potential negative social or environmental consequences. Additionally, the future research should also introduce other independent variables like human capital and as well account for time-invariant factors like geography, colonial history and cultural traits because they often explain persistent differences in economic outcomes across countries but are omitted in standard panel models (like fixed effects). By incorporating time-invariant controls (via hybrid models or hierarchical approaches), studies can isolate FDI’s causal role while capturing unobserved heterogeneity, improving policy relevance.

APPENDICES

A. MODELS

Appendix A1: POOLED OLS MODEL

```
Pooling Model

Call:
plm(formula = log_GDPpc ~ log_CFDI + GCFpGDP + infldefl + TradeOp,
    data = pr_pdata, effect = "individual", model = "pooling")

Balanced Panel: n = 11, T = 20, N = 220

Residuals:
    Min.  1st Qu.   Median  3rd Qu.     Max.
-1.55201 -0.63209  0.10439  0.53914  1.74080

Coefficients:
               Estimate  Std. Error t-value  Pr(>|t|)
(Intercept)  5.38749523  1.01300668  5.3183  2.62e-07 ***
log_CFDI     0.09649773  0.17213597  0.5606 0.5756607
GCFpGDP     -0.01995341  0.00579412 -3.4437 0.0006896 ***
infldefl     0.00031899  0.00104402  0.3055 0.7602523
TradeOp      0.02267487  0.00121690 18.6333 < 2.2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    315.06
Residual Sum of Squares: 119.23
R-Squared:      0.62156
Adj. R-Squared: 0.61452
F-statistic: 88.2802 on 4 and 215 DF, p-value: < 2.22e-16
```

Appendix A2: WITHIN MODEL(FEM)

```
Oneway (individual) effect Within Model

Call:
plm(formula = log_GDPpc ~ log_CFDI + GCFpGDP + infldefl + TradeOp,
    data = pr_pdata, effect = "individual", model = "within")

Balanced Panel: n = 11, T = 20, N = 220

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-0.373488 -0.087930 -0.003579  0.093533  0.500152

Coefficients:
           Estimate Std. Error t-value  Pr(>|t|)
log_CFDI 0.14660530 0.03841397  3.8165 0.0001792 ***
GCFpGDP  0.00599837 0.00201333  2.9793 0.0032376 **
infldefl 0.00010119 0.00022007  0.4598 0.6461557
TradeOp  0.00267125 0.00094412  2.8293 0.0051279 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    5.6921
Residual Sum of Squares: 4.338
R-Squared:      0.23788
Adj. R-Squared: 0.18584
F-statistic: 15.997 on 4 and 205 DF, p-value: 2.0497e-11
```

APPENDICES.

Appendix A3: BETWEEEN MODEL(FEM)

```
Oneway (individual) effect Between Model

Call:
plm(formula = log_GDPpc ~ log_CFDI + GCFpGDP + infldefl + TradeOp,
    data = pr_pdata, effect = "individual", model = "between")

Balanced Panel: n = 11, T = 20, N = 220
Observations used in estimation: 11

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-0.951648 -0.693020  0.018086  0.563479  1.056155

Coefficients:
               Estimate  Std. Error t-value Pr(>|t|)
(Intercept)  5.8486e+00  1.3279e+01  0.4404  0.67505
log_CFDI     2.8569e-02  2.2548e+00  0.0127  0.99030
GCFpGDP     -2.6376e-02  4.9571e-02 -0.5321  0.61378
infldefl    -8.0245e-05  1.8393e-02 -0.0044  0.99666
TradeOp      2.4107e-02  7.0613e-03  3.4140  0.01425 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    15.468
Residual Sum of Squares: 5.214
R-Squared:      0.66292
Adj. R-Squared: 0.43821
F-statistic: 2.95005 on 4 and 6 DF, p-value: 0.11447
```

Appendix A4: RANDOM EFFECT MODEL(REM)

```
Oneway (individual) effect Random Effect Model
   (Swamy-Arora's transformation)
Call:
plm(formula = log_GDPpc ~ log_CFDI + GCFpGDP + infldefl + TradeOp,
    data = pr_pdata, effect = "individual", model = "random")
Balanced Panel: n = 11, T = 20, N = 220
Effects:
                 var std.dev share
idiosyncratic 0.02116 0.14547 0.024
individual    0.86794 0.93163 0.976
theta: 0.9651

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-0.385806 -0.081771 -0.017000  0.081573  0.511082
Coefficients:
              Estimate Std. Error z-value  Pr(>|z|)
(Intercept) 5.79616856 0.36179508 16.0206 < 2.2e-16 ***
log_CFDI    0.14526331 0.03885296  3.7388 0.0001849 ***
GCFpGDP     0.00562423 0.00203179  2.7681 0.0056382 **
infldefl    0.00010267 0.00022262  0.4612 0.6446841
TradeOp     0.00304976 0.00094665  3.2216 0.0012747 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    6.0687
Residual Sum of Squares: 4.6571
R-Squared:      0.23261
Adj. R-Squared: 0.21833
Chisq: 65.1691 on 4 DF, p-value: 2.3706e-13
```

APPENDICES.

Appendix A5: SUMMARY OF THE MODELS

COMPARISONS OF MODELS

	GDP per Capita			
	log_GDPpc			
	PooledOLS	between	within	REM
	(1)	(2)	(3)	(4)
Chinese FDI	0.096	0.029	0.147***	0.145***
	(0.172)	(2.255)	(0.038)	(0.039)
Domestic Investment	-0.020***	-0.026	0.006***	0.006***
	(0.006)	(0.050)	(0.002)	(0.002)
Inflation	0.0003	-0.0001	0.0001	0.0001
	(0.001)	(0.018)	(0.0002)	(0.0002)
Trade Openness	0.023***	0.024**	0.003***	0.003***
	(0.001)	(0.007)	(0.001)	(0.001)
Constant	5.387***	5.849		5.796***
	(1.013)	(13.279)		(0.362)
Observations	220	11	220	220
R2	0.622	0.663	0.238	0.233
Adjusted R2	0.615	0.438	0.186	0.218
F Statistic	88.280*** (df = 4; 215)	2.950 (df = 4; 6)	15.997*** (df = 4; 205)	65.169***
Note:				*p<0.1; **p<0.05; ***p<0.01

B. TESTS

Appendix B1: F-TEST (WITHIN VS POOLED OLS)

```
F test for individual effects

data:  log_GDPpc ~ log_CFDI + GCFpGDP + infldefl + TradeOp
F = 542.95, df1 = 10, df2 = 205, p-value < 2.2e-16
alternative hypothesis: significant effects
```

Appendix B2: TEST BREEUSCH-PAGAN (REM VS. POOLEDOLS)

```
Lagrange Multiplier Test - (Breusch-Pagan)

data:  log_GDPpc ~ log_CFDI + GCFpGDP + infldefl + TradeOp
chisq = 1603.1, df = 1, p-value < 2.2e-16
alternative hypothesis: significant effects
```

APPENDICES.

Appendix B3: TEST DE HAUSMAN (FEM VS. REM)

```
Hausman Test

data:  log_GDPpc ~ log_CFDI + GCFpGDP + infldefl + TradeOp
chisq = 30.166, df = 4, p-value = 4.528e-06
alternative hypothesis: one model is inconsistent
```

Appendix B4: WOOLDRIDGE TEST FOR AUTOCORRELATION

```
Breusch-Godfrey/Wooldridge test for serial correlation in panel models

data:  log_GDPpc ~ log_CFDI + GCFpGDP + infldefl + TradeOp
chisq = 146, df = 20, p-value < 2.2e-16
alternative hypothesis: serial correlation in idiosyncratic errors
```

Appendix B5: BREUSCH-PAGAN TEST FOR HETEROSCEDASTICITY

```
studentized Breusch-Pagan test

data:  within_model
BP = 21.082, df = 4, p-value = 0.000305
```

C. GENERALIZED METHOD FOR MODELS (GMM)

Appendix C1: SUMMARY OF GMM.

```
Oneway (individual) effect One-step model System GMM

Call:
pgmm(formula = diff(log_GDPpc) ~ lag(diff(log_GDPpc), 1) + lag(diff(log_CFDI),
    1) + lag(GCFpGDP, 1) + infldefl + lag(TradeOp, 1) | lag(log_GDPpc,
    2:3), data = pr_pdata, effect = "individual", collapse = TRUE,
    transformation = "ld", steps = 1, robust = TRUE)

Balanced Panel: n = 11, T = 20, N = 220

Number of Observations Used: 385
Residuals:
      Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
-0.1983572 -0.0145077  0.0000000  0.0006583  0.0169724  0.3545063

Coefficients:
                        Estimate  Std. Error z-value  Pr(>|z|)
lag(diff(log_GDPpc), 1)  2.7788e-01  5.2320e-02  5.3111 1.089e-07 ***
lag(diff(log_CFDI), 1)   2.7189e-02  9.5586e-03  2.8445  0.004448 **
lag(GCFpGDP, 1)          5.0916e-04  1.8919e-04  2.6912  0.007119 **
infldefl                -1.1338e-04  1.5813e-05 -7.1698 7.510e-13 ***
lag(TradeOp, 1)          4.2828e-05  3.2671e-05  1.3109  0.189896
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Sargan test: chisq(8) = 10.52377 (p-value = 0.23017)
Autocorrelation test (1): normal = -2.388311 (p-value = 0.016926)
Autocorrelation test (2): normal = -0.693963 (p-value = 0.48771)
Wald test for coefficients: chisq(5) = 1243.85 (p-value = < 2.22e-16)
```

APPENDICES.

C2: GMM RESULT

System GMM Results

Dependent Variable:GDP per capita(Δlog(GDPpc))	
Lagged GDP Growth (Δlog(GDPpc), t-1)	0.278***
	(0.052
Lagged FDI Growth (Δlog(CFDI), t-1)	0.027***
	(0.010)
Lagged Gross Capital Formation (GCFpGDP, t-1)	0.001***
	(0.0002)
Inflation (infldefl)	-0.0001***
	(0.00002)
Lagged Trade Openness (TradeOp, t-1)	0.00004
	(0.00003)
Sargan Test (p-value)	0.23
AR(1) Test (p-value)	0.017
AR(2) Test (p-value)	0.488
Observations	
Observations	11

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

*** p < 0.01, ** p < 0.05, * p < 0.1. Robust standard errors in parentheses.

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Abstract/

This study analyzes the impact of China's Foreign Direct Investment (CFDI) on economic growth in 11 East African countries over the period 2003–2022, based on the Neoclassical growth theory. Using panel data econometrics, it compares Pooled OLS, Fixed Effects (FEM), and Random Effects (REM) models. Although diagnostic tests initially supported the FEM model, the presence of serial correlation and heteroskedasticity led to the adoption of the dynamic GMM approach. Results indicate that a 1% increase in the growth of Chinese FDI leads to a 0.027% rise in GDP per capita in the following year. The study concludes that Chinese FDI significantly contributes to economic growth in East Africa, supporting policies aimed at attracting and effectively managing such investments.

Keywords: Chinese FDI, economic growth, East Africa, panel data, GMM, fixed effects, foreign investment.

Résumé :

Cette étude examine l'impact de l'investissement direct étranger chinois (CFDI) sur la croissance économique dans 11 pays d'Afrique de l'Est entre 2003 et 2022, en s'appuyant sur la théorie néoclassique de la croissance. En mobilisant des méthodes économétriques en données de panel, elle compare les modèles Pooled OLS, effets fixes (FEM) et effets aléatoires (REM). Bien que les tests initiaux aient privilégié le modèle à effets fixes, la présence d'autocorrélation et d'hétéroscédasticité a conduit à l'adoption du modèle dynamique GMM. Les résultats révèlent qu'une augmentation de 1 % de la croissance de le CFDI entraîne une hausse de 0,027 % du PIB par habitant l'année suivante. L'étude conclut que le CFDI joue un rôle significatif dans la croissance économique en Afrique de l'Est, ce qui justifie des politiques d'attractivité et de gestion efficace de ces flux.

Mots-clés : IDE chinois, croissance économique, Afrique de l'Est, données de panel, GMM, effets fixes, investissement étranger

ملخص:

تتناول هذه الدراسة تأثير الاستثمار الأجنبي المباشر الصيني على النمو الاقتصادي في 11 دولة من دول شرق إفريقيا خلال الفترة 2003–2022، بالاستناد إلى نظرية النمو الكلاسيكي الجديد. اعتمدت الدراسة على نماذج الاقتصاد القياسي لبيانات PANEL، حيث قارنت بين نماذج Pooled OLS ، التأثيرات الثابتة (FEM) ، والتأثيرات العشوائية (REM) . ورغم أن الاختبارات الأولية دعمت نموذج التأثيرات الثابتة، إلا أن ظهور الارتباط الذاتي وتغاير التباين دفع إلى استخدام نموذج GMM الديناميكي. أظهرت النتائج أن زيادة بنسبة 1% في نمو الاستثمار الصيني تؤدي إلى ارتفاع بنسبة 0.027% في الناتج المحلي الإجمالي للفرد في العام التالي. وتخلص الدراسة إلى أن الاستثمار الأجنبي الصيني يساهم بشكل ملموس في تعزيز النمو الاقتصادي في شرق إفريقيا، مما يدعم السياسات الرامية إلى جذب هذه التدفقات واستغلالها بكفاءة.

الكلمات المفتاحية: الاستثمار الأجنبي الصيني، النمو الاقتصادي، شرق إفريقيا، بيانات لوحية، نموذجGMM ، التأثيرات الثابتة، الاستثمار الأجنبي.