

UNIVERSITY OF GHANA

DEPARTMENT OF ECONOMICS



**TRADE OPENNESS AND ECONOMIC GROWTH: ANALYZING THE ROLE OF
HUMAN CAPITAL IN AFRICA.**

BY

**JOSEPH AUSTIN NYARKO
(10937795)**

**THIS THESIS/DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA,
LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD
OF MPhil IN ECONOMICS DEGREE.**



NOVEMBER 2024

DECLARATION

I, JOSEPH AUSTIN, NYARKO, hereby declare that this thesis is original research undertaken by me under the guidance of my supervisors; and except references to other people's work which have been duly cited, this thesis has neither in part nor on the whole been submitted for another degree elsewhere.



.....
JOSEPH AUSTIN NYARKO

(10937795)

8 / 11 / 2024

.....
DATE

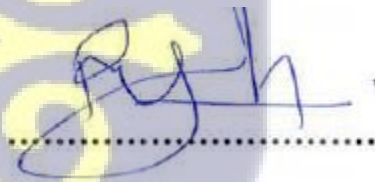


DR. PRISCILLA TWUMASI BAFFOUR

(SUPERVISOR)

26/09/2024

.....
DATE



DR. REBECCA NAA YAA AYIFAH

(SUPERVISOR)

26/09/2024

.....
DATE

INTEGRI PROCEDAMUS

DEDICATION

I dedicate this thesis to the Almighty God who granted me life and good health to see this through.
Also, to my family and friends who stood by me and motivated me throughout the thesis journey.
And finally, to the Department of Economics who granted me the opportunity of admission and guidance leading to this great success.



ACKNOWLEDGEMENT

I express my sincere gratitude to the almighty God who granted me life, health, and provision from my life's beginning until now. I also extend my heartfelt gratitude to my parents for their constant support and care throughout my academic journey.

Finally, I would like to express my profound gratitude to the senior members of the Department of Economics for the opportunity of admission offer and their unflinching guidance and rigorous grooming within this 2-year academic journey at the University of Ghana. And also, to my supervisors Dr. Priscilla Twumasi Baffour and Dr. Rebecca Naa Yaa Ayifah for their extra support in supervisory and counseling during my thesis period. And to my colleagues whom I toiled with to the end.

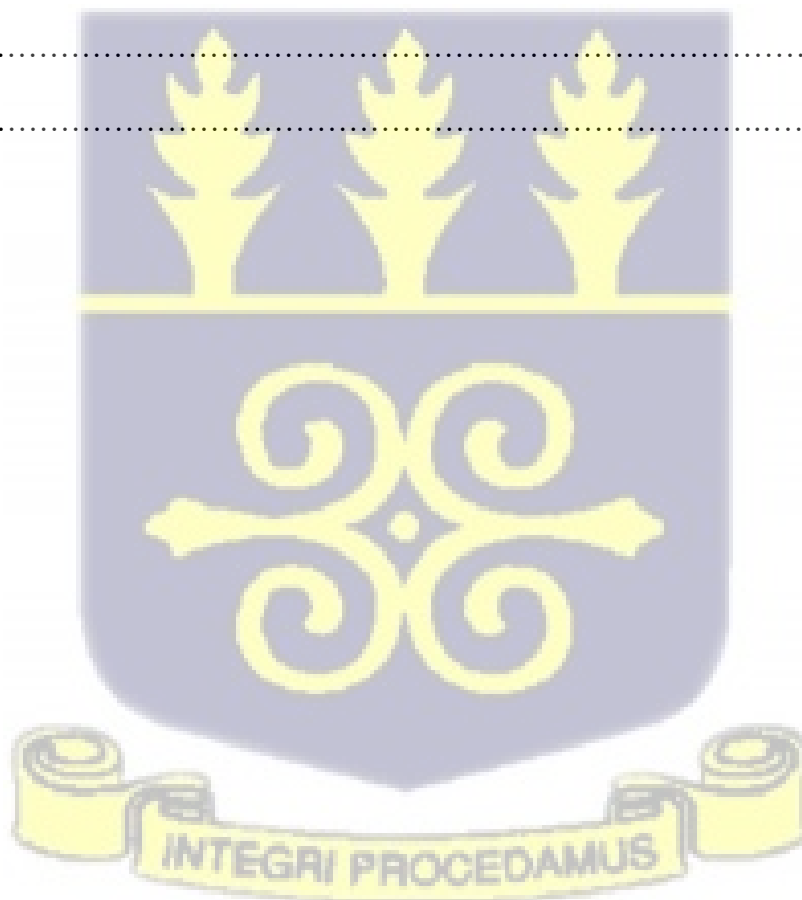


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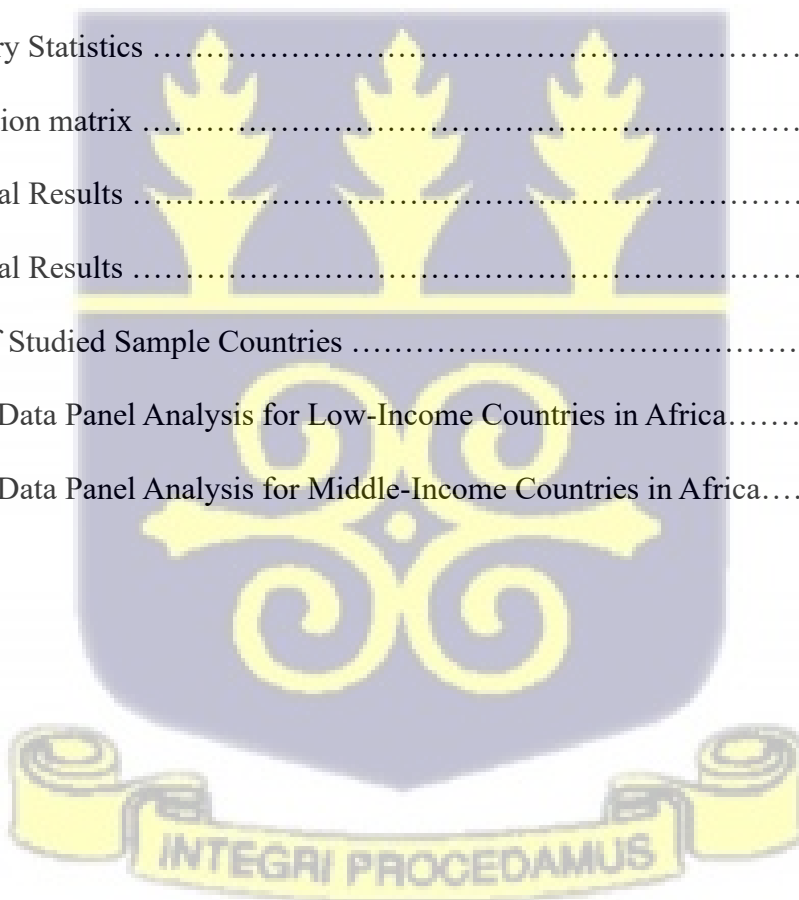
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ACRONYMS

ADF - Augmented Dickey-Fuller

AfCFTA – African Continental Free Trade Area

AU - African Union

GDP – Gross Domestic Product

GMM - Generalized Method of Moments

GNI - Gross National Income

HCA- Human Capital Accumulation

IMF - International Monetary Fund

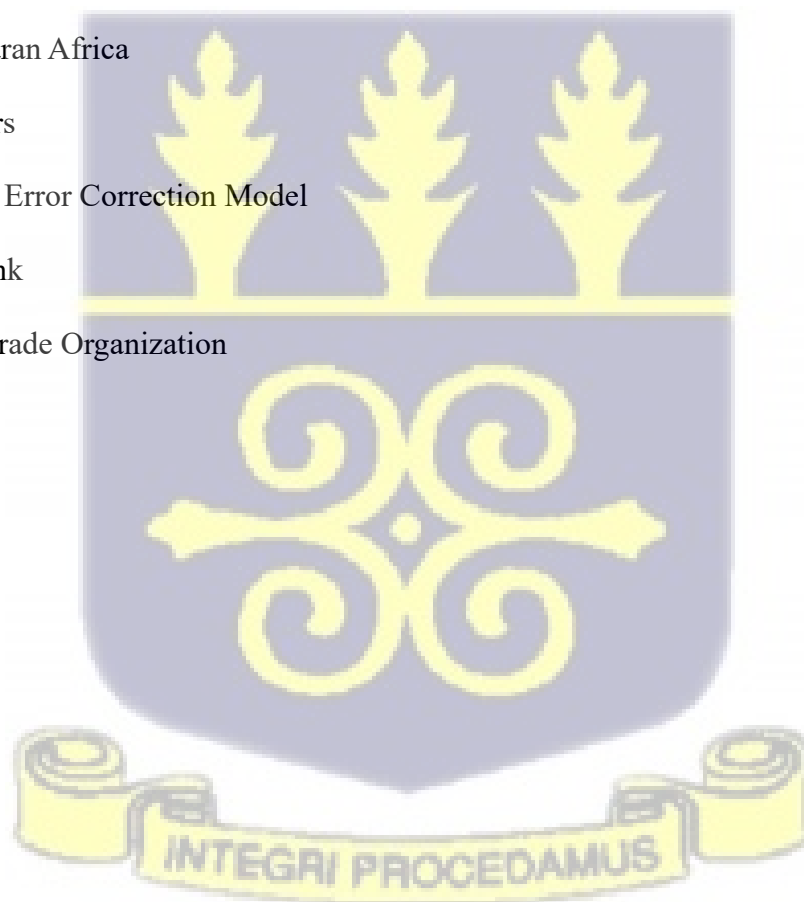
SSA – Sub-Saharan Africa

US\$ - US Dollars

VECM - Vector Error Correction Model

WB - World Bank

WTO - World Trade Organization



ABSTRACT

Over the past few decades, the implementation of numerous intra-African trade treaties has not been very successful for various reasons, including license and permit policies, increased transportation costs, inadequate infrastructure, etc. (see Turkson et al. (2023)). To achieve great success with intra-Africa trade, the African Union (AU) introduced the African Continental Free Trade Area (AfCFTA) treaty in June 2018 to enhance sustainable development throughout the African continent. The AU introduced the AfCFTA to foster intra-African trade through mutually advantageous trade agreements between member states. The policy aims to increase economic growth and lessen poverty in Africa by liberalizing trade. AfCFTA's primary goal is to establish a shared market for goods and services to achieve equitable and sustainable development throughout the continent in the next fifty years. Over the past years, empirical studies have yielded inconsistent findings regarding trade-driven growth in Africa and the global economy. To explain the reasons behind the conflicting results, Le Goff and Singh (2014) found that when a country has a highly developed financial sector, robust governance, and high levels of human capital, the full effect of trade-driven growth is realized. Therefore, this thesis examines how Human Capital Accumulation (HCA) functions in Africa's trade-growth nexus. The study employs the static panel approaches on 49 African countries from 2000 to 2020. The study shows that trade openness and human capital boost economic growth. The study also discovers that HCA mitigates the detrimental effects of trade openness on African economic growth. Thus, from the findings of the study it can be inferred that to ultimately profit from trade openness, individual countries must implement policies that promote human capital development to the point where they can compete globally.

CHAPTER ONE

INTRODUCTION

1.1 Background of study

Economic growth denotes an increase in a country's per capita income over time. A consistent increase in the Gross Domestic Product (GDP) of a nation is regarded as an important aspect of achieving economic development. Global policymakers have been focused on ensuring and maintaining GDP, as well as the factors that influence it. At the beginning of the 20th century, many economists tried to explain some of the elements that led to the consistent growth in GDP. Solow (1956), for example, argued in his widely read paper "A Contribution to the Theory of Economic Growth" that labor, physical capital, and technology were the primary drivers of economic growth as well as the cause of the GDP disparities between countries. The research went on to conclude that technology was an exogenous factor in the entire growth process. Many economists expanded on Solow's hypothesis along the way, arguing that technology was endogenous and that HCA was a critical factor in economic growth. The significant expansion of the four Asian Tigers (Taiwan, Hong Kong, South Korea, and Singapore), and later China, at the end of the 20th century, spawned a completely new debate, convincing many economists that international trade was the missing piece of the puzzle to increasing GDP and thus improving economic performance (see Le Goff and Singh (2014).

Trade-led growth theories advanced by Romer (1990) and Young (1991) in the early 1990s heightened the narrative, leading to numerous policymakers advocating for greater trade openness

among countries. The main conclusion of the theories was that developed and developing countries that opened their economies to international trade grew much faster than countries with closed economies. Grossman and Helpman (1990) argued that a country's ability to improve productivity and facilitate technological progress is heavily dependent on how open it is to international trade. Owing to the notion that trade openness is crucial for economic expansion, policymakers all over the world began to implement trade treaties, particularly in developing economies. Since the establishment of this hypothesis, the vast majority of economies, both developed and developing, have opened their doors to international trade.

An early empirical analysis of the trade-driven growth nexus of some economies in the world revealed results that were consistent with the theory's prediction, i.e., they discovered trade openness impacts economic growth positively (Edwards, 1998; Dollar, 1992; Warner, 1995; Frankel and Romer, 1999). A consensus on the nexus was then established until Rodrik and Rodriguez (2000) raised doubt on the general conclusion made by the previous researchers. The study attributed the conclusion made by the previous researchers on the nexus to various reasons ranging from how trade openness was measured, the availability of data, and the type of methodology used in the estimation. The structured and convincing criticisms about the trade-driven growth nexus raised questions about the conclusions made earlier and led many economists to question whether trade openness was beneficial or not. Some researchers analyzed the criticisms made by Rodrik and Rodriguez (2000) and dismissed most of their findings (see Warner, 2003; Fiestas, 2005). Though the majority of the criticisms were dismissed, a definitive conclusion on the relationship remained ambiguous. While most researchers discovered, for instance, that nations that opened up to international trade had a significant impact on economic growth for

example, Edwards (1992), Karras (2003), and Balassa (1978), some studies also asserted that openness to trade is harmful to economic expansion, especially in developing nations. For example, Rodriguez and Rodrik (2000). Also, the general notion that countries opened to international trade should have a substantial increase in economic growth didn't hold for most developing countries with time. This increased interest in finding reasons why developed nations profited more than developing nations from trade openness.

The lack of a clear connection between international trade and growth prompted researchers to review a substantial amount of literature beyond the points raised by Rodrik and Rodriguez (2000). Several economists have argued that early debates on trade openness and economic development largely emphasized the direct link between the two, rather than exploring the broader effects of trade on overall economic performance (For example Le Goff and Singh (2014). Early criticisms primarily targeted the measurement of trade, and the methodologies used to explain the trade-growth relationship, rather than examining how trade actually impacts economic growth.

A new school of thought emerged with the primary goal of determining the process through which openness to trade affects GDP growth. Le Goff and Singh (2014) were among the first to address the mechanism through which trade openness affects growth. The study aimed to determine the relationship between trade and poverty in Africa, concluding that trade has a fully realized impact on economic growth when the countries involved have a stronger financial system, strong governance, and high levels of human capital. This suggests that competent human resources are needed to adopt the technology and knowledge brought in by trade to be able to compete locally and internationally. It can then be argued, for the most part, that a high degree of human capital is required to take advantage of every opportunity that openness to international trade with other

countries presents. Hence, nations with more advanced levels of human capital benefit more from trade liberalization than nations with lower levels of human capital. Since developed and developing nations differ in how they accumulate human capital, comparisons can be made regarding the trade-led growth nexus.

In general, trade openness is determined by a nation's openness to global trade, i.e., the amount of goods and services it imports and exports. Trade openness has the potential to boost economic growth by facilitating access to goods and services, as well as increasing total productivity factors and optimizing resource allocation through the spread of both technology and knowledge. Keho (2017). Trade openness, according to Jadoon et al. (2015), has four major effects on economic growth: "knowledge transfer, technological advancement, capital accumulation, and factor price equality." Some of the advantages brought about by trade openness require human capital to be fully realized. Schultz (1961) defines human capital as knowledge and skills acquired by individuals over time through training, education, and work experience. A better-equipped labor force is more likely to adopt and use new technology, as well as benefit from other trade policies that promote economic growth. This means that for trade-related knowledge and technology to be beneficial to an economy, a well-developed human capital is required.

As previously stated, out of the three factors stated by Le Goff and Singh (2014), human capital is considered one of the major factors necessary to reap the full range of international trade advantages although strong governance and deeper financial are also necessary for the overall balance of the economy in order to benefit fully from trade openness. There has been a lot of research done on Africa in terms of institutional relevance and financial development in the trade-

led growth nexus. Matthew and Adegboye (2014), Yameogo and Omojolaibi (2021), and Akinlo and Okunlola (2021) have all explored the trade-led growth nexus through the relevance of institutions in Africa. Ibrahim and Sare (2018) have also done the same studies on the relevance of financial development. However, not much research has been done to show how trade influences growth in SSA by highlighting the importance of human capital.

In terms of other regions in the world, Soukiazis and Antunes (2012) and Haq and Luqman (2014) investigated the connection between trade openness and growth through the relevance of HCA in Europe and Asia respectively. Morris (1996) also explored the phenomenon behind the rapid growth of some of the countries in East Asia specifically four Asian Tigers (Taiwan, Hong Kong, Singapore, and South Korea) and concluded that although trade and other factors contributed greatly to their economic performance, the most significant factor among them was the development of human capital across all levels. Nonetheless, not much research has been conducted on the trade-growth nexus through the lens of human capital in Africa. Thus, the purpose of this thesis is to demonstrate the importance of HCA in the trade-driven growth in Africa.

The reason for going in this direction stems from the establishment of the AfCFTA by the African Union (AU). In an attempt to enhance sustainable development throughout the African continent, the AU introduced the AfCFTA to foster intra-African trade through mutually advantageous trade agreements between member states. Though the treaty was mentioned during the foundation of AU in 1963, the treaty came into realization in June 2018. Since then, all 54 state members of the African continent have appended their signatures to be part of the treaty. AfCFTA is expected to be the largest global free trade area created since the World Trade Organization (WTO). AfCFTA's

primary goal is to establish a single common market. for products and services to attain inclusive and sustainable development across the continent over the next 50 years. The policy aims to increase economic growth and lessen poverty in Africa by liberalizing trade.

Trade liberalization refers to the process of eliminating or lowering limitations or obstacles to the unrestricted flow of goods and services between nations. Trade liberalization among countries leads to more openness to international trade, hence the reason for discussing the issue from the point of trade openness. Therefore, the key query is: given the degree of human capital development in African nations, will these countries gain from increased trade openness? In contrast to other continents worldwide, Africa is still among the world's poorest continents. World Bank (2023) separated the 54 African nations into four categories (lower income, lower middle income, upper middle income, and high income). This was calculated using the Gross National Income (GNI) per capita for 2022. In terms of percentage, 85% of African nations are classified as lower-middle-income and low-income.

In addition, the literacy rate in these countries is lower compared to the countries in the upper and high-income categories. The low-income and lower-middle-income categories recorded an average literacy rate of 68.13% compared to the upper-middle and high-income countries which recorded a rate of 89.95% and 96.20% respectively as of 2020 World Bank (2023). Taking it on the human capital index side, the four categories of economies (lower income, lower middle income, upper middle income, and high income) recorded an index of 0.364, 0.4317, 0.4730, and 0.632 respectively (World Bank, 2023). Nonetheless, African countries' trade openness has increased significantly over the last few decades, but the benefits of opening up to foreign trade

have not yet materialized as expected. This begs the question of whether trade liberalization will benefit all African countries or if it will exacerbate inequity among African countries.

As discussed earlier, much emphasis is supposed to be placed on the mechanism through which international trade affects economic growth. This thesis will investigate how trade openness affects economic growth in Africa with HCA considered as an interactive factor. This will assist in determining whether trade openness has a noteworthy impact on economic performance in Africa when the required minimum education level is considered. This will also help conclude if the recently proposed free trade agreement will benefit the African continent and help reduce poverty.

1.2 Problem Statement

In many developing regions, particularly in Africa, the relationship between trade openness and economic growth remains ambiguous and contested. While some economies have experienced growth spurts following liberalization policies, others have seen little to no improvement or even declines in economic performance. This inconsistency in outcomes raises important questions about the underlying mechanisms linking trade policy and growth in the African context. Many researchers have tried to establish the relationship empirically using various econometric techniques on wide ranges of data across countries. (Yameogo and Omojolaibi, 2021; Akinlo and Okunlola, 2021; Ibrahim and Sare, 2018). Nevertheless, the results obtained vary across countries and continents.

Yanikkaya (2003) found that trade openness has a substantial positive impact on economic growth, especially in developing nations. However, Sumbal et al. (2014) carried out comparable studies on

80 developing countries and concluded that international trade has a detrimental effect on growth in the economy.

The same ambiguity can be found when discussing the empirical results in Africa. Onafowora and Owoye (1998), Brueckner and Lederman (2015), and Asfaw (2015) investigated the relationship between trade openness and economic performance in SSA and concluded that trade openness is beneficial to SSA. Zahonogo (2016) on the other hand, did a similar study on 42 SSA countries and concluded that drivers of international trade hinder economic growth. The differences in the empirical conclusions are primarily attributable to the kind of data, the econometric methods applied, and, above all, the failure to establish the mechanism by which openness to international trade affects economic performance.

Now, regarding the mechanism through which trade openness affects economic growth, Le Goff and Singh (2014) examined the circumstances in Africa and argued that for the influence of global trade on economic performance to be completely realized the countries in question ought to have a deeper financial sector, strong governance, and high levels of human capital accumulation. In light of these findings, a thorough investigation has been carried out regarding the importance of financial growth and institutions in the trade-led growth nexus in Africa, for example, Yameogo and Omojolaibi (2021); Akinlo and Okunlola (2021) and Ibrahim and Sare (2018). However, nothing has been done regarding that of human capital in the SSA. However, this line of inquiry into the significance of HCA in the trade-led growth nexus has been exhausted in some regions of the world. Soukiazis and Antunes (2012) performed such research in European countries and concluded the interactive terms of human capital and trade openness are statistically insignificant.

Furthermore, Haq and Luqman (2014) conducted a study on nine Asian countries. and discovered that the interaction of HCA and trade openness has a positive impact on growth. Sumbal et al. (2014) also did it on developing and developed nations and concluded that the interactive term exhibited a positive and significant impact. Jadoon et al. 2015 also conducted the same research on both developed and developing countries in Asian countries and concluded that countries with higher human capital accumulation benefited more from trade openness than countries with lower human capital accumulation.

Though this research has been done on certain regions, namely, Europe, America, and Asia, it is necessary to explore the relationship in Africa. It is important to embark on such an investigation given that the African continent has low human capital development as compared to the other studied regions. This helps determine if the obtained results in the other region will be consistent with that of the African continent given the disparities in HCA. Table 1 gives insight into the difference in human capital development among the various regions in the world as per the World Bank (2023). Using literacy rate and secondary school enrollment as a proxy for HCA, we compare the differences among all the regions. As seen in Table 1, in terms of literacy rate North America recorded the highest of 98.74 with SSA recording the lowest of 67.55%. Now taking into consideration secondary school enrollment, Europe and Central Asia recorded the highest of 104.15 with SSA recording the lowest of 44.38%. Given these distinctions and the fact that the effect of international trade on economic growth is dependent on HCA, it is critical to reconsider the nexus in light of the role of HCA in Africa.

Table 1. Literacy and Secondary Enrollment Rates by Region

Region	Literacy rate	Secondary Enrollment
East Asia & Pacific	96.002	89.993
Europe and Central Asia	98.505	104.146
Middle East and North Africa	79.762	77.565
South Asia	72.659	69.443
North America	98.740	101.356
Sub-Saharan Africa	67.547	44.381

Source: Author's illustrations based on data from the WDI database. World Bank (2023)

1.3 Research Questions

From the above analysis, this study seeks to answer these research questions:

- What is the effect of trade openness on economic growth in Africa?
- What is the effect of human capital on economic growth in Africa?
- What is the effect of the interactive term of trade openness and human capital on economic growth in Africa?

1.4 Research Objectives

Generally, this study seeks to examine the role of human capital in the international trade and economic growth nexus. The specific objectives of the study are:

- To determine whether trade openness has an effect on economic growth in Africa.
- To determine whether human capital has an effect on economic growth in Africa.
- To investigate whether the level of human capital determines the effect of trade openness on economic growth in Africa.

1.5 Significance of Study

Due to the general lack of clarity regarding the connection between trade openness and economic growth, this thesis will integrate human capital as a multiplicate variable to trade openness to find its impact on economic growth. This method aims to ascertain the importance of HCA in the trade-growth nexus in Africa. Consequently, this will help in drawing inferences about the level of HCA needed to realize the full effect of trade openness on economic growth in Africa. It will also assist governments in various countries to make favorable policies toward investment in human capital in order to get the full benefit from trade openness. This will also give an insight into the recent trade policy that is being adopted by the African continent. The trade policy that is AfCFTA has been established in order to liberalize trade across Africa. Trade liberalization will lead to more openness hence it's important to determine the impact of trade openness on economic growth considering the level of development of human capital in Africa now. This will help us get an idea of how the trade policy will work.

1.6 Methodology

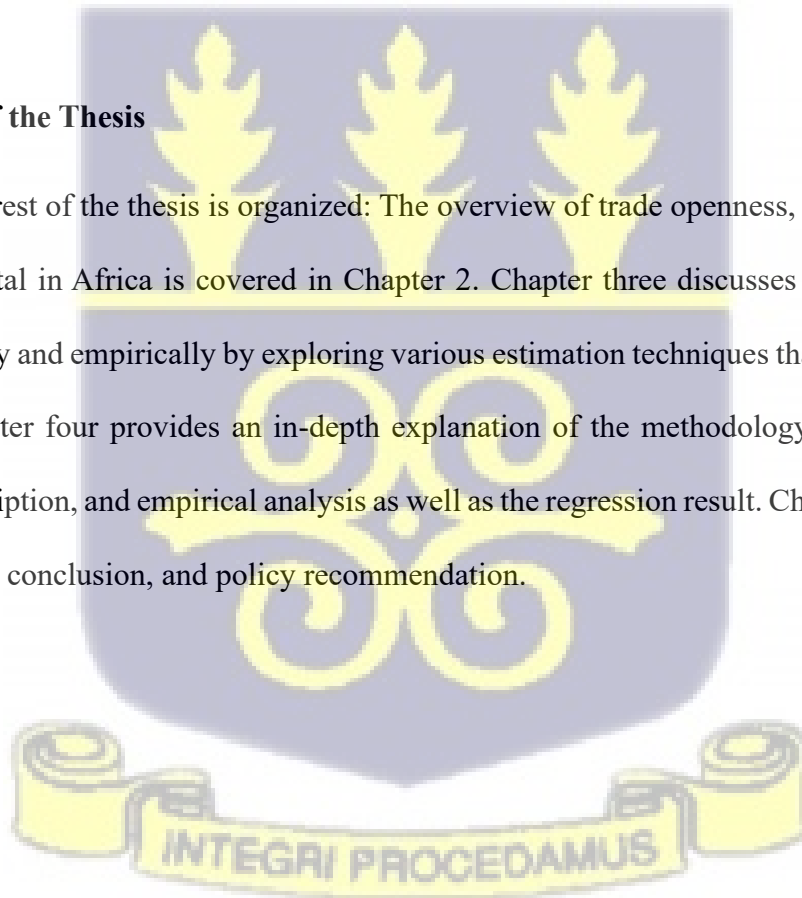
Over the years, the African continent has pushed for increased trade openness among countries. This is the context in which the free trade policy emerged. Hence, this thesis aims to examine trade-driven growth by considering human capital accumulation (HCA) across 49 African countries over the period 2000 to 2020. The list of sample countries used in the thesis is found in the appendix. The panel data analysis is based on endogenous growth model by Solow (1956).

The first model seeks to assess the individual effect of trade openness and HCA on economic expansion. To measure economic growth, GDP per capita is used as the dependent variable, and

trade openness and human capital are used as the independent variables. The purpose of the second model is to look into each nation's capacity for absorption. With this, the interaction of trade openness and HCA is included to estimate the model. Enrollment in secondary schools will be used as a proxy for human capital. Government spending, labor force, Foreign Direct Investment (FDI), and capital formation will be included in the model as a control variable. The data for the 49 countries selected come from World Development. Indicators (2023). The thesis will employ the panel data estimations (Pooled OLS model, Random Effect, or Fixed Effect) to estimate the model. The necessary panel estimation test, such as the Hausman-Taylor estimator, will be performed.

1.7 Structure of the Thesis

This is how the rest of the thesis is organized: The overview of trade openness, economic growth, and human capital in Africa is covered in Chapter 2. Chapter three discusses existing literature both theoretically and empirically by exploring various estimation techniques that were previously employed. Chapter four provides an in-depth explanation of the methodology employed in the study, data description, and empirical analysis as well as the regression result. Chapter Five focuses on the summary, conclusion, and policy recommendation.



CHAPTER 2

OVERVIEW OF TRADE OPENNESS, HUMAN CAPITAL AND ECONOMIC GROWTH IN AFRICA.

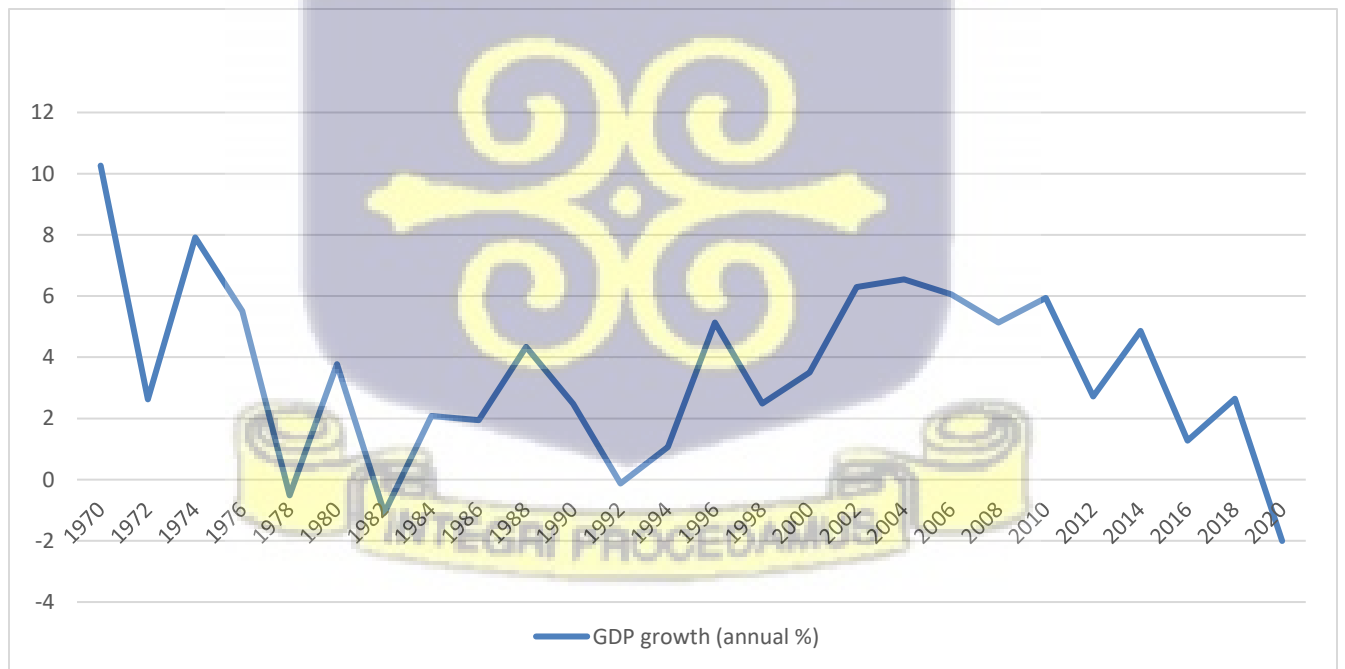
2.0 Introduction

This chapter provides an overview of trade openness, human capital, and economic growth in Africa. The chapter provides an in-depth analysis of the trends in the three variables studied.

2.1. Economic growth in Africa

Like other economic blocks in the world, the African continent has experienced periodic growth over the past decades. Figure 1 shows the trends in economic growth in Africa between 1970 and 2020.

Figure 1: Trends in Economic Growth in Africa, 1970-2020



Source: Author's illustrations based on data from WDI World Bank (2023)

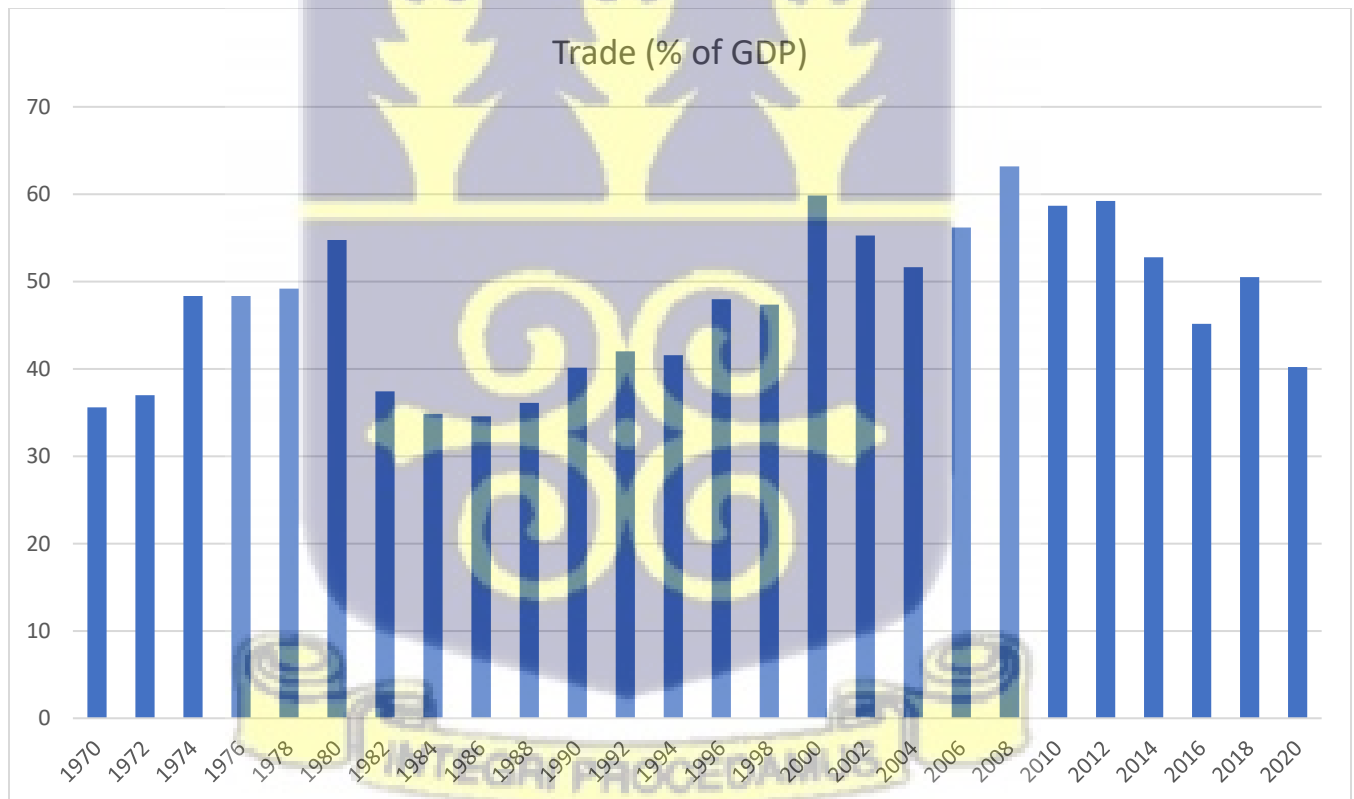
Figure 1 illustrates the trends that indicate that, in comparison to the 2000s, the economic growth of Africa was markedly higher in the 1970s. In 1970, economic growth peaked with a recorded growth rate of 10.26% (World Bank, 2023). This notable expansion is ascribed to the majority of African nations' post-independence fast industrialization in the 1960s (Steel and Evans, 1981). However, Africa's economic growth declined from 10.26% in 1970 to 2.6% in 1972. Economic growth eventually started picking up after 1972 to 7.9% in 1974 but started to have a drastic decline from 1974. By 1978, economic growth had worsened to -0.51%. According to Bloom et al. (2020), low rates of higher education enrollment in Africa were responsible for the low GDP growth observed between 1975 and 1990. Africa experienced fluctuations in growth up until 1998. Afterward, Africa experienced a steady growth up until 2010. Africa again experienced fluctuations in growth between 2010 and 2020 where it recorded a growth rate of -2.0% in 2020. (World Bank, 2023).

2.2. Trade Openness in Africa

Trade liberalization became a popular term among the African continent between the 1980s and 1990s. In the 1950s and 1960s, most of the countries on the African continent gained independence and right from the onset embarked on industrialization. In those years, most countries widely implemented the import substitution system. For example, Nigeria, Tanzania, and Zambia in the 1960s and Ghana and, Madagascar in the 1980s. The failure of the import substitution due to debt crises in the 1980s and early 1990s led to many countries embarking on trade liberalization. The liberalization was introduced to African countries through programs that were advocated by the International Monetary Fund (IMF) and the World Bank (WB). Reduction of restrictions and removal of tariffs were some of the conditions African countries needed to meet in order to receive

aid from the IMF and the WB. By 1995 almost all African countries were practicing open trade policies. “Africa’s average tariff rates dropped from 30% at the end of 1970s to 21% in early 1990s. Tariff rates continued to decrease and reached 13% in 2006” Mangir et al. (2017). This resulted in an increase in intra-African trade to 13% by 2012 (Turkson et al. (2023). The African Union then proposed the AfCFTA as a means of advancing intra-African trade in 2012, as a component of its promotion of the continent's sustainable growth. Preceding to that, the continent of Africa had created regional economic agreements to enhance trade across all of its main regions. For a more comprehensive discussion on regional and economic integration, refer to Turkson et al. (2023).

Figure 2: Trends in Trade Openness in Sub-Saharan Africa, 1970-2020



Source: Author’s illustrations based on data from WDI. World Bank (2023)

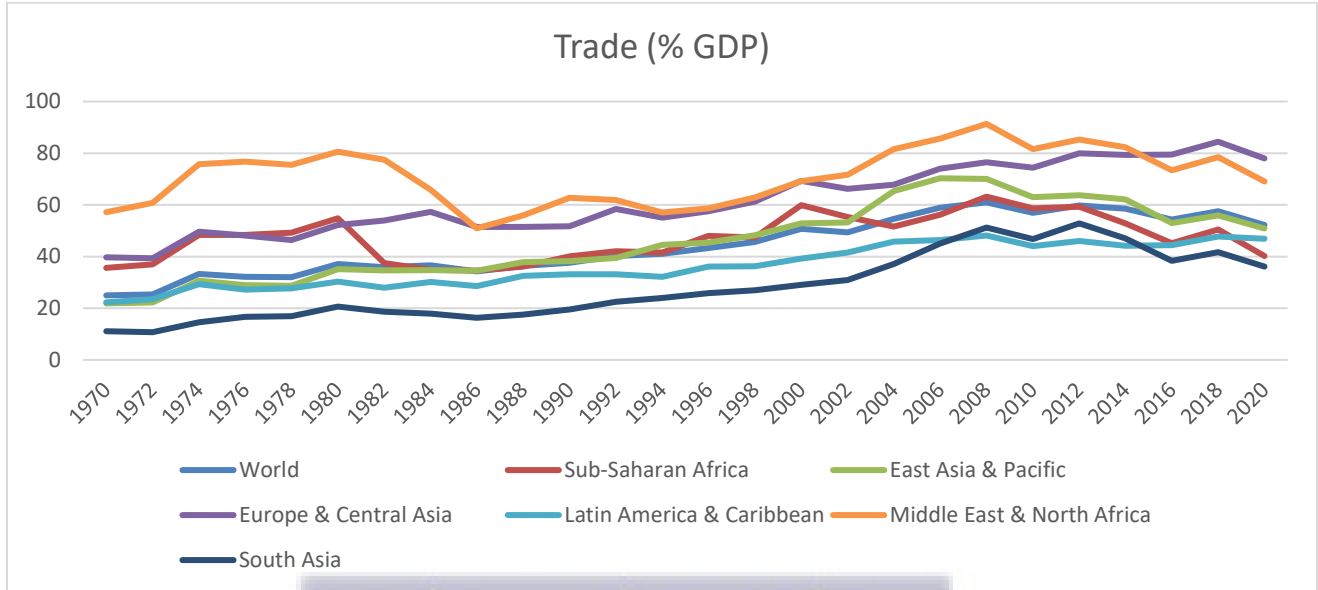
Figure 2 displays the changes in SSA's trade openness between 1970 and 2020. The trends depicted in Figure 2 show an upward trend in trade openness during the 1970s up until 1980. This upward trend can be attributed to the promotion of industrialization in SSA post-colonial rule. SSA experienced a drastic decline in trade openness during the early 1980s and recorded the continent's lowest trade openness of 34.86% in 1986.

This is attributed to the failure of the import substitution system in the early 1980s. However, the introduction of recovery programs by the IMF and the WB saw the continent experience a steady increase in trade openness from 1988. SSA recorded a high trade openness of 59.8% in 2000 since the inception of the programs and reached 63.18% in 2008. However, following the drop in global trade as a result of the 2008 global recession, SSA's trade openness declined to 55.84% in 2009 before rising to 58.67% in 2010. During the period between 2010 and 2020, SSA's trade openness has experienced major fluctuations with the lowest recorded in 2020 at 40.19%. This is attributed to the 2020 COVID-19 (World Bank, 2023).

Figure 3 compares the trade openness of SSA with other economic blocks in the world. Among all the regions, North Africa and Middle East recorded the highest trade openness of 91.3% in 2008. SSA has fared well with all the regions with only “Europe and Central Asia” and Middle East and “North Africa” recording higher than it has. SSA has had a steady growth in trade openness above the world averages up until 2012.



Figure 3: Trends in Trade Openness, by region 1970-2020



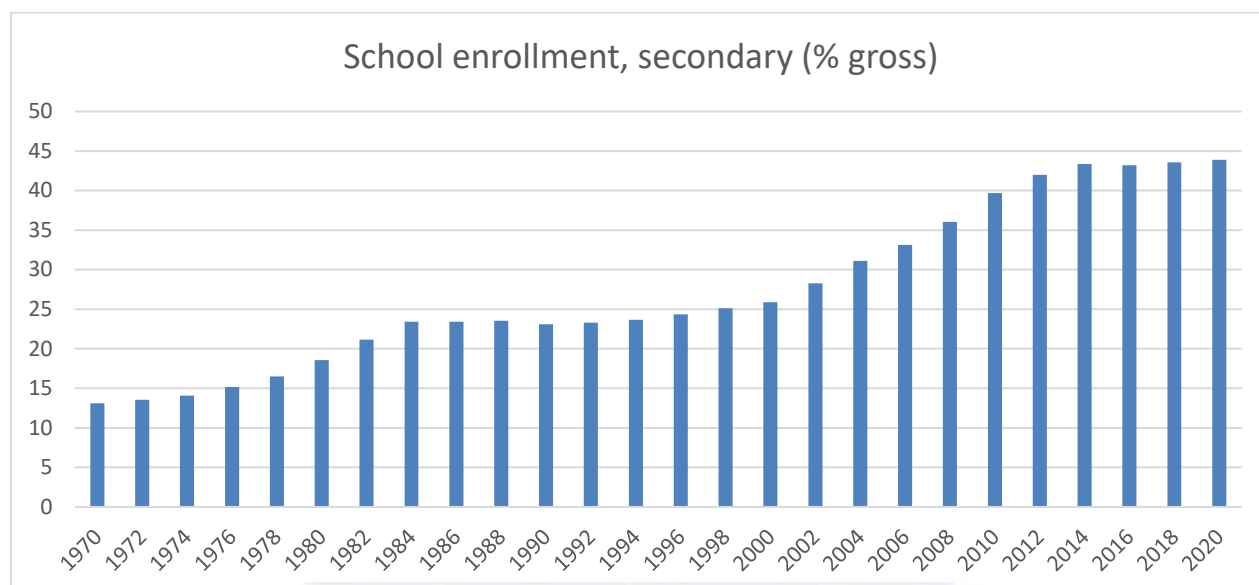
Source: Author's illustrations based on data from WDI. World Bank (2023)

2.3. Human Capital Development in Africa

In terms of HCA, Figure 4 depicts the trend in secondary school enrollment in SSA. The trend depicts a steady increase in school enrollment from 13.1% in 1970 to 23.4% in 1984. Growth in school enrollment stalled from 1984 to 1994. After 1994, SSA experienced a steady increase in secondary enrollment from 23.64% in 1994 to 43.9% in 2020

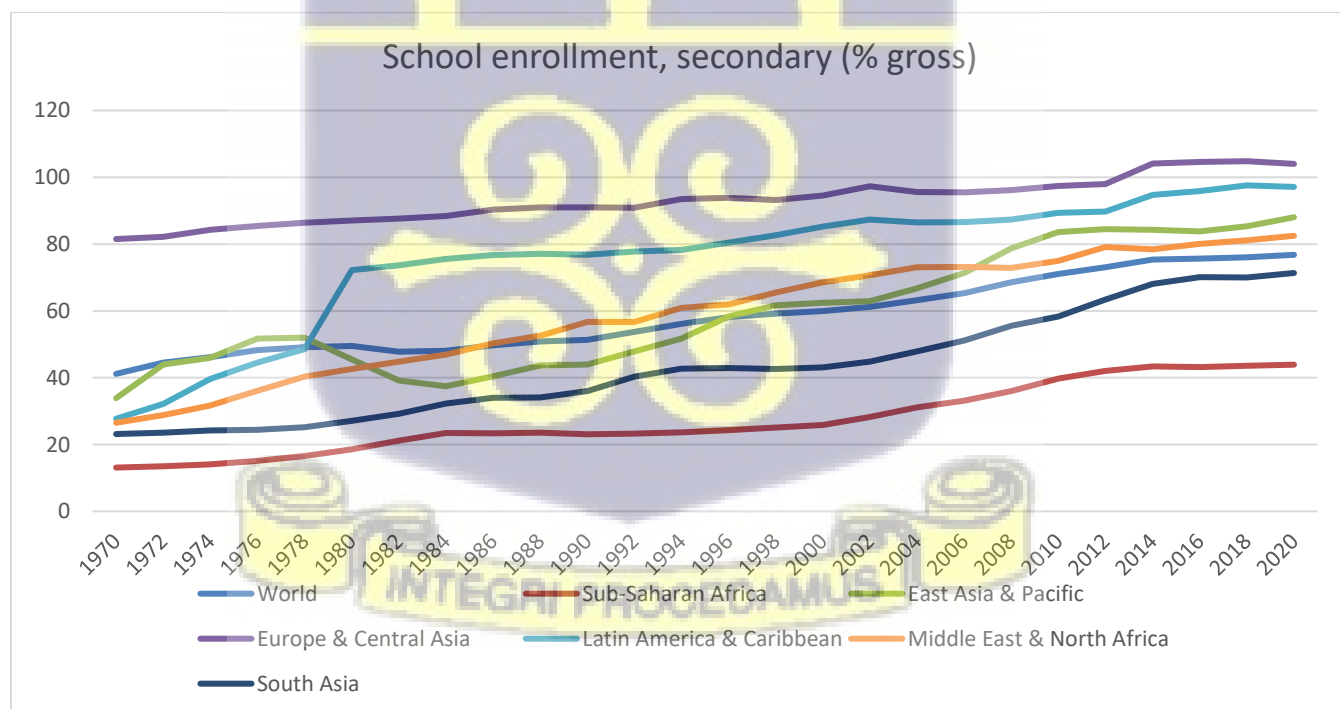
Figure 5 compares the level of human capital of SSA with other economic blocks in the world. Among all the regions, Europe and Central Asia are the region with the highest level of secondary school enrollment. Although school enrollment in all regions has been steadily increasing, SSA has the lowest secondary school enrollment rate of any region.

Figure 4: Trends in Secondary school enrollment in Sub-Sahara Africa, 1970-2020



Source: Author's illustrations based on data from WDI. World Bank (2023)

Figure 5: Trends in Secondary school enrollment by region 1970-2020



Source: Author's illustrations based on data from WDI. World Bank (2023)

CHAPTER 3

LITERATURE REVIEW

3.0 Introduction

This chapter presents a review of the theoretical and empirical literature on the relationship between economic growth and trade openness and the role human capital plays in ensuring the full realization of the impact of trade openness. The chapter also discusses the depth of empirical literature by considering the dataset, scope of study, and methodologies used.

3.1 Theoretical Literature and Conceptual Framework.

3.1.0 Endogenous Growth Theory and Its Relevance to Trade Openness and Human Capital

While the Solow growth model and its augmented version by Mankiw, Romer, and Weil (1992) provide a useful foundation for understanding long-run economic growth through the accumulation of physical and human capital, the model remains limited in explaining sustained growth without exogenous technological progress. To address these limitations, endogenous growth theories were developed in the late 1980s and early 1990s, emphasizing that long-run growth can be explained by factors that are determined within the economic system, especially human capital accumulation, innovation, and knowledge spillovers.

Lucas (1988) was among the first to formalize the role of human capital in growth theory, suggesting that investments in education and the skills of the labor force generate increasing returns to scale. In these models, human capital not only contributes directly to production but also

enhances the productivity of other inputs, including physical capital. Thus, human capital accumulation is not subject to diminishing returns in the same way as in the Solow framework.

This view supports the inclusion of human capital as a key explanatory variable in empirical analysis. It also justifies policies aimed at improving educational outcomes and skills development as mechanisms for fostering long-run economic growth in developing countries, including those in Africa.

Endogenous growth theory also allows for the inclusion of trade openness as a determinant of growth through channels such as technology diffusion, increased competition, and access to larger markets. Romer (1990), for instance, emphasizes the role of ideas and technological innovation in driving productivity. Through trade, countries can access foreign technologies, benefit from knowledge spillovers, and improve their resource allocation efficiency. In open economies, exposure to international markets can accelerate innovation and learning-by-doing, especially when combined with domestic absorptive capacity, which is largely a function of human capital levels. Thus, trade openness and human capital development are mutually reinforced in the context of endogenous growth models.

Bringing together these insights, the conceptual model guiding this study posits that economic growth in developing countries is influenced not only by the accumulation of capital but also by the degree of openness to international trade and the development of human capital. Within the endogenous growth framework, these variables can generate sustained increases in output by enhancing productivity and fostering innovation. Hence, the empirical analysis aims to assess the

effect of trade openness and human capital development on economic growth, grounded in theoretical models that explicitly recognize these mechanisms as internal to the growth process.

3.1.1 Economic Growth and Trade Openness

Classical trade theory, pioneered by Adam Smith and Ricardo (1817), emphasizes the benefits of international trade based on comparative advantage. Smith's theory of absolute advantage suggests that countries benefit from specializing in goods they can produce more efficiently. Ricardo advanced this idea by showing that trade can be beneficial even when one country is more efficient in producing all goods, as long as there are differences in relative efficiency. These theories are foundational to the belief that openness to trade fosters economic growth by allowing countries to allocate resources more efficiently, increase output, and benefit from specialization.

The Heckscher-Ohlin (H-O) model builds on classical theory by incorporating factor endowments (capital and labor) to explain trade patterns (see Leamer (1955)). According to the H-O model, countries export goods that use their abundant factors intensively and import goods that use their scarce factors. This model assumes perfect competition and constant returns to scale. However, classical and neo-classical theories do not adequately explain real-world phenomena such as intra-industry trade and the persistent differences in growth rates among open economies. These limitations necessitate more modern approaches

Modern trade theories, notably those developed by Paul Krugman (1980), incorporate increasing returns to scale, imperfect competition, and product differentiation. These models explain why countries with similar factor endowments and technological capabilities still engage in trade.

According to Krugman, trade enables firms to benefit from economies of scale by producing for larger markets, which leads to increased productivity and innovation. Modern trade theory also introduces the concept of path dependence and cumulative causation, where early advantages in trade can reinforce a country's economic position.

These models are particularly relevant for developing countries seeking to integrate into global value chains and diversify their economies through industrialization. Amidst all these theories about trade openness, no explicit relationship has been established with economic growth. The inability to establish an explicit connection has been attributed to a lot of issues ranging from the econometric technique used and the measure of trade openness. Nevertheless, despite the chaos, the consensus is that trade openness influences economic expansion. Over the years, empirical studies have looked at the trade-growth nexus; however, the findings in this literature vary widely and contradict each other across different approaches and nations.

3.1.2 Economic Growth and Human Capital

Human capital theory has been used as an instrument to shape educational policies in many countries over the past decades. Before human capital became popular in the '60s and '70s, there were a lot of mentions about its importance, for example, Adam Smith and Alfred Marshall. In the 1950s and 1960s, economic analyses began including human capital in explaining growth theories. Becker (1962) and Mincer (1958) presented different perspectives on HCA, most likely as a result of numerous variables that indirectly influence the creation and application of human resources. In the 1960s, Schultz (1961) promoted human capital theory, and Becker (1964) continued the revolution on HCA while refuting the popular opinion that physical capital was the primary driver

of economic expansion. They asserted that human capital is necessary and sufficient for economic growth. Schultz (1961) expanded on the argument, discovering that countries, both developed and developing, saw an increase in economic growth as the educational attainment of the labor force increased. Romer (1990) emphasized the importance of human capital as a vital component for the creation of new ideas, which in turn enhances economic expansion. Lucas (1988) posits that sustained economic growth is a direct result of the development of human capital, with education serving as the primary catalyst for knowledge accumulation. Later, Mankiw et al. (1992) performed an empirical analysis by expanding Solow's model (1956) by incorporating human and physical capital as growth drivers and discovered HCA to have a significant and positive impact on output.

Bohlander et.al (2001) and Dess and Pickens (1999) define human capital as an ‘individual's knowledge, skills, and capabilities that have economic value’. Similarly, so far, it has been established that human capital consists of three main parts: health, training, and education. Education and improved health are examples of human capital development that are believed to provide the labor force with the knowledge and skills required to contribute to the nation's development. Gould and Ruffin (1995) argued that human capital can be put into two roles that are “as an input to production” and “as a determinant of technological progress and long-run growth”

Choosing the proxy to represent human capital development has been the main problem confronting the theory. In the case of education, researchers tend to use primary, secondary, and tertiary school enrollment, average years of schooling, government expenditure on education, and

pupil-to-teacher ratio as the proxy for education which represents the qualitative or quantitative aspect of education. Most researchers believe the qualitative side of education tends to be a more desirable measure of human capital than the quantitative side. In some instances, primary education is considered as the main proxy for human capital since it serves as the first form of development of labor. On the other hand, higher education is usually considered a proxy because it is regarded as a specialized form of human capital. Higher education is again considered a key factor of economic growth as it is assumed to be the standing point for technological advancement in an economy.

3.1.3 Trade Openness and Human Capital

Theoretically, it is argued that increased trade openness will boost growth via resource allocation, productivity gains from specialization, or both. Trade policy's role in economic growth has received extensive attention in the trade literature. Ricardo's theory states that by being open to international trade, a country can reallocate its limited resources to more productive sectors. The consensus is that trade openness will not fully benefit a country that does not have a high level of HCA. This suggests that highly skilled human capital is required for the adoption of new technology through international trade. Grossman & Helpman (1991b).

3.2 Empirical Literature

The trend of the literature review included in the empirical literature features the studies conducted using worldwide data coverage (including both developed and developing countries), Sub-Saharan Africa, and individual countries

3.2.1 Economic Growth and Trade Openness

Empirically, a lot of research has been done on the trade-driven growth nexus using a wide range of data and econometric tools over the past few decades. The results obtained were per what the theory predicted, that is, there wasn't a definite connection between trade openness and economic growth. Edward (1992) was one of the first economists to assess the nexus in developing nations. The author utilized the OLS method on 30 developing countries for a period between 1970 and 1980. The study revealed that countries that embarked on more openness to international trade tend to grow more quickly than nations with trade barriers and trade policy distortions.

Harrison (1996) on the other hand utilized both panel and cross-section data for periods 1960 to 1987 and 1978 and 1988 on developing countries to establish the connection between economic expansion and trade openness. The study employed different proxies of trade openness at different periods to ascertain their effect on economic growth. In general, the study concluded that trade openness has a positive impact on economic growth.

Karras (2003) also employed panel data techniques to ascertain the connection between trade openness and economic expansion. The study was conducted in 56 countries for the period 1951 to 1998, and another in 105 countries for the period 1960- 1997. The study found trade openness to have a positive and significant relationship with economic growth.

Yanikkaya (2003) investigated the effects of trade openness and trade barriers on economic growth in emerging and developed countries. The study used panel data techniques on over 100 developed and developing countries from 1970 to 1997. The study employed different proxies of trade openness and trade barriers to assess its impact on economic growth. For trade openness, the study

used the ratio of exports plus imports to GDP, import penetration ratios, and, export shares in GDP as proxies, and for trade barriers, the study utilized a proxy which is defined as “restrictions that exist on payments concerning current transactions in the form of quantitative limits or undue delay other than restrictions imposed for security reasons and official action directly affecting the availability or cost of exchange”. The study concluded that trade openness has a positive impact on economic growth, mostly for emerging countries. Also, contrary to the trade-led growth literature, the trade barrier was discovered to have a positive impact on economic growth.

Gries and Redlin (2012) investigated the short-run and long-run connection between economic expansion and trade openness for 158 countries from 1970 to 2009. The study employed panel cointegration tests, panel error correction models, and GMM estimation models to explore the relationship between the two variables. The authors discovered that trade openness has a positive and significant relationship with economic growth but exhibited a negative relationship in the short run. They concluded that a country undergoing a short-run adjustment will hurt its economy more if it embarks on a trade openness policy.

Tahir and Azid (2015) employed panel data approaches to examine, from 1990 to 2009, the trade-driven growth nexus in 50 emerging nations. The authors used two proxies of trade openness that is “the ratio of exports plus imports to GDP and industrial output as a ratio of GDP” and concluded that trade openness has a positive and significant impact on economic growth.

Now on a country level, similar research was undertaken and as stated earlier there wasn't a definitive link to the trade-driven growth nexus. Hye and Lau (2015) attempted to determine the

short- and long-term relationships between trade openness and economic growth in India using the ARDL model and a rolling window regression technique. According to the study, trade openness has a short-term positive correlation with economic growth but a long-term negative correlation. Osabuohien (2007) also performed such research on some African countries that is Nigeria and Ghana for the period 1975 to 2004. The study used the “Augmented Dickey-Fuller (ADF) and the Philip-Perron (PP)” tests and concluded that trade openness positively affects economic growth in both countries with the effect being more in Nigeria than Ghana.

Moyo et al. (2017) also employed the ARDL model to investigate the long-run connection between economic expansion and trade openness in Ghana and Nigeria for the period 1980 to 2016. The study discovered that trade openness has a positive and significant impact on economic growth in Ghana. The situation was different in Nigeria where the two variables were found to exhibit a negative and insignificant relationship.

Asiedu (2013) also investigated the trade-driven growth nexus in Ghana using time series data from 1986 to 2010. To examine long-term relationships, the study also used the ARDL model. The study used the growth rate of real GDP as a proxy for economic growth and the ratio of imports to exports to GDP as a proxy for trade openness. The study found trade liberalization to have a positive and significant long-run impact on economic growth in Ghana.

Musila and Yiheyis (2015) also investigated the impact of trade openness and trade policy-induced trade openness on economic growth in Kenya. The study employed the Granger Causality test and

found trade openness to have a positive but insignificant impact on economic growth. Also, trade-induced trade openness was found to have a negative but significant effect on economic growth.

Keho (2017) examined the connection between economic expansion and trade openness during the period 1965 to 2014 in Cote d'Ivoire. The study employed Autoregressive Distributed Lag and Toda and Yamamoto Granger causality tests. The study concluded that trade openness does have a positive and significant impact on economic growth in Cote d'Ivoire. Also, capital formation exhibited a positive relationship with trade openness in promoting economic growth.

Malefane and Odhiambo (2018) examined the trade-driven growth nexus during the period 1975 to 2014 in South Africa. The study employed Autoregressive Distributed Lag in a “multivariate framework” that included “trade openness, investment, government consumption expenditure, inflation rate, and financial development” as independent variables. The study also employed the “Dickey-Fuller test with Generalized Least Squares (GLS) de-trending, Phillip-Perron test, and the Perron (1997) test”. To ascertain the relationship the author explored different proxies of trade openness which are the “ratio of imports plus export to GDP, the ratio of exports to GDP, the ratio of imports to GDP, and, an index of trade openness, which accounts for the country size and geography”. The study discovered the proxy, ratio of imports plus exports to GDP exhibited a positive and significant effect on economic growth in the long run while the other proxies achieved the same result only in the short run.

Similar studies obtained the same ambiguous result in the case of Africa. Onafowora and Owoye (1998) utilized the vector error correction model (VECM) to investigate the impact of trade

policies on economic growth in 12 SSA countries. The study uses the VECM because “it treats each variable in the system as potentially endogenous and relates each variable to its past values and past values of all other variables”. The study used the growth rate of exports as a proxy for trade openness and real output growth as a proxy for economic growth. The study concluded that out of the 12 SSA countries studied, 10 of the countries had trade policies, and the growth rate of exports exhibited a positive significant impact on economic growth. This goes on to say that economic growth can be stimulated through trade openness, more specifically being more export oriented. Nevertheless, the impact on individual countries is not implicit since countries react differently to policies regarding international trade due to their characteristics.

Asfaw (2015) also employed a generalized least-square method on a panel of 47 SSA countries from 2000 to 2008 to assess the relationship between trade policies and economic growth in SSA countries. The study found trade openness to have a positive and significant relationship with economic growth.

Brueckner and Lederman (2015) utilized instrumental variables as a representative of trade openness to ascertain its impact on economic growth in SSA countries. The study employed two forms of instrumental variables on 22 SSA countries from 1981 to 2009. Rainfall is the first instrument used to represent growth in SSA countries to find its effect on trade. The second instrument used is the GDP growth of OECD economies to represent trade in SSA countries to find its effect on economic growth in SSA. The findings of the study concluded that economic growth has a significant and negative effect on trade openness while trade openness, on the other hand, has a positive and significant impact on economic growth. The research findings indicated

that more openness leads to an increase in economic growth in SSA countries. The main finding is that greater openness to international trade causes economic growth in SSA. The study went further to conclude that the impact is intensely felt in the long run as compared to the short run.

Zahonogo (2016) investigated the trade-driven growth nexus using a dynamic growth model for 42 SSA countries from 1980 to 2012. The study also used real GDP per capita as an indicator of economic growth and “the ratio of the sum of imports and exports to GDP, exports to GDP, and the ratio of imports to GDP” as indicators for trade openness. The study applied the “Pooled Mean Group (PMG) estimation technique to estimate dynamic heterogeneous panels by considering long-run equilibrium relations”. The author discovered that there exists a trading threshold below which countries experience greater benefits to economic growth and vice versa. Also, the study concluded that there exists a non-linear relationship between trade openness and economic growth in SSA countries. The study went on to point out that though trade openness is beneficial in SSA countries, some of the drivers of trade openness exhibited negatively with economic growth hence trade openness must be controlled.

Ijirshar (2019) employed a pooled mean group panel on a panel data set of ECOWAS members for the period 1975 to 2017 to ascertain the trade-driven growth nexus. The study found trade openness to positively and significantly affect economic growth in all the ECOWAS countries. Now, amidst all the research done across all the regions in the world, there wasn't a definitive conclusion. The results obtained remained ambiguous across all regions.

3.2.2 Economic Growth and Human Capital

Mankiw et al. (1992) and Barro and Lee (1993) were the first researchers to carry out empirical studies on how HCA affects economic growth. In their research, they discovered a positive correlation between education and economic growth, as the theory suggests. Mankiw et al. (1993) employed secondary school enrollment as a proxy for human capital stock. Some of the early Researchers who empirically tested the theory discovered disparate outcomes as postulated by the theory. The majority of papers made use of the human capital stock detailed in Barro-Lee (1993) and discovered a detrimental effect on economic expansion. For example, Islam (1995), Pritchett (1996), and Judson (1996). Also, Levine and Renelt (1992) showed in their paper that education as a form of human capital has no significant statistical impact on economic growth.

Benhabib and Spiegel (1994) conducted a cross-country analysis using HCA estimates constructed by Kyriacou (1991) which used enrollment in primary, secondary, and tertiary education as a proxy of human capital investment. They concluded that the impact of HCA on economic growth was insignificant. Sacerdoti et al. (1998) similarly used years of schooling as a substitute for human capital and contended that the influence of human capital on economic expansion was negligible, with physical capital acting as the primary driver to growth in the economy. Based on the outcome, they deduced that enhanced cognitive skills resulting from more education may have a weak or even negative impact on economic growth.

Mehrara and Musai (2013) also conducted studies to look into the connection between education and GDP in developing countries by using panel unit root tests and panel cointegration analysis for the period 1970-2010. The outcome revealed a strong relationship between economic expansion, investment, and education in all the countries, yet education did not have any

significant effects on GDP and investment in the short- and long run. They concluded that capital formation and GDP drove education in the mentioned countries, not vice versa hence higher economic growth leads to higher education proxy. They went forward to regard this as a good reason why huge educational investments in developing countries fail to generate higher growth.

Gyimah-Brempong et.al (2006) conducted such a study with higher education as the main proxy for human capital. The paper used panel data over the 1960–2000 period, with a modified neoclassical growth equation, and a dynamic panel estimator to investigate the effect of higher education human capital on economic growth in African countries. They concluded that all levels of education human capital, including higher education human capital, have a positive and statistically significant effect on the growth rate of per capita income in African counties which in some sense differs from the earlier result that found no significant relationship between higher education human capital and income growth

3.2.3 Economic Growth, Human Capital, and Trade Openness

Matthew and Adegboye (2014) investigated the influence of trade openness on economic growth and institutions' relevance in the trade-driven growth nexus. The study employed the Least Square Dummy Variables technique and system GMM on 30 SSA countries from 1985 to 2012. The study concluded that institutions positively and significantly impact economic growth. This means that for SSA countries to benefit mostly from trade openness they have to create a conducive environment that is free from any instability. On the other hand, trade openness had little significance on economic growth.

Yameogo and Omojolaibi (2021) examined the individual impact of trade openness on economic growth and also the role of institutions in the trade-led growth nexus. The study employed the ‘Panel Autoregressive Distributed Lag model, Panel Vector Auto-regression, and the System of Generalized Method of Moments’ on SSA countries from 1990 to 2017. The study used ‘the ratio of exports plus imports to GDP as a proxy for trade openness and per capita GDP (constant 2010 GDP) as a proxy for economic growth as control variables the study used foreign direct investment (FDI), institutional quality proxied by rule of law and control of corruption employment rate as labor force and population growth”. The study concluded that institutions and trade liberalization positively and significantly impact economic growth in the long run while institutional quality reduces economic growth in the short run. Also, trade openness has adverse effects on economic growth in the short run.

Akinlo and Okunlola (2021) also assessed the trade-driven growth nexus considering institutional quality in 38 SSA countries. The authors employed panel data estimation techniques such as pooled OLS, fixed effects, and GMM on panel data spanning from 1986 to 2015. The study concluded that the interactive terms of institutional quality and trade openness have a positive impact on economic growth. The paper stressed that institutional quality for example, “corruption, bureaucratic quality, law and order and, government stability” do hurt economic growth. This suggests that quality institutions are necessary for a country to have the most impact from trade openness.

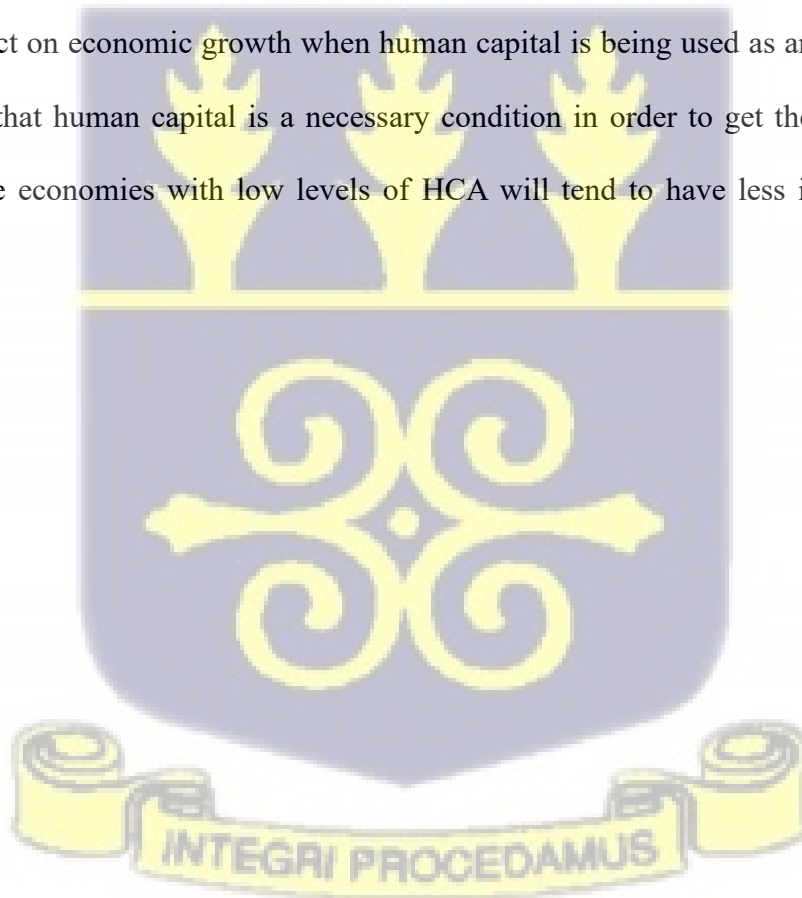
Muhammad et. al (2014) discussed the issues in the literature on the impact of trade openness on economic growth.

Soukiazis and Antunes (2012) investigated the impact of trade openness on economic growth taking into consideration human capital. The authors employed the system GMM in 14 European countries from 1980 to 2004. The study used “articles ratio, average years of schooling, the patents ratio, and patent/article ratio” as proxies for human capital. The study concluded that trade openness has a positive and significant impact on economic growth. Also, the study argued that the interactive term of human capital and economic growth was found to be statistically insignificant. Human capital was found to have a positive impact on economic growth only when trade openness was higher than the 31.8% threshold. On the other hand, trade openness was found to have a positive impact on economic growth only if the average years of education were higher than 6.6. One of the key conclusions from the study is that either human capital or trade openness are the constraining elements of the trade-led growth nexus.

Haq and Luqman (2014) examined the impact of the interactive term on human capital and trade openness on economic growth. The study adopted an extended neoclassical growth model for the theoretical framework. The study employed difference GMM of the dynamic panel regression techniques on 9 Asian countries for the period 1972 to 2012. The authors used two different proxies for human capital, that is average years of schooling and learning by doing to assess their impact on economic growth when we consider trade openness. The study discovered that the average year of school is positive but statistically insignificant on economic growth. On the other hand, learning by doing was found to have a positive and significant effect on economic growth. This suggests that Asian countries' trade openness contributes greatly to economic growth through the learning-by-doing part of human capital. Also, the interactive term of average years of schooling and trade openness was found to have a positive and significant impact on economic growth. The paper went

on to conclude that countries that embark on trade openness and have high levels of human capital will have more impact on economic growth as compared to countries with low levels of human capital. This suggests that though trade openness impacts economic growth, its impact is fully realized through human capital.

Sumbal et. al (2014) investigated the relevance of HCA in the trade-led growth nexus in 80 developed and developing countries. The paper employed the system GMM for the period 1980 to 2014. The paper used years of schooling and government expenditure on education as proxies for human capital. The study discovered trade openness to have a significant and negative impact on economic growth. On the other hand, the authors found trade openness to have a positive and significant impact on economic growth when human capital is being used as an interactive term. This concludes that human capital is a necessary condition in order to get the most from trade openness. Hence economies with low levels of HCA will tend to have less impact from trade openness.



CHAPTER 4

METHODOLOGY AND EMPIRICAL ANALYSIS

4.0 Introduction

This chapter outlines the methodology employed in the study, detailing the research design, model development, data sources, variable descriptions, estimation techniques, and analysis of empirical results. It introduces the econometric models used to analyze the data and address the research questions. Additionally, the chapter explains the approach taken to examine the selected variables and the process of constructing the empirical models.

4.1. Research Design

This study investigates the relationship between trade openness, human capital, and economic growth in Africa using a panel dataset of 49 African countries from 2000 to 2020. The research questions are:

1. What is the effect of trade openness on economic growth in Africa?
2. What is the effect of human capital on economic growth in Africa?
3. What is the effect of the interaction term of trade openness and human capital on economic growth in Africa?

To address these questions, the study adopts a panel data regression framework, estimated through a fixed effects (FE) model, grounded in the augmented Solow growth model. This methodological approach is justified for both theoretical and empirical reasons, as outlined below.

4.1.1 Use of Panel Data

Panel data combines time series and cross-sectional observations, making it especially suitable for analyzing economic growth across countries over time. This approach increases the degrees of freedom, improves the efficiency of the estimates, and captures the dynamics of structural change in a way that purely cross-sectional or time series data cannot (Hsiao, 2003; Baltagi, 2005).

In the context of African economies, panel data helps to account for country-specific unobservable characteristics such as institutional quality, colonial history, geographical features, or natural resource endowments. These characteristics, if omitted, could bias the estimated effects of trade openness and human capital.

4.1.2 Choice of Fixed Effects Estimator

Static panel models employ the pooled OLS, the random effect (RE) and FE model. In the OLS estimation, all observations are pooled together, with the dual nature of time series and cross-sectional data ignored. The pooled model ignores all time effects and assumes that all countries involved have the same output function that is, there is no individual heterogeneity. It also assumes that the dependent variable's coefficients remain constant across sections and time. The model is tested to check for time effects. After the test for the time effect, the p-value is equal to zero (see appendix for Stata result).

Since the model under study exhibits the presence of a time effect and individual heterogeneity, then the random effect becomes the appropriate method to use. The appropriate test to check such heterogeneity is the Breusch-Pagan Test. Now if the model exhibits no individual heterogeneity, then the OLS approach will be best to estimate the model. After the test for heterogeneity, the p-

value is zero (see appendix for result), hence we reject the OLS and conclude that the RE is appropriate.

The RE model assumes that the error term varies over time and across countries. In this case, an error term is added to the model to capture the individual heterogeneity of the countries involved. The error term is assumed to vary between countries but is constant for any given country. One of the major assumptions under the random model is the new error term, that is the heterogeneity term which does not correlate with the regressors of the model. Now if this assumption is violated, that is, if the heterogeneity term correlates with the regressors then the FE becomes the best model for the study. This is because the FE allows for a correlation between the regressors and the heterogeneity. The FE estimator is appropriate when unobserved country-specific factors are correlated with explanatory variables. Fixed effects models are particularly useful in controlling for unobserved heterogeneity, which is likely to be present in a diverse set of African economies. By focusing on within-country variations over time, the FE model isolates the impact of time-varying variables like trade openness and human capital while controlling for time-invariant influences.

To select between the fixed effect and the random effect, the Hausman test is a crucial test. After the Hausman test, the p-value is equal to zero (see appendix for result), hence we conclude that the fixed effect is appropriate. Also, because panel data is a mix of cross-sectional and time-series data, both autocorrelation and serial correlation issues are likely to exist. As a result, a test for both heteroscedasticity and serial correlation is required.

Additionally, to capture the conditional relationship between trade openness and human capital, the model includes an interaction term. This allows for the examination of whether human capital enhances or moderates the effect of trade openness on economic growth.

This decision is supported by endogenous growth theory, which emphasizes that the benefits of openness and globalization are not automatic but depend on a country's absorptive capacity often proxied by its level of education or human capital (Lucas, 1988; Grossman & Helpman, 1991).

The inclusion of the interaction term directly addresses the third research question by testing whether the effect of trade openness is amplified or diminished by a country's level of human capital

Although economic growth is inherently dynamic, this study selects a static fixed effects model over dynamic approaches for practical and statistical reasons:

- The panel is relatively short in time for many countries, which can compromise the reliability of dynamic estimators.
- Including a lagged dependent variable in a dynamic panel model introduces bias in the presence of fixed effects (Nickell, 1981).

Given the study's primary aim is to assess structural relationships and conditional effects rather than convergence speed, the static FE model is deemed more appropriate.

4.2. Model Formulation

The study employs static panel data techniques that are pooled OLS, random effects, and fixed effects to estimate the model. This study adopts the augmented Solow-Swan model approach

developed by Mankiw, Romer, and Weil (1992), which incorporates human capital as an additional factor of production alongside labor and physical capital.

$$Y_{it} = A_{it} f(K_{it}^{\partial}, H_{it}^{\beta} L_{it}^{1-\partial-\beta}) \dots\dots\dots (1)$$

Where, Y_{it} , K_{it} , L_{it} , H_{it} , and A_{it} represents output, physical capital accumulation, labor, human capital accumulation, and technology respectively.

$0 < \partial < 1$ represents the elasticity of output for physical capital, and $0 < \beta < 1$ is the elasticity of output for labor.

This study is built fundamentally on the determinants of economic growth captured by the augmented version of the Solow model. Hence, following the augmented version of the Solow (1956) model, we investigate the factors that explain economic growth by developing a model in which countries' GDP per capita levels are determined by HCA, trade openness, and other controls such as labor force, government consumption, capital formation, foreign direct investment.

GDP per capita growth is used as a proxy for economic growth. GDP per capita is used because it reflects a country's overall well-being as well as its economic performance (Hye and Lau., 2015; Tahir and Azid., 2015). The sum of exports and imports of goods and services as a percentage of GDP is used to gauge trade openness. This metric has been widely used in the literature to assess how well a country has integrated itself into global markets (Haq and Luqman., 2014; Soukiazis and Antunes., 2012; Matthew and Adegboye., 2014; Brueckner and Lederman., 2015; Moyo et al., 2017; Le Goff and Singh., 2014). In line with Zahonogo (2016), Ijirshar (2019), and others, we use the secondary school gross enrolment rate, which is the total number of students enrolled in secondary education, as a gauge of human capital. Government expenditure is included as a control variable. It measures final government consumption spending and is expressed as a share of

GDP. Government spending can have a positive or negative effect. The effect of government spending depends on whether it favors productive or non-productive sectors (Malefane and Odhiambo., 2018; Akinlo and Okunlola., 2021; Ijirshar., 2019). As a measure of investment, gross fixed capital formation is considered. It is regarded as a direct proxy of contribution to physical capital accumulation as well as an indicator of efforts to develop fundamental economic infrastructure. Physical capital is a gauge of an economy's level of investment as well as the accessibility of its infrastructure (Akinlo and Okunlola., 2021; Zahonogo., 2016). All the variables are transformed into natural logarithms. This is done to lessen skewness and create spreads that are nearly equal and/or have an additive or nearly linear relationship.

The econometric model is as follows:

$$Y_{it} = f(HCA_{it}, OPEN_{it}, CONT_{it}) \dots\dots\dots (2)$$

Where $CONT_{it}$ denote the control variables. In an equation form model 1 can, be written as:

$$Y_{it} = \beta_0 + \beta_1 HCA_{it} + \beta_2 OPEN_{it} + \beta_3 LF_{it} + \beta_4 PHY_{it} + \beta_5 FDI_{it} + \beta_6 GOVEX_{it} + \varepsilon_{it} \dots\dots\dots (3)$$

Model 3 depicts a model with country-specific effects and time effects.

$$Y_{it} = \beta_0 + \beta_1 HCA_{it} + \beta_2 OPEN_{it} + \beta_3 LF_{it} + \beta_4 PHY_{it} + \beta_5 FDI_{it} + \beta_6 GOVEX_{it} + \delta_i + \theta_t + \varepsilon_{it} \dots\dots\dots (4)$$

We include a multiplicative interaction term of trade openness and HCA in Equation (3) to investigate whether human capital moderates the effect of trade openness on economic growth.

$$Y_{it} = \beta_0 + \beta_1 HCA_{it} + \beta_2 OPEN_{it} + \beta_3 LF_{it} + \beta_4 PHY_{it} + \beta_5 FDI_{it} + \beta_6 GOVEX_{it} + \gamma(HCA_{it} \times OPEN_{it}) + \delta_i + \theta_t + \varepsilon_{it} \dots\dots\dots (5)$$

From the models, Y , HCA , $OPEN$, LF , PHY , FDI , and $GOVEX$ represent “GDP per capita measured in constant 2015 US\$, human capital accumulation proxied by secondary school enrollment, trade openness proxied by the sum of export and import as a percentage of GDP, total labor force, the gross fixed capital formation as a percentage of GDP, net inflows of foreign direct investment measured in current US dollars, and, the general government final consumption expenditure as a percentage of GDP respectively” World Bank (2023). Also, θ_t , δ_i , ε_t , i , and, t represent the time effect, unobserved country-specific effect, idiosyncratic error term cross-section dimension of the variables, natural logarithm, and, time series dimension of the variables respectively. The alphas and betas represent the intercepts and coefficients of the models.

The purpose of including a multiplicative interactive term is to objectively show that the trade-driven growth nexus is dependent on the HCA. In other words, to show that HCA is a necessary condition for trade openness to have an impact on economic growth. The evaluation of whether the interaction between trade openness and HCA amplifies or distorts the effect of trade on economic growth is based on the signs of the coefficients of trade openness B_2 and the interaction term, γ . A positive sign suggests that trade performance on economic growth is enhanced by HCA and vice versa. Considering the HCA, the overall impact of trade on economic growth is calculated as:

$$\frac{\delta \ln Y}{\delta \ln OPEN} = B_2 + \gamma HCA \quad (6)$$

According to equation 6, “if $B_2, \gamma > 0$, it suggests that the accumulation of human capital is an enhancer of trade openness on economic growth. On the other hand, if $B_2 > 0, \gamma < 0$, the total effect

of trade on growth is contingent upon the magnitude of each coefficient. If the negative sign of γ outweighs the positive sign of B_2 then human capital accumulation distorts the positive impact of trade on growth. Conversely, if γ negative sign is smaller than B_2 positive signs, it suggests that the distortionary influence of human capital accumulation is insufficient to impede trade's beneficial effects on economic growth. It suggests that the beneficial impact of trade openness on economic growth is lessened by the accumulation of human capital. Also, if $B_2 < 0$, $\gamma > 0$ then it implies that human capital accumulation mitigates the negative effect of trade on growth. Finally, if $\gamma = 0$, it means that the interaction of human capital with trade openness does not affect economic growth". Cohen and Cohen (1983), Adeleye et. al (2020). This implies that the effect of trade openness on economic growth is not dependent on HCA.

4.3 Data Source and Description of Variables

This thesis uses panel data on 49 African countries from 2000 to 2020. The data for the selected countries is taken from the World Development Indicators report, (WDI; 2023). The sample is chosen based on the availability of data. Table 2 details the description of the variables.

Table 2. Description of Variables

GDP per capita	"GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products" (World Bank; 2023). The variable is expressed in constant 2015 US dollars.
Gross fixed capital	"Gross fixed capital formation includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of

formation (GFCF)	roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings” (World Bank; 2023).
Labor force	“The labor force comprises people ages 15 and older who supply labor for the production of goods and services during a specified period. It includes people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers.”. (World Bank; 2023).
Human Capital	Human capital is proxied by gross secondary school enrollment. “The gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown”. (World Bank; 2023)
Trade Openness	“Trade openness is measured by the sum of exports and imports of goods and services, as a share of the gross domestic product” (World Bank; 2023).
Foreign Direct Investment	“It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. The variable is expressed in current U.S. dollars”. (World Bank 2023)
General government expenditure	“General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services including compensation of employees. It also includes most expenditures on national defense and security but excludes government military expenditures that are part of government capital formation”. (World Bank 2023)

Table 3 shows the summary of statistics of the variables used. The summary statistics computes the mean, standard deviation, minimum, and maximum values of the variables.

Table 3. Summary Statistics

Variable	Observation	Mean	Std. Dev.	Minimum	Maximum
Real GDP per Capita	982	2255.712	2523.914	255.100	14222.55
Gross Fixed Capital Formation	939	21.315	8.699	1.097	81.021
Labor force	1,029	7860624	1.08E+07	121592	6.86E+07
Human capital (% gross)	631	46.037	24.589	6.197	109.444
Trade Openness (% of GDP)	969	68.231	34.968	9.955	347.997
Government expenditure	929	14.979	7.240	0.952	61.167
FDI (constant 2015 US\$)	1,017	7.83E+08	1.59E+09	-7.40E+09	1.16E+10

Note: For example: 6.86E+07 = 68600000; 7.83E+08 = 783000000; Std. Dev: Standard Deviation; GDP: Gross Domestic Product; FDI: Foreign Direct Investment

Source: Authors Computation

Table 4 details the correlation between the explanatory variables and the dependent variable GDP

Table 4. Correlation matrix

	GDP	GFCF	Labor Force	Human capital	Trade Openness	Gov. Expenditure	FDI
GDP	1						
GFCF	0.128	1					
Labor Force	-0.128	0.076	1				
Human capital	0.744	-0.078	0.026	1			
Trade Openness	0.341	0.343	-0.327	0.244	1		
Gov. Expenditure	0.274	0.104	-0.307	0.170	0.339	1	
FDI	0.152	0.144	0.500	0.300	-0.056	-0.111	1

From Table 3, trade openness as a percentage of GDP across the 969 observations has a mean score of 68.23 with minimum and maximum of 9.96% and 348% respectively. It can also be seen that the mean value of 68.23% was influenced by outliers such as the maximum of 348%. The standard

deviation is 34.97 depicting the deviations from the overall mean value estimated within the sample data. The GDP per capita (2015) in dollars has a mean score of \$2255.71 with the minimum at \$255.1 and the maximum recorded at \$14222.55 across the 982 observations. The standard deviation of \$2523.91 is greater than the mean indicating wider disparities in the income per head of the 49 countries. Human capital accumulation also has a mean score of 46.03% with a maximum and minimum of 6.197% and 109.44% respectively. The minimum and maximum indicate the level of human capital gap between the selected 49 countries. Also, there is a disparity in the number of observations because the data is an unbalanced panel data

Table 4 details the correlation between the variables. The correlation matrix indicates that GDP per capita is positively correlated with all the variables except the labor force. Also, human capital is positively correlated with trade openness. Given that all correlation statistics in Table 3 are less than 0.75, it is evident that the covariates do not display multicollinearity Adeleye et. al (2020).

To sum up, the explanatory variables exhibit a correlation that aligns with the general theory.

4.4 Analysis of Empirical Results

The primary goal of this research is to investigate how the relationship between trade openness and economic growth in the selected countries is influenced by the accumulation of human capital. This section presents the study's results as well as the empirical findings. The data was collected and analyzed per the study's objectives and research questions. Stata IC 15 Econometrics software is used for analysis.

All three results are shown in Tables 5. Several tests were run to determine which of the three models is the best estimator. The Breusch-Pagan test was used to determine whether there is individual heterogeneity. The test revealed individual heterogeneity, so the random model was preferred over the pooled model. Also, to determine which of the fixed and random models is the best, the Hausman test is used. Based on the estimates, the Hausman test shows a low p-value of less than 0.05. Now, this counts against the null hypothesis that the random effect model is consistent, so the model favors the fixed effects model. The Stata results for the Hausman test and a detailed list of the countries studied can be found in the Appendix. From Tables 5 and 6, columns 1,3,5 represent the model without the interaction term, and columns 2, 4, and 6 are the models with the interaction term. Also, columns 1,2, 3,4, 5,6, represent results on Pooled OLS(OLS), Random Effects (RE), and Fixed Effects (FE) respectively.

4.4.1 Result for the 49 Selected African Countries

As established earlier, the study aims to determine the impact of trade openness and HCA on economic growth and objectively demonstrate the importance of HCA in the trade-driven growth nexus. A thorough examination of the pooled OLS findings can be found below.

Trade Openness

Table 5 shows that trade openness has a negative and insignificant effect on economic growth in column 1 but is positive and statistically significant at 10% in column 3. In column 5, the coefficient estimate is 0.051 and significant at a 10% level. This result suggests that a 1% increase in trade openness is expected to increase economic growth by 0.051%, all other things being equal. This can be explained by the favorable positioning of African nations in terms of international

trade, considering the levels of export diversification and the number of imports by these countries (Agbeyegbe et al., 2006). The positive significance of trade openness could only become proof of the assertion made by other researchers concerning the positive effect of open trade on economic growth in Africa. The results corroborate the studies by (Harrison, 1996; Yanikkaya, 2003; Tahir and Azid 2015). The studies mentioned and the results that were obtained bear similarities regarding the economic conditions of the countries and the trade openness metric, which is the ratio of imports plus exports to GDP. Using imports to GDP as a proxy, Bunje et al. (2022) discovered that trade openness hinders economic growth. The study concluded that while exports stimulate growth in Africa, imports impede it. Also, Gries and Redlin (2012) found trade openness to negatively affect economic growth in the short run. They concluded that a country undergoing a short-run adjustment will hurt its economy more if it embarks on a trade openness policy. This implies that while trade openness—defined as the ratio of imports to exports to GDP—has a favorable impact on economic growth, policies should promote a higher ratio of exports to imports.

Human Capital Accumulation

HCA positively impacts economic growth and is statistically significant at 1% in columns 1, 3, and 5. In column 5, the coefficient estimate is 0.146. This result suggests that a 1% increase in HCA is expected to increase economic growth by 0.146 %, all other things being equal. This implies human capital is a great contributing factor to economic growth in Africa. The result is consistent with Ogundari (2018), Sultana et. al (2022), Gyimah-Brempong et. al (2006), and Wirajing et al., (2023). Hence, we can suggest that regardless of the human capital substitute employed, the results obtained exhibit the same outcome: human capital contributes greatly to improving economic performance. This confirms the study by Gyimah-Brempong and Wilson

(2005), which disclosed that there is no discernible difference between the impact of human capital growth in Africa and the rest of the world.

Table 5: Result of Pooled Regression for the 49 Selected African Countries

	OLS		RE		FE	
GDP per capita	(1)	(2)	(3)	(4)	(5)	(6)
Human capital	0.997*** (0.047)	-1.321*** (0.406)	0.28*** (0.261)	-0.419*** (0.145)	0.146*** (0.028)	-0.383*** (0.134)
Trade openness	-0.11 (0.073)	-2.203*** (0.37)	0.059* (0.033)	-0.594*** (0.137)	0.051* (0.029)	-0.453*** (0.128)
Human capital*Trade Openness		0.575*** (0.1)		0.183*** (0.037)		0.141*** (0.035)
Capital Formation	0.0007 (0.086)	0.03 (0.084)	-0.044* (0.027)	-0.0364 (0.026)	-0.02 (0.025)	-0.016 (0.024)
Labor Force	-0.218*** (0.027)	-0.189*** (0.026)	0.129*** (0.046)	0.124*** (0.046)	0.494*** (0.061)	0.46*** (0.06)
Gov. Expenditure	-0.118* (0.061)	-0.179*** (0.059)	-0.018 (0.025)	-0.025 (0.025)	0.009 (0.023)	0.001 (0.023)
FDI	0.139*** (0.017)	0.144*** (0.017)	0.013** (0.005)	0.014*** (0.005)	0.008 (0.005)	0.009* (0.005)
Constant	4.902*** (0.508)	12.81*** (1.462)	3.958*** (.662)	6.492*** (0.852)	-1.24 (0.865)	1.126 (1.033)
R Squared	0.657	0.678				
Within R Squared			0.512	0.533	0.547	0.562
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
NO. Observation	528	528	528	528	528	528
Number of countries	49	49	49	49	49	49

***, **, * denote significance at 1%, 5% and 10%, respectively; Standard errors reported in parentheses. GDP represents Gross Domestic Product. Gov; Government

Source: Authors' Computations

Human Capital Accumulation* Trade Openness

From the individual analysis, the result shows that trade openness and HCA contribute positively to economic growth in all the selected countries. Now, on the contribution of HCA to the trade-led growth nexus, the interaction term coefficients, which indicate whether HCA enhances or distorts the impact of trade openness on economic growth, are positive and statistically significant in columns 2, 4, and 6. In column 6, the coefficient of the interactive term is positive and significant at a 1% level, with the coefficient of trade openness being negative at a 1% level. Now, based on equation 6 and according to Adeleye et al. (2020), HCA mitigates the negative effects of trade openness on economic growth. This is consistent with the conclusions made by Haq and Luqman (2014) and Sumbal et. al (2014). This means a well-developed human capital lessens the negative effect of free trade. In earlier research, the precise impact of the interactive term was not clarified. The distinction is that this study's findings go into greater detail about the particular function that human capital plays in the trade-growth relationship.

Trade theories remain ambiguous regarding the effect of trade openness on economic growth. While some theories contend that trade openness hurts economic growth (Young, 1991; Lucas, 1998), others contend that it has a positive impact (Chang et al., 2009; Kim, 2011). Drozd and Miškinis (2011) identified several negative aspects of trade openness that hinder economic growth. Some factors highlighted include market inflexibility, difficulty establishing new industries, structural unemployment, etc. As stated earlier, the findings of this study stipulate that human capital accumulation acts as a channel to mitigate the adverse effects of trade openness on economic growth. For example, in the case of market inflexibility, which refers to the state in which an economy's market specializes or concentrates on a limited set of competencies because

of comparative advantage, hence making it more challenging to adjust to a highly competitive, volatile free market and to seize new opportunities (Killick, 1995; Drozd and Miškinis 2011). A robust human capital base conditioned to adjust to various circumstances will help the economy adjust in a volatile free market by offering different innovative ideas.

Given that there are vast differences in the macroeconomic structures of countries in Africa, the passing of the AfCFTA treaty will benefit some countries greatly than others. Less developed countries will have more negative impacts than positives compared to more developed countries. These stated disadvantages of trade openness can be minimized by individual countries if there are deliberate attempts to improve human capital to be more versatile in carrying out innovative ideas. Thus, each country needs to implement policies that will guarantee the development of human capital to mitigate the negative effects of trade openness.

Foreign Direct Investment

The coefficients of FDI are positive and statistically significant at 1% in columns 1 and 3. In column 5, the coefficient estimate is 0.008 and statistically insignificant at a 10% level. This suggests that a 1% increase in FDI is expected to increase economic growth by 0.008%, all other things being equal. This suggests that, though FDI positively affects economic growth, its impact is not significant enough to influence growth in Africa. This is in contrast to Zekarias (2016), who found that FDI had a positive and significant impact on economic growth in East Africa. Yimer (2023), on the other hand, classified countries into three categories: "fragile, factor-driven, or investment-driven," and found that FDI had an insignificant impact on economic growth in the

fragile category, but a positive and significant impact in the other two. This suggests that the impact of FDI is dependent on the level of development and composition of the economy.

Labor Force

The coefficient of the labor force is negative in column 1 but positive in column 3 and is both statistically significant at a 1% level. In column 5, the coefficient estimate is 0.494 and statistically significant at the 1% level. This suggests that a 1% increase in the labor force is expected to increase economic growth by 0.494%, all other things being equal. This demonstrates how skilled labor contributes significantly to economic growth in Africa Matthew and Adegboye (2014). This is in contrast to the conclusion of Adeleye et al. (2020), who found that an increase in unskilled labor harms economic growth. This means that, for labor force to have a significant impact on economic growth, proper training is necessary.

Government Expenditure

The coefficient of government expenditure is negative and statistically insignificant at a 10% level in column 1. Column 5's coefficient is positive but statistically insignificant at a 10% level. This indicates government spending does not influence economic growth in Africa. The results corroborate the studies by (Landau, 1983; Barro, 1990; Diyoike et al. 2017). Notwithstanding the outcomes seen in Africa, the impact of government spending remains unclear. In their study, Devarajan et al. (1996) expounded that the impact of government spending is contingent upon the nature of the spending. Mose (2014) offers evidence in favor of this conclusion, pointing out that government spending was negative in consumption and positive in sectors like health but

insignificant in other areas like education and agriculture. Therefore, it is essential to distribute government spending properly to maximize its impact.

Physical Capital

The coefficient of physical capital is positive in column 1 and negative 3. In column 5, the coefficient is negative and is statistically insignificant at a 10% level. This result implies that domestic investment does not influence growth in selected African countries. The results corroborate Ijirshar's (2019) and Zahonogo (2016) studies. Physical capital's insignificant impact on economic growth is linked to developing economies' low absorptive capabilities with per-industrial infrastructure to drive such growth.

4.5 Robustness Analysis

A robust analysis was carried out to ensure the study's findings were reliable. A different proxy for HCA is used in the model. Primary completion rate “is the number of new entrants in the last grade of primary education, regardless of age, divided by the population at the entrance age for the last grade of primary education.” (World Bank 2023)

The outcomes detailed in Table 6 align with the conclusions presented in Table 5. Table 6 reveals that both HCA and trade openness impact economic growth positively. Also, concerning how HCA and trade openness interact to affect economic growth, Table 6 shows that HCA reduces the adverse impact of trade liberalization in Africa. These findings indicate that the results obtained will be consistent irrespective of the proxy used for HCA.

Table 6: Static Data Panel Analysis (Primary completion rate as a proxy for HCA)

	OLS		RE		FE	
GDP per capita	(1)	(2)	(3)	(4)	(5)	(6)
Primary Completion	1.043*** (0.082)	-2.260*** (0.744)	0.163*** (0.032)	-0.466** (0.229)	0.083*** (0.031)	-0.416** (0.207)
Trade openness	0.073 (0.083)	-3.343*** (0.769)	0.037 (0.032)	-0.662*** (0.252)	0.048* (0.029)	-0.506*** (0.229)
Primary Completion*Trade		0.826*** (0.185)		0.167*** (0.06)		0.132** (0.054)
Capital Formation	0.006 (0.082)	0.111 (0.081)	-0.022 (0.024)	-0.007 (0.024)	-0.046* (0.021)	-0.034 (0.022)
Labor Force	-0.307*** (0.029)	-0.289*** (0.029)	0.26*** (0.041)	0.245*** (0.04)	0.507*** (0.045)	0.497*** (0.045)
Gov. Expenditure	0.116 (0.071)	0.026 (0.073)	0.044* (0.025)	0.044* (0.025)	0.027 (0.023)	0.027 (0.023)
FDI	0.207*** (0.019)	0.206*** (0.019)	0.029*** (0.005)	0.029*** (0.005)	0.021** (0.005)	0.021*** (0.005)
Constant	2.602*** (0.573)	16.048*** (3.064)	1.84*** (0.566)	4.639*** (1.119)	-1.434** (0.612)	0.754 (1.087)
R Squared	0.549	0.565				
Within R Squared			0.474	0.448	0.472	0.478
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
NO. Observation	573	573	573	573	573	573
Number of countries	49	49	49	49	49	49

***, **, * denote significance at 1%, 5% and 10%, respectively; Standard errors reported in parentheses. GDP represents Gross Domestic Product.

Source: Authors' Computations

The outcomes detailed in Table 6 align with the conclusions presented in Table 5. Table 6 reveals that both HCA and trade openness impact economic growth positively. Also, concerning how HCA and trade openness interact to affect economic growth, Table 6 shows that HCA reduces the

adverse impact of trade liberalization in Africa. These findings indicate that the results obtained will be consistent irrespective of the proxy used for HCA.

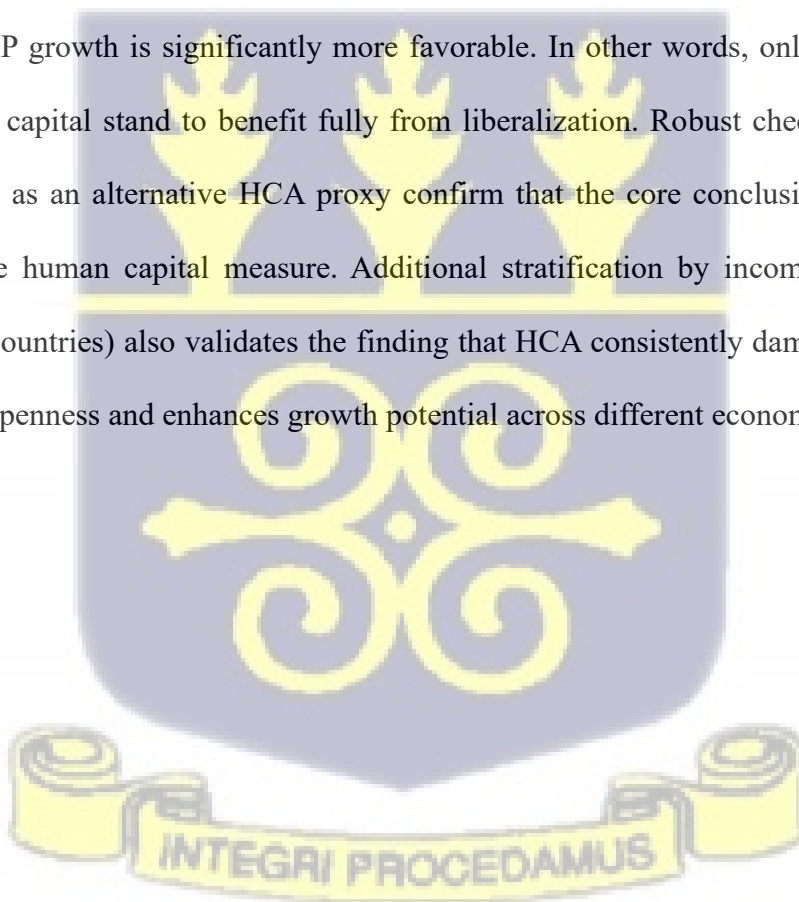
Once more, to assess how sensitive our conclusions are to data and estimation methods, the sample countries are divided into two groups based on the World Bank's classification of countries by income level, specifically, 21 low-income developing countries and 28 middle-income countries. In this analysis, upper- and lower-middle-income countries are considered middle-income as defined by the World Bank. The results are detailed in the Appendix. Again, the results obtained are consistent with the findings of the study. Tables A2 and A3 show that HCA reduces the adverse impact of trade liberalization in Africa, irrespective of the country's income level.

4.6 Conclusion

In this chapter, we systematically developed and implemented an empirical framework to analyze the relationship between HCA, trade openness, and economic growth in 49 African countries over the period 2000–2020. Three static panel estimation techniques, the pooled OLS, random effects, and fixed effects were used to identify the most appropriate model specification. Statistical diagnostics (Breusch-Pagan and Hausman tests) clearly favored the fixed effects model, accounting for unobserved heterogeneity across countries. The empirical strategy further enriched this base by incorporating a multiplicative interaction term between HCA and trade openness, allowing us to test whether the impact of trade on growth depends meaningfully on human capital levels. From the fixed effects estimates, we found that:

- Human capital accumulation exerts a positive and highly significant effect on GDP per capita growth, confirming that greater secondary school enrollment contributes substantially to economic performance.
- Trade openness, on its own, exhibits a negative direct effect in the presence of the interaction term; however, through the interaction mechanism, human capital mitigates or reverses this adverse impact.
- The interaction coefficient is positive and statistically significant, indicating that higher levels of human capital amplify the growth-enhancing potential of trade openness.

Also, from the result we see that for countries with stronger HCA, the overall effect of trade openness on GDP growth is significantly more favorable. In other words, only economies with adequate human capital stand to benefit fully from liberalization. Robust checks using primary completion rates as an alternative HCA proxy confirm that the core conclusions remain stable regardless of the human capital measure. Additional stratification by income levels (low vs. middle-income countries) also validates the finding that HCA consistently dampens the negative effects of trade openness and enhances growth potential across different economic contexts.



CHAPTER 5

SUMMARY, CONCLUSION AND POLICY RECOMMENDATION

5.0 Introduction

This chapter finalizes the thesis by providing the summary, the conclusion of the entire study, and policy recommendations.

5.1 Summary

The thesis begins by introducing the concept of trade openness and HCA and their effect on economic growth in Africa and the world. The following section presents a thorough overview of Africa's trade and human capital history. The idea of the trade-growth nexus is thoroughly investigated theoretically and empirically in chapter three of the thesis. The empirical studies conducted on the effect of trade openness on economic growth have shown conflicting results over the past years. The thesis elaborates on the paper by Le Goff and Singh (2014), which addressed the conflicting results by stating the mechanism through which openness to global trade affects economic development. Their result suggests that the impact of openness to trade on economic growth is fully realized when the countries in question have a more developed financial sector, strong governance, and high levels of HCA. As a result, this study seeks to contribute to the existing literature on the trade-growth nexus by examining human capital's role in the relationship. On the other hand, both theoretical and empirical studies analyzed the effect of human capital on economic growth and showed positive results.

This study employs the static panel approach to examine the trade and human capital nexus on economic growth for 49 African countries from 2000 to 2020. GDP per capita and the sum of imports and exports are used as a proxy for economic growth and trade openness, respectively. Also, the study employs gross secondary school enrollment as a proxy for human capital. This proxy is used because it is viewed as the minimum form of education where individuals have the necessary skills to contribute to the economy. Moreover, FDI, government expenditure, labor force, and physical capital are included in the model as control variables to make the model more robust. The study addresses three research questions, including whether trade openness and human capital impact economic growth separately and the role of human capital in the trade and economic growth nexus. The study concludes that trade openness and human capital impact economic growth positively and significantly. Also, concerning the role of human capital in the trade-growth nexus, the study reveals that human capital accumulation mitigates the negative effect of trade openness on economic growth in Africa.

5.2 Conclusion

Panel data on 49 African countries from 2000 to 2020 is employed to evaluate human capital's role in the trade-growth nexus. The study concluded that trade openness and human capital individually positively and significantly affect economic growth. Also, human capital is a tool to mitigate trade openness's adverse effects on economic growth. Hence, there is a need for individual countries to put educational policies in place to help develop human capital to the extent that they can compete internationally and foster the success of the intra-Africa treaties on the African Continent.

For further studies, the study recommends that future research into the trade-growth nexus includes the three essentials highlighted by Le Goff and Singh (2014) to determine the full effect of trade openness on economic growth when all the conditions that are developed financial sector, strong governance, and high levels of human capital are in place.

5.3 Policy Recommendation

Based on the empirical findings of this study, the following recommendations are proposed for African countries to enhance the positive impact of trade openness and human capital on economic growth:

Developing Trade-Aligned Educational Policies:

The study finds that while human capital and trade openness individually have negative effects on growth, their interaction has a positive effect suggesting that better alignment between education and trade policies can yield improved outcomes.

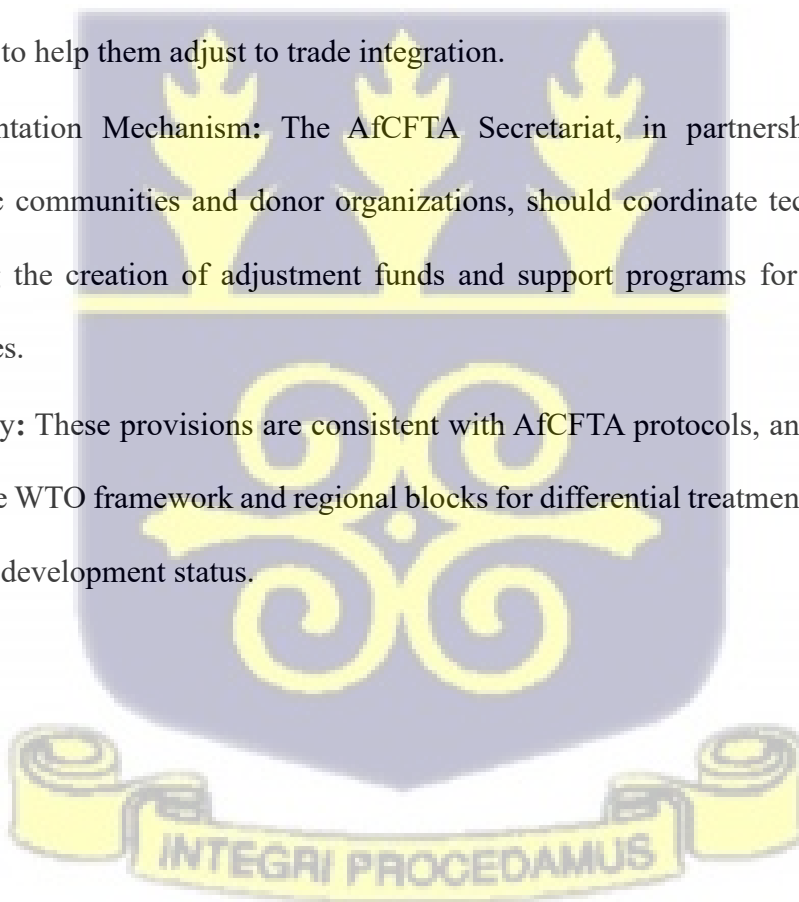
- **Policy Action:** Governments should design and implement educational programs that are explicitly aligned with the demands of regional and global trade. This includes expanding vocational and technical education in sectors with high export potential, such as agribusiness, light manufacturing, and ICT.
- **Implementation Mechanism:** Ministries of Education and Trade should collaborate to develop curricula responsive to labor market trends and trade patterns. Public-private partnerships with export-oriented industries can ensure training programs are relevant and demand-driven.

- **Feasibility:** Many African countries already have skills development policies in place; reorienting them toward trade-linked sectors will require targeted policy reform rather than entirely new infrastructure.

Implement Safeguards for Less Developed Members under AfCFTA:

The AfCFTA presents opportunities but also risks for less developed economies that may be disadvantaged by exposure to more competitive markets.

- **Policy Action:** Introduce phased liberalization schedules and safeguard mechanisms for vulnerable economies. Capacity-building assistance and structural support should be provided to help them adjust to trade integration.
- **Implementation Mechanism:** The AfCFTA Secretariat, in partnership with regional economic communities and donor organizations, should coordinate technical assistance, including the creation of adjustment funds and support programs for SMEs in weaker economies.
- **Feasibility:** These provisions are consistent with AfCFTA protocols, and precedent exists within the WTO framework and regional blocks for differential treatment of member states based on development status.



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APPENDIX

Table A1. List of Studied Sample Countries

1. Algeria	25. Guinea-Bissau
2. Angola	26. Kenya
3. Benin	27. Lesotho
4. Botswana	28. Libya
5. Burkina Faso	29. Madagascar
6. Burundi	30. Mali
7. Cabo Verde	31. Mauritania
8. Cameroon	32. Mauritius
9. Central African Republic	33. Morocco
10. Chad	34. Mozambique
11. Comoros	35. Namibia
12. Congo, Dem. Rep	36. Niger
13. Congo, Rep	37. Nigeria
14. Côte d'Ivoire	38. Rwanda
15. Djibouti	39. Senegal
16. Egypt, Arab Rep	40. Sierra Leone
17. Equatorial Guinea	41. South Africa
18. Eritrea	42. South Sudan
19. Eswatini	43. Sudan
20. Ethiopia	44. Tanzania
21. Gabon	45. Togo
22. Gambia, The	46. Tunisia
23. Ghana	47. Uganda
24. Guinea	48. Zambia
	49. Zimbabwe

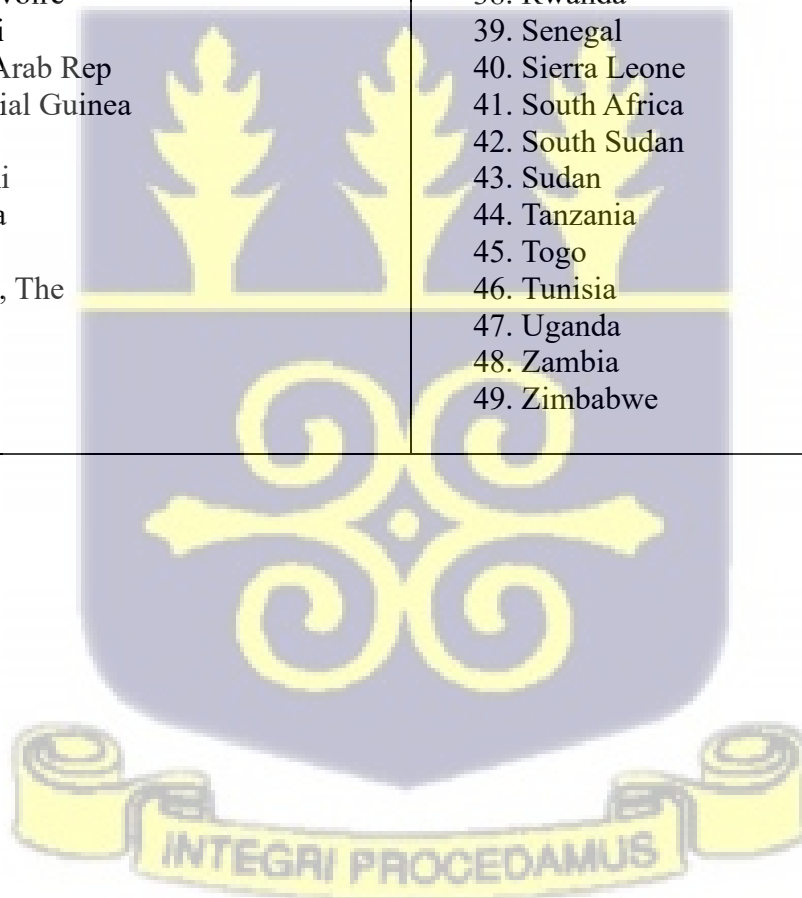


Table A2: Static Data Panel Analysis for Low-Income Countries in Africa

	OLS		RE		FE	
GDP per capita	(1)	(2)	(3)	(4)	(5)	(6)
Human capital	0.322*** (0.043)	0.478 (0.442)	0.251*** (0.03)	-0.629*** (0.180)	0.180*** (0.039)	-0.648*** (0.171)
Trade openness	-0.54*** (0.061)	-0.399 (0.404)	0.241*** (0.047)	-0.575*** (0.172)	0.269*** (0.045)	-0.519*** (0.165)
Human capital*Trade		-0.04 (0.116)		0.238*** (0.048)		0.229*** (0.046)
Capital Formation	0.132* (0.075)	0.131* (0.075)	-0.014 (0.034)	-0.01 (0.032)	-0.019 (0.032)	-0.016 (0.031)
Labor Force	-1.39*** (0.033)	-0.139*** (0.329)	0.084* (0.051)	0.063 (0.05)	0.276*** (0.085)	0.202** (0.082)
Gov. Expenditure	-0.269*** (0.055)	-0.265*** (0.055)	-0.139 (0.035)	-0.175*** (0.034)	-0.121*** (0.034)	-0.161*** (0.034)
FDI	0.11*** (0.014)	0.11*** (0.138)	0.004 (0.007)	-0.002 (0.006)	-0.005 (0.006)	-0.003 (0.006)
Constant	7.816*** (0.481)	7.286 (0.014)	3.764*** (0.747)	7.138*** (1.018)	0.924 (1.257)	4.971 (1.445)
R Squared	0.589	0.589				
Within R Squared			0.628	0.672	0.638	0.677
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
No. Observation	227	227	227	227	227	227
Number of countries	21	21	21	21	21	21

***, **, * denote significance at 1%, 5% and 10%, respectively; Standard errors reported in parentheses. GDP represents Gross Domestic Product. Gov; Government

Source: Authors' Computations

Table A3: Static Data Panel Analysis for Middle-Income Countries

GDP per capita	OLS		RE		FE	
	(1)	(2)	(3)	(4)	(5)	(6)
Human capital	0.882*** (0.066)	0.811 (0.626)	0.321*** (0.038)	-0.843*** (0.281)	0.134*** (0.039)	-0.974*** (0.247)
Trade openness	0.077 (0.081)	0.016 (0.557)	-0.081** (0.041)	-1.139*** (0.257)	-0.084** (0.036)	-1.099*** (0.226)
Human capital*Trade		0.016 (0.144)		0.284*** (0.068)		0.272*** (0.060)
Capital Formation	-0.215** (0.099)	-0.217** (0.102)	-0.104** (0.042)	-0.129*** (0.042)	-0.077** (0.037)	-0.102*** (0.037)
Labor Force	-0.176*** (0.027)	-0.175*** (0.028)	0.081 (0.053)	0.084 (0.051)	0.616*** (0.08)	0.604*** (0.077)
Gov. Expenditure	-0.207*** (0.067)	-0.205*** (0.068)	0.006 (0.034)	0.013 (0.033)	0.038 (0.03)	0.044 (0.029)
FDI	0.147*** (0.019)	0.147*** (0.02)	0.023*** (0.007)	0.023*** (0.007)	0.005 (0.007)	0.005 (0.006)
Constant	4.877*** (0.613)	5.137** (2.361)	5.585*** (0.761)	9.924*** (1.272)	-1.724 (1.111)	2.629* (1.438)
R Squared	0.623	0.622				
Within R Squared			0.518	0.552	0.588	0.617
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
NO. Observation	301	301	301	301	301	301
Number of countries	28	28	28	28	28	28

***, **, * denote significance at 1%, 5% and 10%, respectively; Standard errors reported in parentheses. GDP represents Gross Domestic Product. Gov; Government

Source: Authors' Computations



Figure A1: STATA result for test for time effect.

```
. testparm _Iyear*

( 1)  _Iyear_2001 = 0
( 2)  _Iyear_2002 = 0
( 3)  _Iyear_2003 = 0
( 4)  _Iyear_2004 = 0
( 5)  _Iyear_2005 = 0
( 6)  _Iyear_2006 = 0
( 7)  _Iyear_2007 = 0
( 8)  _Iyear_2008 = 0
( 9)  _Iyear_2009 = 0
(10)  _Iyear_2010 = 0
(11)  _Iyear_2011 = 0
(12)  _Iyear_2012 = 0
(13)  _Iyear_2013 = 0
(14)  _Iyear_2014 = 0
(15)  _Iyear_2015 = 0
(16)  _Iyear_2016 = 0
(17)  _Iyear_2017 = 0
(18)  _Iyear_2018 = 0
(19)  _Iyear_2019 = 0
(20)  _Iyear_2020 = 0

F( 20,   501) =    8.34
Prob > F =    0.0000
```

Figure A2: STATA result

Breusch and Pagan Lagrangian multiplier test for random effects

$\ln Y[\text{country}, t] = Xb + u[\text{country}] + e[\text{country}, t]$

Estimated results:

	Var	sd = sqrt(Var)
lnY	.8135941	.9019945
e	.0096084	.0980223
u	.3233678	.5686544

Test: Var(u) = 0

$\chi^2_{(01)} = 1039.49$
 Prob > $\chi^2 = 0.0000$

Figure A3: STATA results for the Hausman Test

```
. hausman fixed
```

	Coefficients			
	(b) fixed	(B) .	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lnPHY	-.0162803	-.0443584	.0280781	.
lnLF	.4599823	.129097	.3308853	.0388218
lnHCA	-.3833618	.2800436	-.6634054	.1316197
lnOPEN	-.4529826	.0592962	-.5122788	.1241065
lnGOVEX	.0010609	-.0177462	.0188071	.
lnFDIC	.0088185	.0130359	-.0042173	.

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

```
chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
        = 107.91
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)
```

Figure A4: STATA results

Modified Wald test for groupwise heteroskedasticity
 in fixed effect regression model

H0: $\sigma(i)^2 = \sigma^2$ for all i

```
chi2 (45) = 3.9e+28
Prob>chi2 = 0.0000
```

