

Input Factors Influencing Economic Growth in Uganda (1990-2023)

By

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DECLARATION

I, Mwijukye Justine, confirm that this dissertation entitled "*Input Factors Influencing Economic Growth in Uganda (1990-2023)*" is my own generated work. It has not been submitted to any other institution for any academic award. All works of other authors consulted have been duly acknowledged through proper citation and referencing.

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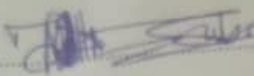
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APPROVAL

This dissertation titled, *"Input Factors Influencing Economic Growth in Uganda (1990-2023)"* has been written under our guidance and supervision and is now ready for submission to the Faculty of Business, Economics and Governance of Bishop Stuart University.

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Dedication

This research report is dedicated to my dear husband; Agaba Bob Kazwengye (Late), children (Agaba Elijah Kazwengye and Agaba Melissa for their unwavering support and encouragement throughout this journey. To my advisor (sisters), Ms Penny Mbabazi and Ms Mwikirize Deborah whose invaluable spritual guidance and expertise have been instrumental in shaping this work. And most importantly to my parents Mr. Kazwengye Melichiadis (Father in-law) and Ms Kobusingye Robina (Mother) whose sacrifices and belief in my potential have been the foundation of my academic pursuits.

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ABSTRACT

This study examined determinants of economic growth in Uganda (1990–2023) by focusing on gross capital formation, education expenditure, and population increase, using annual time-series data from 1990 to 2023 and applying the Autoregressive Distributed Lag (ARDL) model to capture both short-run and long-run relationships. The findings revealed that gross capital formation had a positive long-run coefficient (1.016) but its influence was statistically insignificant ($p = 0.123$), with short-run coefficients also found to be non-significant ($p > 0.70$), indicating that capital accumulation has not been a decisive contributor to Uganda's growth. Education expenditure, considered as a measure of human capital, displayed statistically significant positive effects in both the short run (coefficient = 0.352, $p = 0.004$) and the long run (coefficient = 0.491, $p = 0.036$), confirming the essential role of human capital in enhancing economic growth. By contrast, population increase exerted statistically insignificant influence in the short run (-0.383 , $p = 0.509$) and the long run (1.321, $p = 0.465$), suggesting that demographic expansion has not directly translated into economic growth without accompanying structural transformation. The ARDL estimations established education as the most influential factor, while capital formation and demographic change showed weak or negligible contributions. Model diagnostic tests confirmed robustness, with no heteroskedasticity, no serial dependence, and no non-normality, while the error correction coefficient (-0.211 , $p = 0.026$) demonstrated convergence toward long-run equilibrium. The study concludes that prioritizing education investment is essential for Uganda's sustainable growth, recommending that government increase funding to the education sector, strengthen institutional systems to improve the productivity of capital, and design demographic strategies that transform rapid population expansion into a long-term economic advantage.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

Input Factors Influencing Economic Growth in Uganda Economic growth is a fundamental objective for any nation seeking to improve its standard of living, reduce poverty, and enhance overall societal welfare. In the context of Uganda, a developing country in East Africa, achieving sustained economic growth remains a key challenge, despite the country's notable progress in recent years. As Uganda continues to transition from an agrarian-based economy to one that is more industrialized and service-oriented, understanding the factors that drive or hinder economic growth becomes essential for policy formulation and strategic planning (Kasekende & Atingi-Ego, 2015). This study aims to explore the input factors influencing economic growth in Uganda, specifically focusing on the role of human capital, physical capital, technology, and natural resources. Each of these factors plays a critical role in shaping the trajectory of Uganda's economic development, and an in-depth analysis of their relative contributions can provide invaluable insights into how the country can optimize its growth potential (Uganda Bureau of Statistics [UBOS], 2020). For instance, improvements in education and skills development, critical elements of human capital, have been shown to correlate strongly with productivity and growth in several African economies (Sahn & Stifel, 2003). Similarly, the role of physical capital, such as infrastructure and investment in industries, is widely acknowledged as a primary determinant of economic performance (Kiggundu, 2002). Uganda has experienced periods of economic growth, but challenges such as insufficient infrastructure, limited access to education and skills training, inadequate investment in technology, and inefficient use of natural resources have sometimes undermined these gains (Asiimwe, 2017). Additionally, external factors such as global market fluctuations and regional political dynamics can also affect the nation's growth prospects (Mugisha, 2021). Therefore, understanding the interplay between these inputs can help policymakers identify the key levers to accelerate growth. This study is motivated by the need to bridge the gap in existing literature concerning Uganda's specific growth drivers. While many studies have focused on general macroeconomic policies or the role of agriculture, there is limited research addressing the precise input factors that impact Uganda's unique economic landscape (Muwonge, 2019). The findings of this study will provide empirical evidence that can guide Uganda's policymakers, development partners, and other stakeholders in crafting targeted

strategies that address the country's specific growth challenges. Ultimately, this study aims to contribute to a broader understanding of how input factors can be leveraged to sustain and expand Uganda's economic growth, offering practical recommendations for both short-term and long-term development plans.

1.1 Global growth trends

Globally, economic growth remains a dominant theme in development economics and continues to be viewed as a key pathway for reducing poverty, creating employment opportunities, and improving overall quality of life (World Bank, 2021). Sustained increases in Gross Domestic Product (GDP) per capita are strongly associated with progress in health, education, infrastructure, and technological advancement, demonstrating that growth extends beyond mere output expansion to influence broader welfare outcomes (IMF, 2022). In recent decades, policymakers have increasingly evaluated growth not only in terms of its pace but also in its inclusiveness and sustainability, making it a central focus of contemporary economic policy debates (World Bank, 2021).

Historical experiences provide important lessons for developing countries. Japan, the United States, and Germany achieved remarkable economic transformation by consistently investing in capital, advancing technology, and prioritizing education and innovation, thereby making effective use of their human resources (OECD, 2020). Although their average annual growth rates of around 2–3% appear modest, they reflect the stability of advanced economies that have already undergone industrial transformation. By contrast, developing countries such as India, Vietnam, and Brazil have recorded higher but more volatile growth rates of about 5–7% in recent decades, largely driven by structural reforms, export expansion, and participation in global value chains (UNDP, 2022). Despite these impressive performances, inequality, institutional weaknesses, and external shocks continue to constrain the sustainability of growth in many emerging economies (Gelb, Meyer, & Ramachandran, 2020).

The drivers of economic growth have been widely explored in both theoretical and empirical literature, with gross fixed capital consistently recognized as a major driver of output expansion. For example, the Solow Swan model emphasizes capital accumulation as a foundation for long-

term productivity, where increased investment in machinery, infrastructure, and other physical assets enhances national output (Solow, 1956; Mankiw, Romer, & Weil, 1992).

Solow Swan Growth Model further underscores capital accumulation, expansion of the labour force, and technological progress as fundamental drivers of long-run output (Solow, 1956). In contrast, endogenous growth theories highlight the roles of human capital, innovation, research, and institutional quality as internal mechanisms that sustain productivity growth (Romer, 1990). Together, these models suggest that demographic dynamics, physical investment, and human capital formation are essential components in explaining global and national growth trajectories.

1.1.2 Uganda's growth trajectory

Uganda's economic experience reflects moderate but uneven growth over the last two decades. The country recorded an average GDP growth of 4–6% between 2007 and 2018, largely sustained by agriculture, services, and small-scale manufacturing (World Bank, 2023). Agriculture continues to serve as the backbone of national production, engaging most of the labor force, while the services sector has grown alongside trade, transport, and communications. However, Uganda's population is expanding at one of the fastest global rates, creating significant pressure on infrastructure, education, health systems, and employment opportunities. Fixed capital formation remains limited due to under investment in essential infrastructure such as energy, transport, and industry, whereas human capital development faces constraints linked to deficiencies in education quality, healthcare delivery, and technological adoption (Kasekende & Ssemogerere, 2020). Although growth has shown relative stability, poverty reduction has not progressed as quickly as anticipated, and inequality persists as a barrier to inclusive development (Obwona, 2002).

Figure 1.1 presents Uganda's GDP performance between 2000 and 2023. The trend demonstrates phases of rapid growth during the mid-2000s, a slowdown following the global financial crisis, moderate recovery between 2010 and 2018, contraction in 2021 due to the COVID-19 pandemic, and renewed rebound towards 5% during 2022–2023 (World Bank, 2023).

Figure 1.1 Showing Uganda's GDP Growth Rate (1990-2023)



Source: World Bank, 2023

The above figures show that Uganda has generally experienced stable growth over the past two decades, though fluctuations from external shocks and structural weaknesses remain (IMF, 2022). Strong growth in the mid-2000s reflected the potential of agriculture and services, while the sharp downturn in 2021 exposed risks of overdependence and limited diversification (AfDB, 2023). The recovery in 2022–2023 highlights resilience but also the need for reforms to enhance productivity, human capital, and institutional effectiveness (World Bank, 2023). Population growth continues to strain social services and job creation, fixed capital formation remains weak due to underinvestment in infrastructure, and human capital gaps persist in education, health, and skills, yet these factors are central to growth (Romer, 1990). Although growth theories emphasize them, their combined effect in Uganda remains underexplored (Kenganzi, 2018). Uganda has made progress but still faces demographic pressures, infrastructural deficits, and limited human capital, explaining why growth has not yielded broad-based poverty reduction. Policymakers must therefore shift growth toward sustainable investments in population management, capital, and human development (World Bank, 2023).

This research was therefore undertaken to investigate the key input elements influencing economic growth in Uganda, with particular emphasis on demographic expansion, capital accumulation, and human capital development, which have remained insufficiently explored in recent empirical studies.

1.2 Problem statement

The Government of Uganda has implemented a range of measures to accelerate economic growth, including industrialization programs, infrastructure development, and investment in education and health under Vision 2040 (National Planning Authority, 2020). Despite these interventions, economic performance has remained below target. Between 2020 and 2023, GDP growth averaged 3.6% (2.9% in 2020, 4.3% in 2021, 3.5% in 2022, and 3.7% in 2023), which is far below the regional benchmark of 6% required to reduce poverty and enhance competitiveness (African Development Bank, 2023).

This persistent under performance raises questions about the adequacy of current policies in addressing the main drivers of growth (IMF, 2022). Low and unstable growth increases the risk of economic stagnation, rising poverty, and widening inequality, while also limiting the possibility of attaining middle-income status and weakening Uganda's competitive position in the East African region (World Bank, 2023). These challenges point to the urgency of re-examining the underlying factors influencing the country's growth path.

Although scholars such as Obwona (2002) and Kenganzi (2018) have examined Uganda's growth determinants, much of the existing research is outdated, narrow in scope, and constrained by methodological weaknesses such as neglecting endogeneity concerns. These limitations have reduced the reliability and applicability of earlier findings. The present study seeks to fill this gap by analyzing population expansion, capital accumulation, and human capital development in shaping Uganda's economic growth, using contemporary data and rigorous analytical approaches to provide policy-relevant evidence.

1.3 Purpose of the study

The aim of the study was to examine the effects of input factors on economic growth in Uganda.

1.4 Study Objectives

- i. To determine the effect of gross fixed capital on economic growth in Uganda
- ii. To determine the effect of labour force on economic growth in Uganda
- iii. To determine the effect of population growth on economic growth in Uganda.

1.5 Research Hypotheses

The study tested the following null hypotheses:

H₀₁: Physical capital has no effect on economic growth in Uganda.

H₀₂: Labour force has no effect on economic growth in Uganda.

H₀₃: Population growth has no effect on economic growth in Uganda.

1.6 Scope of the study

The scope of the study was of three forms namely; geographical scope, time scope and conceptual.

1.6.1 Geographical scope

This study was undertaken within the context of Uganda's economy which is predominantly based on agriculture, services, and a growing industrial sector. Agriculture remains the backbone, employing over 60% of the labor force and contributing significantly to export earnings through products such as coffee, tea, fish, and maize (World Bank, 2023). The services sector, led by trade, transport, tourism, and communications, has grown rapidly in recent decades, accounting for the largest share of GDP. Industry, though still developing, is expanding through construction, manufacturing, and agro-processing, driven by investments in infrastructure and energy. Uganda's economy is further shaped by its youthful and fast-growing population, regional integration through the East African Community, and natural resource potential, including recent oil discoveries. However, it continues to face challenges such as high population growth, infrastructure deficits, limited technological adoption, and governance concerns, which constrain the pace of structural transformation and inclusive development (IMF, 2022; AfDB, 2023).

1.6.2 Content Scope

The study focused on the key determinants of economic growth considered as input factors, specifically labour force, population expansion, and physical capital. Population growth was analyzed within the Solow (1956) growth framework and its later extensions, where labour force dynamics are viewed as directly shaping output alongside capital formation and human capital development. Economic growth, treated as the dependent variable, was measured using real GDP per capita, expressed as the annual percentage change in GDP per capita at constant prices. This

measure is widely used in growth studies because it accounts for population changes and reflects improvements in living standards (Barro & Sala-i-Martin, 2004; World Bank, 2023).

1.6.3 Time Scope

The study examined the period 1990–2023, a duration chosen because it provides sufficient annual data for evaluating long-term patterns in Uganda’s economic growth. This timeframe captures key structural and policy changes, including the rollout of Vision 2040 strategies, global economic shocks, and demographic transitions, making it suitable for assessing the influence of population trends, capital formation, and human resource development on economic performance.

1.7 Significance of the Study

The findings of this research are expected to benefit different categories of stakeholders in several important ways.

Policymakers and government agencies. Evidence generated from this study will highlight the specific drivers of Uganda’s economic growth. Such results will be useful to institutions like the Ministry of Finance, Planning and Economic Development, the National Planning Authority, and other government bodies in formulating policies that are data-driven and focused on the fundamental sources of growth. When applied, the findings can also contribute to the realization of Vision 2040 and subsequent National Development Plans by ensuring that investments in infrastructure, education, and health are directed toward sectors with the highest potential for sustainable growth. This relevance is particularly important for enhancing fiscal prioritization and minimizing resource misallocation.

Academicians and researchers. By providing updated empirical insights, the study will enrich literature on growth determinants in developing economies, especially in Uganda. Previous studies have often been either outdated or too narrowly focused, but this research incorporates recent data and rigorous methodologies to address existing gaps. The results will serve as a reference point for further research while stimulating scholarly discussion and advancing theoretical understanding in development economics, particularly with regard to the application of the Solow Growth Model and related theoretical frameworks within Uganda.

Development partners and donor agencies. The World Bank, the International Monetary Fund (IMF), and the African Development Bank are among the global institutions that rely on empirical analyses to shape aid policies and development programs. By offering a deeper understanding of Uganda's growth patterns, this research enables these agencies to align external assistance with the country's priorities and design interventions that foster sustainable and inclusive development.

Private sector actors and investors. The study provides evidence on the role of capital formation and human capital investment that will help local and international investors make informed decisions about sectors with the greatest growth potential. If considered, the findings will encourage investment in manufacturing, services, and agro-processing, thereby creating jobs, raising productivity, and strengthening Uganda's competitiveness in the regional and global economy.

The Ugandan public. Citizens stand to gain directly when evidence-based policies translate into better services, improved job opportunities, and reduced poverty. If considered, the study will contribute to a more inclusive economy where growth outcomes are equitably distributed. In this way, the significance extends beyond academic and policy circles to directly affect people's livelihoods, reinforcing the link between economic research and social transformation.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents the meaning of economic growth, theoretical review underpinning the concept of growth and its determinants, and empirical literature presented in line with the research objectives.

2.1 The Concept of Economic Growth

Economic growth refers to the continuous rise in a country's capacity to produce goods and services over time (Saymeh & Orabi, 2013). It reflects an economy's ability to meet the needs of its citizens by expanding output and improving welfare (Nurina, 2015). Anidiobu et al. (2018) define growth as the increase in real GDP or GDP per capita, expressed at constant prices to eliminate the effect of inflation. In most economic analyses, growth is measured by changes in GDP, which indicate the overall expansion of national output and improvements in living standards.

2.2 Theoretical Review

The Solow Growth Model provides one of the most influential explanations of how economies expand over time. The model argues that long-run growth depends on the accumulation of production inputs such as capital, labour, and technology (Solow, 1956). Later refinements by Mankiw, Romer, and Weil (1992) incorporated human capital as an additional factor, recognizing its role in shaping productivity and long-term performance.

2.2.1 The Exogenous Growth Theory

The exogenous or neoclassical growth theory, advanced by Solow (1956), is central to explaining economic performance in developing countries such as Uganda. It emphasizes that output growth depends on the effective use of capital, labour, and technological progress. While increases in capital and labour may raise production in the short term, they cannot sustain growth indefinitely. Instead, technological progress is identified as the primary driver of long-run growth, explaining variations in productivity across countries (Solow, 1956; Barro & Sala-i-Martin, 2004).

Uganda has continued to experience difficulties in meeting its growth objectives, with GDP expanding at an average of 3.6% between 2020 and 2023, well below the East African Community target of 6% (World Bank, 2023; East African Community, 2022). Heavy dependence on capital

formation and labour force growth has produced only marginal gains, leaving structural weaknesses unresolved. Solow's model demonstrates that without sustained technological advancement, such inputs can only generate temporary increases in output, falling short of driving long-term growth (Aghion & Howitt, 2009).

Drawing on Solow's framework, Uganda's development strategy must prioritize technological progress as a foundation for durable economic expansion. Government efforts have largely emphasized infrastructure and workforce development, but innovation and technology adoption have received limited attention. Empirical studies show that advances in technology can significantly improve productivity levels and help close the gap between Uganda's current performance and regional aspirations (Mankiw, Romer, & Weil, 1992; Jones, 2016).

In addition, the model emphasizes the importance of creating conditions that foster innovation, including strong education systems, effective research and development (R&D), and policies that support technological upgrading. Although Vision 2040 recognizes the central role of technology in economic transformation, implementation has so far been narrow in scope. Placing greater focus on technological progress offers a pathway to reversing Uganda's sluggish growth performance.

From this perspective, the neoclassical growth theory serves as a relevant analytical tool for Uganda. By combining technological advancement with traditional inputs such as labour and capital, the country can accelerate productivity, align more closely with regional benchmarks, and promote sustainable economic development.

2.3 Growth fixed capital and economic growth

In a study by Nabende & Dennis (2021), which aimed to analyze the long-run relationship between infrastructure investment and economic growth in Uganda during 2000–2018, the autoregressive distributed lag (ARDL) model was applied. The study established that road infrastructure significantly enhanced economic performance by improving agricultural productivity. Upgraded rural roads helped to minimize post-harvest losses, reduce transport costs, and enhance farmers' access to markets and inputs.

In a study by Kajubi (2020), which aimed to examine the contribution of telecommunications infrastructure to Uganda's economic growth between 2005 and 2019, a panel regression model was applied. The results demonstrated that mobile and internet technologies significantly boosted GDP through higher productivity, stimulated innovation, and enhanced market integration for small and medium-sized enterprises (SMEs). Given Uganda's rapidly growing informal sector, digital infrastructure also strengthened information flows and promoted financial inclusion through mobile money platforms. The study concluded that investment in digital infrastructure is not only a driver of economic growth but also essential for inclusive development, as it enables marginalized groups to actively participate in the economy. These findings are consistent with endogenous growth theory, which highlights human capital and knowledge diffusion as key mechanisms through which infrastructure supports long-term productivity.

Ainebyoona et al. (2022) examined the role of energy infrastructure, with emphasis on large hydropower projects such as the Karuma and Isimba dams, in shaping Uganda's economic growth between 2000 and 2020. Applying time series econometric methods, their study revealed that although electricity generation capacity expanded, inefficiencies in distribution networks and high end-user tariffs limited the expected impact. Despite improvements in access to electricity benefiting industries, challenges such as unreliability and unequal distribution reduced the overall contribution of energy investments to GDP. The authors recommended strengthening distribution systems, reducing inefficiencies, and ensuring equitable access to energy in order to maximize the benefits of infrastructure. This evidence is consistent with Solow's (1956) neoclassical framework, which suggests that capital accumulation enhances output only when complemented by efficient support systems that minimize diminishing returns.

Mugume & Kaggwa (2021) explored how industrial parks and special economic zones influenced Uganda's economic performance from 2008 to 2020. Applying a difference-in-differences approach, they compared GDP levels in regions with industrial parks against those without and established that locations with industrial parks recorded stronger productivity, particularly within manufacturing, and created more employment opportunities. Nonetheless, the study identified persistent constraints, including weak infrastructure within the zones, poor linkages with domestic firms, and limited access to affordable energy. The authors recommended targeted investment in transport and energy systems, complemented by stronger institutional frameworks, to maximize

the contribution of SEZs. These findings are consistent with evidence from East Asia, where SEZs have stimulated growth by linking production with global value chains under adequate infrastructure and governance systems.

Atuheire et al. (2020) examined how airport infrastructure contributes to trade and tourism in Uganda. Using an input–output model, they established that the modernization of Entebbe International Airport enhanced trade flows and significantly increased tourism revenue. Improvements in passenger handling and cargo services facilitated the mobility of goods and people, which in turn supported GDP growth. Nonetheless, challenges such as logistical inefficiencies, inadequate personnel training, and limited use of modern technology continued to restrict the airport’s growth potential. The authors recommended investments in digital logistics platforms, expansion of airport services, and continuous training for aviation staff to boost efficiency. They concluded that air transport remains a central driver of economic progress in a globalized economy.

Globally, physical capital investment continues to be a key driver of economic growth. Barro & Sala-i-Martin (2004) emphasize that infrastructure such as transport networks, electricity supply, and telecommunications reduces transaction costs, enhances productivity, and creates an enabling environment for further investment. Evidence from countries like Kenya and Rwanda demonstrates that prioritizing well-designed infrastructure initiatives stimulates growth and strengthens competitiveness within the East African Community (AfDB, 2022). Although Uganda has made progress in expanding its infrastructure base, it still trails behind its neighbors in terms of efficiency, reliability, and upkeep. This shortfall weakens national competitiveness and slows structural transformation, particularly in manufacturing and export diversification.

Vision 2040 continues to face persistent challenges, including inefficiencies in project delivery, budget overruns, corruption, and delays in implementation, all of which reduce the overall contribution of infrastructure to national development (UNDP, 2022). Unequal access between rural and urban areas further compounds the problem, with rural regions often left underserved. This imbalance restricts agricultural productivity and hinders small-scale industrial development, thereby reinforcing regional inequality. Promoting equitable and inclusive infrastructure access is therefore vital to ensuring that investment in this sector contributes effectively to broad-based growth.

Despite the existing body of research, significant gaps remain regarding how fixed capital shapes Uganda's economic performance. Much of the literature has focused narrowly on individual infrastructure sectors, such as roads or energy, instead of examining their combined contributions to agriculture, manufacturing, and services. In addition, while infrastructure expansion has been widely studied, fewer analyses have assessed quality-related attributes such as efficiency, sustainability, and reliability, which are equally important in shaping long-term development. Rural–urban disparities and their economic consequences also remain insufficiently explored. Furthermore, the indirect role of physical capital such as enabling better educational facilities, improving access to healthcare, or supporting technological adoption through digital systems has not received adequate attention in empirical studies.

Fixed capital formation remains a cornerstone of Uganda's development strategy and continues to be emphasized in national planning frameworks. However, realizing its full potential requires more than expansion of infrastructure stock; it calls for improvements in equitable distribution, efficiency, and quality. A holistic approach involving both policymakers and researchers is essential, one that integrates cross-sectoral linkages, addresses inefficiencies, and balances the development of rural and urban areas. Such an approach would strengthen not only the direct contribution of physical capital to national output but also its indirect role in promoting human development and advancing technological innovation. Aligning infrastructure policy with these priorities will allow Uganda to achieve sustainable economic transformation consistent with its long-term growth aspirations.

2.4 Human capital and economic growth

Human capital, which includes education, health, and skills, is widely acknowledged as a cornerstone of economic growth. Both theoretical and empirical research consistently indicate that investment in human capital enhances productivity, drives innovation, and sustains long-term development (Barro & Sala-i-Martin, 2004; Psacharopoulos & Patrinos, 2018). In the case of Uganda, policy initiatives such as Universal Primary Education (UPE), Universal Secondary Education (USE), and the National Development Plan III (NDP III) were adopted to strengthen human capital development. However, persistent constraints such as limited funding, disparities in access, and quality gaps have curtailed the full economic benefits of these initiatives.

Education plays a vital role in driving economic transformation. Higher levels of education are closely linked to increased productivity, improved labor market performance, and greater adoption of technology (Barro & Sala-i-Martin, 2004). Ainebyoona & Kisembo (2021) evaluated government expenditure on education between 2000 and 2020 and found that investments in secondary and tertiary education had a significant positive impact on GDP. Their findings underscored how higher education directly contributes to labor productivity and economic performance. Likewise, Mukasa & Obura (2020) showed that technical and vocational education and training (TVET) enhances workforce competencies, particularly in manufacturing, thereby improving output and competitiveness. These results align with endogenous growth theory, which highlights the role of knowledge and skills accumulation in sustaining innovation-driven growth.

Healthcare plays an essential role in driving Uganda's economic growth by improving workforce productivity through better physical and mental well-being. Tumusiime et al. (2022) examined healthcare spending between 2005 and 2019 and reported that higher public expenditure reduced absenteeism, improved efficiency, and made a positive contribution to GDP. Despite this progress, weaknesses in service delivery, unequal access across regions, and poor management systems limited the overall benefits of healthcare investment. These findings support Barro & Sala-i-Martin's (2004) view that strong health systems lower morbidity and mortality, thereby increasing labor force participation. Nevertheless, evidence shows that Uganda continues to lag in healthcare financing compared to global trends (World Bank, 2023).

The interaction between education and healthcare is equally critical for sustainable growth. Ainebyoona & Kisembo (2021) and Tumusiime et al. (2022) emphasized that while education builds technical knowledge and skills, healthcare ensures that the labor force remains healthy and productive. Together, these factors foster innovation, reduce dependency, and enhance long-term economic performance. Yet little research has assessed their combined contribution in Uganda, leaving a significant empirical gap.

The private sector also plays an important role in building human capital by complementing government interventions. Private institutions such as schools, hospitals, and training centers help close gaps in access and quality. Mukasa & Obura (2020) showed that private TVET providers are central to bridging Uganda's skills gap, particularly in technical fields that support industrialization. Psacharopoulos & Patrinos (2018) further noted that private healthcare services

often deliver better-quality outcomes, thereby boosting workforce productivity. However, evidence on the private sector's role in human capital development remains scarce and requires further study.

Regional disparities further challenge human capital investment. Barungi et al. (2021) found that rural areas receive fewer educational and healthcare resources than urban areas, limiting their overall contribution to national development. The World Bank (2023) observed that urban areas disproportionately benefit from these investments, which deepens inequality and undermines balanced growth. Addressing these disparities is therefore necessary to ensure equitable distribution of human capital development across regions.

Investment in human capital is central to Uganda's long-term economic strategy. Both education and healthcare contribute positively to growth, yet persistent issues of quality, efficiency, and equity reduce their overall impact. The literature points to critical gaps that require attention, such as the exploration of the combined role of education and health, the contribution of private sector initiatives, and the implications of regional disparities. Addressing these areas will enable policymakers to adopt a comprehensive approach to human capital development, ensuring that investments translate into sustainable economic transformation in line with Vision 2040 and NDP III.

2.5 Population growth and economic growth

Population growth remains an important driver of economic performance and is often described as having a dual impact. On one hand, an increasing population expands the labor force, broadens domestic markets, and stimulates aggregate demand, thereby creating opportunities for sustained growth. On the other hand, rapid demographic expansion can overburden infrastructure, stretch public services, and reduce per capita access to resources unless accompanied by sufficient investment and economic opportunities. Uganda, with one of the highest fertility rates globally and an average annual population growth rate of 3 percent, provides a critical case for assessing how demographic patterns influence long-term growth and sustainable development (World Bank, 2023; UBOS, 2022).

A rising population offers potential benefits through greater labor supply. Kisembo & Tumwine (2020) examined the relationship between demographic change and labor force participation in Uganda from 2000 to 2019, showing that an expanding workforce contributed positively to GDP, especially in agriculture and the informal sector where the majority of citizens are employed. However, they also emphasized that without complementary investment in education, healthcare, and skills development, the productivity potential of this growing labor force remains underutilized, limiting its capacity to drive national development.

Global scholarship reinforces this mixed perspective. Barro & Sala-i-Martin (2004) contend that demographic expansion has the potential to stimulate innovation and productivity, particularly when aligned with strong investment in human capital. Similarly, Bloom et al. (2019) emphasized the importance of converting high fertility rates into a demographic dividend by implementing policies that promote education, healthcare, and job creation. Rwanda provides a regional example where deliberate investments in these areas enhanced growth, improved life expectancy, and reduced fertility (AfDB, 2022). By contrast, Uganda continues to struggle with limited service quality and inadequate healthcare financing, constraining its capacity to replicate such progress (World Bank, 2023).

The challenges of rapid population growth in Uganda are evident in strained public services. Tumusiime *et al.* (2022) found that between 2005 and 2020, rising population levels intensified pressure on education, housing, and healthcare systems, lowering service quality and constraining productivity. Similarly, Barungi *et al.* (2021) observed that inadequate infrastructure and poor connectivity in rural areas exacerbated inequality, further weakening the contribution of rural populations to GDP. At the same time, urban centers face overcrowding, traffic congestion, and insufficient facilities, which undermine economic activity.

Despite these challenges, population growth also contributes positively to domestic market expansion. Nabende & Mukasa (2021) explored the interaction between demographic growth and market size in Uganda from 2000 to 2020, showing that larger populations stimulated demand for goods and services, thereby driving production and trade. While this expansion created opportunities for agriculture, services, and commerce, the study cautioned that inflationary pressures and reduced per capita welfare could erode these benefits if reforms were not undertaken.

The uneven regional distribution of demographic growth further complicates Uganda's economic path. Kisembo et al. (2021) observed that urban areas, particularly Kampala, benefit more from population increases because of better infrastructure, expanded job opportunities, and improved service access, while rural regions remain less served and less diversified. This imbalance has reinforced inequality and restricted inclusive national growth.

Although a significant body of literature exists on the population–growth nexus, notable gaps remain. Limited empirical work has assessed the economic consequences of Uganda's high dependency ratio, with more than half of the population below 15 years. Sector-specific studies on how rapid demographic growth influences areas such as agriculture, healthcare, and education remain scarce. Furthermore, the contribution of technological adoption in managing these pressures is still underexplored, despite its potential to ease the burden of demographic change.

Population growth therefore presents both opportunities and constraints for Uganda's development. While it enhances labor supply and expands domestic demand, it simultaneously places greater strain on infrastructure, services, and natural resources. Addressing identified research gaps on dependency ratios, regional disparities, and technological innovation is essential for leveraging Uganda's demographic trends. With strategic investments in education, health, and employment creation, supported by effective policy reforms, Uganda can convert its rapid demographic expansion into a sustainable driver of economic transformation.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents the methodology applied in the investigation, highlighting the research design, data sources, model specification, and techniques of data analysis.

3.1 Research Design

This study used a quantitative approach, applying a time-series framework to examine the determinants of Uganda's economic growth. This approach was appropriate as it enables the assessment of short-run variations as well as long-run growth dynamics in the economy. The investigation relied on annual macroeconomic data from 1986 to 2023, providing a comprehensive data set that allowed meaningful statistical evaluation.

3.2 Data type and sources

Annual time series data for Uganda spanning 1990 to 2023 was utilized. This time frame was selected because it reflects the post-liberalization period under the National Resistance Movement (NRM), characterized by structural reforms, stabilization programs, and various development initiatives. The choice of this horizon is appropriate since it captures the influence of liberalization policies on Uganda's growth trajectory, offering a solid basis for examining the long-term connection between input factors and economic performance (World Bank, 2023; UBOS, 2022). To enhance the robustness of the analysis, annual data were converted into quarterly observations using EViews software, thereby expanding the sample size and improving estimation accuracy. This procedure is widely used in time series econometrics to improve model precision and better reflect the dynamics of economic growth (Gujarati & Porter, 2009).

3.3 Theoretical Frame work

The study adopted neoclassical Solow growth model (1956) and its extension by Mankiw, Romer, and Weil (1992), which incorporates traditional inputs such as capital, labor, and human capital. It was further expanded to include endogenous growth elements such as innovation, productivity drivers, and institutional variables like governance, thereby offering a comprehensive framework for analyzing the determinants of economic growth in Uganda (Lucas, 1988; Romer, 1990; Roa, 2006).

The analysis applies an augmented Cobb–Douglas production function characterized by constant returns to capital and labor, with exogenous technological progress.

$$Y_t = A f(K_t, L_t, H_t) \dots \dots \dots (1)$$

Equation (i) can be re-written as:

$$Y_t = A K^\alpha L^\beta H^{(1-\alpha-\beta)} \dots \dots \dots (2)$$

In this specification, Y represents output, A denotes knowledge or exogenous technology coefficient, L stands for labor, and H indicates human capital.

3.4 Model Specification

Building on Solow (1957) and Mankiw, Romer, and Weil (1992), the population growth rate (n) is incorporated in the output function, adjusted for the exogenous rate of technological progress (g) and depreciation of physical capital (δ). In this context, a dynamic growth specification was established within the neoclassical framework to evaluate the GDP per capita variables.

$$\text{Log}(gdppc)_t = A_0 + \alpha_1 \text{Log}(gdppc)_{t-1} + \beta_1 \text{Log}(gcfpc)_t + \beta_2 (\text{humcappc})_t + \beta_3 \text{Log}(n + g + \delta)_t + U \dots \dots \dots (3)$$

The a priori expectations are;

$$A_0 > 0, \alpha_1 > 0, \beta_1 > 0, \beta_2 > 0, \beta_3 > 0$$

3.4.1 Definition and Measurement of Variables

Base Variable	Definition and Measurement
Economic Growth (Y/GDP)	Economic growth is the sustained increase in the total value of goods and services produced in the economy. In the Solow model, it is proxied by real Gross Domestic Product (GDP) measured at constant prices (Solow, 1956; Mankiw, Romer, & Weil, 1992).
Gross Fixed Capital (K)	Gross fixed capital refers to the stock of physical assets such as machinery, infrastructure, and buildings used in the production process. It is commonly measured using gross fixed capital formation as a percentage of GDP (Mankiw, Romer, & Weil, 1992).

Labour Force (L)	The labour force consists of individuals engaged or available for productive work in the economy. It is proxied by labour force participation rates or total employment levels (Solow, 1956).
Population Growth (n)	Population growth reflects the rate at which the population increases, affecting labour supply and capital dilution. It is measured by the annual population growth rate (Mankiw, Romer, & Weil, 1992).
Log(gdppc) _t	The logarithm of Gross Domestic Product per capita at time t that measures of economic growth.
Gcfpc	Gross fixed capital formation per capita which serves as a proxy for physical capital investment.
Humcappc	The logarithm of Human capital per capita at time t , measured by total expenditure on education per capita.
pop_growth Log($n + g + \delta$)	Logarithm of population growth, adjusted for exogenous technological progress and the depreciation rate of capital.

3.4 Estimation procedure

In time series analysis, challenges such as non-stationarity, multicollinearity, simultaneity, and autocorrelation often arise, complicating the accurate estimation of relationships between variables. Non-stationarity occurs when the mean and variance of data are not constant over time, which may lead to spurious regression outcomes if not addressed (Granger & Newbold, 1974). Multicollinearity refers to strong correlations among independent variables that inflate standard errors and weaken the precision of coefficient estimates (Gujarati & Porter, 2009). Simultaneity, also referred to as feedback effects, emerges when explanatory variables are influenced by the dependent variable, violating the exogeneity assumption (Wooldridge, 2015). Autocorrelation occurs when variables are correlated with their past values, potentially biasing standard error estimates and resulting in misleading inference (Durbin & Watson, 1951).

To mitigate these concerns, rigorous pre-estimation diagnostic tests are conducted on time series data. These include unit root tests such as the Augmented Dickey-Fuller and Phillips-Perron procedures to establish stationarity, alongside tests for multicollinearity such as the Variance

Inflation Factor. Post-estimation diagnostics, including residual tests for autocorrelation (e.g., Durbin-Watson) and stability checks, are equally vital for confirming model reliability. By applying these diagnostics, this study ensures that the dataset conforms to the assumptions of the selected econometric techniques, thereby improving the robustness and validity of the results.

3.5 Econometric tests

3.5.1 Normality test

Normality was assessed using the skewness and kurtosis test, which determines whether the dependent variable conforms to a normal distribution. This step is essential since parametric regression models assume normality in the dependent variable, thereby ensuring that residuals also follow a normal distribution (Gujarati & Porter, 2009). The test evaluates the null hypothesis that the data are normally distributed against the alternative hypothesis of non-normality. The null hypothesis is rejected when the combined chi-square probabilities for skewness, kurtosis, and the joint test statistic are below 0.05 (Doornik & Hansen, 2008).

Skewness measures the extent to which a distribution deviates from symmetry, where a value of zero indicates perfect balance. Kurtosis, on the other hand, assesses the degree of tail heaviness in a distribution, with a value of three typically reflecting a normal distribution (Joanes & Gill, 1998). Both measures are widely applied in econometric studies to verify the assumption of normality, which underpins various statistical inference procedures.

3.5.2 Unit Root Tests

Unit root testing was conducted to confirm the stationarity of the data prior to analyzing the relationship between the explanatory and dependent variables. Ensuring stationarity is essential because regressing non-stationary series without a co-integration framework can lead to spurious results. A non-stationary series is characterized by means and variances that change over time, making it unsuitable for direct regression analysis. To address this, the Augmented Dickey-Fuller (ADF) test was employed to assess the presence of unit roots.

The ADF approach involves estimating the following equation:

$$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 t + \sum_{i=1}^p \alpha_i \Delta Y_{t-i} + \varepsilon_t \dots\dots\dots (6);$$

and the hypothesis: $H_0: \beta_1 = 0$ is tested against $H_1: \beta_1 > 0$.

Where Y_t represents the vector of all time series variables included in the model; t denotes the time trend; Δ is the first-difference operator; ε_t represents the error term; and p indicates the optimal lag length of each variable, selected to ensure that the differenced residuals behave as white noise.

The Augmented Dickey-Fuller (ADF) test was primarily applied to evaluate the null hypothesis that $\beta_1 = 0$. Rejection of this hypothesis suggests that the series is stationary and integrated of order zero, $I(0)$. If the null hypothesis is not rejected, the series may be non-stationary, prompting further differencing. Once first differences are tested and found to be stationary, the variable is then considered integrated of order one, $I(1)$ (Johansen, 1988; Maddala, 1977; Adenutsi *et al.*, 2007).

3.5.3 Cointegration tests

After confirming the stationarity properties of the individual time series, a cointegration analysis was carried out to evaluate whether long-run equilibrium relationships exist among the model variables. The objective was to establish if a combination of stationary series is cointegrated, indicating a stable long-term association. In a single-equation framework, the study applied the Engle and Granger (1987) residual-based method, which tests the null hypothesis that the variables are not cointegrated.

3.5.4 Model estimation Methods

This research applied multiple linear regression techniques using time series data to examine the determinants of economic growth in Uganda. A Specific-to-General modeling strategy was adopted to progressively refine the final model, ensuring that only significant variables were retained while maintaining robustness (Hendry, 1995). Given the common challenge of endogeneity in growth regressions, where explanatory variables may correlate with the error term, the Generalized Method of Moments (GMM) was employed as an instrumental variable estimation method (Arellano & Bond, 1991).

The GMM framework provided several advantages, notably its ability to address endogeneity bias and control serial correlation in time series, both of which are frequent concerns in growth studies (Blundell & Bond, 1998). It is also appropriate for dynamic models, where lagged values of the dependent or explanatory variables can serve as valid instruments to generate consistent and unbiased parameter estimates (Roodman, 2009). This strengthened the reliability of the results and reduced the risk of biased conclusions. The integration of the Specific-to-General procedure with GMM further enhanced the methodological rigor of the study.

3.5.5 Control of serial Correlation

The use of time series data spanning several years introduced the possibility of serial correlation in regression residuals, which may result in biased standard errors, unreliable test statistics, and misleading interpretations of economic growth determinants. To address this issue, the study employed the Generalized Method of Moments (GMM) with a “vce robust” specification, which ensures that the reported standard errors remain reliable in the presence of heteroskedasticity and autocorrelation.

This method overcomes the limitations of conventional estimation approaches by strengthening hypothesis testing and improving the accuracy of confidence intervals. Robust GMM estimation further enabled the analysis to correct for potential data biases, ensuring that the estimated effects of physical capital, human capital, and population growth on Uganda’s economic growth were derived without distortion from serial correlation. This enhanced both the validity and the credibility of the findings.

3.6 Data analysis package

EViews and STATA software were employed to examine data patterns and estimate the specified econometric models. EViews was particularly useful for conducting preliminary diagnostics such as unit root testing, cointegration analysis, and data transformation. STATA complemented this by running regression models, applying the Generalized Method of Moments (GMM) to account for endogeneity, and performing post-estimation diagnostics including autocorrelation and stability checks. The integration of both software packages ensured reliable and robust results.

i. Effect of Fixed Capital Growth on Economic Growth in Uganda

STATA was applied to run regression models that measured the contribution of gross fixed capital formation to Uganda's economic performance. The analysis relied on time series data, alongside diagnostic tests like stationarity and multicollinearity, to confirm model accuracy.

ii. Effect of Labour Force Growth on Economic Growth in Uganda

Labour force participation and its influence on Uganda's economic performance were analyzed using econometric methods in STATA. This enabled estimation of how changes in labour force participation contributed to GDP growth over time.

iii. Effect of Population Growth on Economic Growth in Uganda

STATA was used to assess the link between population dynamics and economic performance. Regression models and statistical tests were applied to determine whether changes in population levels enhanced or constrained long-term growth.

3.7 Ethical Considerations

The research process adhered to strict ethical principles that safeguarded credibility, transparency, and respect for data integrity. All data used came from secondary sources available in recognized databases such as those of the Uganda Bureau of Statistics (UBOS), the Bank of Uganda (BOU), and the World Bank Development Indicators (WBDI). These institutions provide validated macroeconomic data, reducing risks related to bias or inaccuracy. Since the research did not involve direct human subjects, risks related to privacy or consent were avoided. All data obtained was handled confidentially and with care, and no attempt was made to manipulate or misrepresent figures to achieve specific outcomes.

Ethical responsibility also extended to the reporting and dissemination of findings. Results from the study were presented objectively, ensuring that conclusions were drawn strictly from the data analysis and not influenced by personal bias. Findings were shared among stakeholders, including policymakers, academics, and development practitioners, to promote informed decision-making and support policy formulation and management. In addition, the study maintained academic honesty by acknowledging all sources consulted and avoiding plagiarism. Proper citation and

referencing were observed in accordance with academic writing standards, ensuring that no works of other scholars were reproduced without attribution.

Furthermore, the study recognized the potential implications of its findings for economic planning and policy in Uganda. To this end, results were communicated in a manner that promotes responsible use, avoiding misinterpretation or misuse of the data. This ethical approach ensured that the research not only contributed to the advancement of knowledge but also aligned with the principles of integrity, accountability, and transparency in academic inquiry.

CHAPTER FOUR

PRESENTATION, INTERPRETATION AND DATA ANALYSIS

4.1 Descriptive statistics

The study examined the summary statistics of the variables as shown below

Variable	Mean	Std. Dev.	Min	Max
gcf_gdp	20.41358	5.581786	8.446924	31.97398
gdp_pc	519.3924	297.6683	152.1135	1072.714
educ_exp	3.35E+08	2.04E+08	76100000	6.92E+08
pop_grw	3.083839	0.213524	2.701456	3.490596

Source: (Secondary Data, 2025)

The descriptive statistics show that the dataset contains 39 observations for most variables, except for education expenditure (36). Gross capital formation as a percentage of GDP (gcf_gdp) averages 20.41%, with moderate variation (Std. Dev. 5.58) and ranges between 8.45% and 31.97%. GDP per capita (gdp_pc) averages 519.39 units, but shows high variability (Std. Dev. 297.67), indicating wide disparities in income levels across observations, with values spanning from 152.11 to 1,072.71. Education expenditure (educ_exp) averages about 335 million, but with very high variation (Std. Dev. 204 million), suggesting large differences in government or national spending on education, ranging from 76.1 million to 692 million. Population growth rate (pop_grw) is relatively stable, with a mean of 3.08% and low variation (Std. Dev. 0.21), fluctuating only between 2.70% and 3.49%. Overall, the data indicate significant variation in income and education expenditure, while population growth remains steady and capital formation moderately dispersed.

4.2 Correlation Matrix

The Pearson correlation matrix was employed to assess the degree of association among GDP per capita, gross capital formation, education expenditure, and population growth. This analysis establishes whether the variables move in the same or opposite direction, while also indicating the strength of these associations. The findings provide a deeper understanding of how these factors interact to shape Uganda's economic growth.

Variable	gdp_pc	gcf_gdp	educ_exp	pop_grw
gdp_pc	1.00	0.58	0.62	-0.15
gcf_gdp	0.58	1.00	0.49	-0.08
educ_exp	0.62	0.49	1.00	-0.12
pop_grw	-0.15	-0.08	-0.12	1.00

Source: (Secondary Data, 2025)

The findings reveal that GDP per capita exhibits a moderate positive correlation with gross capital formation ($r = 0.58$). This indicates that as investment in physical capital increases, income levels improve correspondingly. Such a relationship highlights the role of infrastructure, machinery, and other forms of fixed capital in enhancing productivity and sustaining long-term growth.

Likewise, GDP per capita is positively correlated with education expenditure ($r = 0.62$). This strong association suggests that higher investment in human capital through education contributes to rising income levels. The implication is that a skilled and educated population fosters productivity, innovation, and overall economic performance.

Gross capital formation is also moderately correlated with education expenditure ($r = 0.49$). This suggests that increased physical investment is frequently accompanied by greater spending on education, underscoring the complementary nature of growth strategies that combine infrastructure development with human capital investment.

In contrast, population growth exhibits weak negative correlations with GDP per capita ($r = -0.15$), gross capital formation ($r = -0.08$), and education expenditure ($r = -0.12$). Although these associations are not strong, they suggest that faster population growth may place strain on available resources, limiting the capacity of income, capital investment, and education systems to expand at the same pace.

Taken together, the results show that economic growth in Uganda is more closely linked to improvements in capital formation and education expenditure, while population growth exerts a

small but negative pressure. These relationships provide useful preliminary evidence about the drivers and constraints of economic development in the country.

4.3 Multicollinearity check

The study examined multicollinearity among the independent variables as shown below

Variable	VIF	SQRT VIF	Tolerance	R-Squared
gcf_gdp	2.59	1.61	0.3859	0.6141
educ_exp	2.56	1.6	0.3899	0.6101
Popgrw	1.02	1.01	0.9833	0.0167
Mean VIF	2.06			

Source: (Secondary Data, 2025)

The VIF analysis shows that multicollinearity does not pose a major concern in this dataset, as all VIF values fall well below the accepted threshold of 10 (and even below the stricter cutoff of 5). For instance, gcf_gdp (VIF = 2.59) and educ_exp (VIF = 2.56) exhibit moderate correlations with other predictors, as reflected in their tolerances (0.3859 and 0.3899) and relatively high R-squared values (0.6141 and 0.6101). This indicates some shared variance but not at problematic levels. Conversely, pop_grw (VIF = 1.02) shows negligible multicollinearity, with a very high tolerance (0.9833) and a near-zero R-squared value (0.0167). The mean VIF of 2.06 further confirms that overall multicollinearity is minimal, implying that the predictors can be confidently used in regression analysis without distorting the results.

4.4 Unit root tests

The study examined unit root tests using the Augmented Dickey Fuller (ADF) test as shown below

Variable	Level Test Statistic	Level p- value	1st Difference Test Statistic	1st Difference p-value	Order of Integration (I(d))
GDP per capita	-0.592	0.8728	-3.459***	0.0091	I(1)
Gross Capital Formation	-3.076**	0.0284	-	-	I(0)
Education Expenditure	-1.011	0.7492	-3.198**	0.0201	I(1)
Population growth	-2.911**	0.0440	-	-	I(0)

Source: (Secondary Data, 2025)

The unit root analysis shows that GDP per capita and education expenditure are non-stationary at level (p-values > 0.05) but become stationary after first differencing, classifying them as integrated of order one, I(1). In contrast, gross capital formation and population growth are stationary at level (p-values < 0.05), indicating integration of order zero, I(0). This outcome indicates that the dataset consists of a mix of I(0) and I(1) variables, suggesting that while some require differencing to achieve stationarity, others can be retained in their level form. Such a combination is well-suited for econometric approaches such as the ARDL bounds testing framework, which accommodates variables with different integration orders, provided none exceed I(1).

4.5 ARDL regression results

Variable	Coef.	Std. Err.	t	P> t
Error Correction Term	-0.21132**	0.088191	-2.4	0.026
Long Run				
Gross Capital Formation	1.016286	0.634145	1.6	0.123
Education Expenditure	0.491208**	0.219862	2.23	0.036
Population Growth	1.321443	1.778206	0.74	0.465
Short run				
GDP per capita _{LD}	0.616235**	0.226199	2.72	0.012
Gross Capital Formation	0.091001	0.236606	0.38	0.704
Gross Capital Formation _{LD}	0.027203	0.153216	0.18	0.861
Education Expenditure	0.352204**	0.108302	3.25	0.004
Education Expenditure _{LD}	-0.19958	0.140941	-1.42	0.171
Population Growth	-0.38261	0.569319	-0.67	0.509
Population Growth _{LD}	0.302587	0.544311	0.56	0.584
Constant	-1.70221	1.00756	-1.69	0.105

Summary: ARDL (2,2,2,2) regression, Sample: 1988 – 2021, Number of observations: 34, R-squared: 0.7493, Adjusted R-squared: 0.6239, Log likelihood: 39.154771, Root MSE: 0.0951

Source: (Secondary Data, 2025)

4.5.1 Effect of Gross Capital Formation on Economic Growth

In the short run, the coefficients of gross capital formation (0.091 and 0.027) are statistically insignificant (p-values = 0.704 and 0.861), suggesting that changes in investment expenditure do not immediately or substantially affect economic growth. In the long run, the coefficient of gross capital formation remains positive (1.016), but it is still statistically insignificant (p = 0.123). This implies that although capital investment may contribute to Uganda's growth trajectory, the effect is not strong enough to provide definitive evidence within this model. Overall, gross capital formation demonstrates a theoretically positive but empirically weak effect on economic growth in Uganda.

4.5.2 Effect of Education Expenditure (Proxy for Labour Force) on Economic Growth

In the short run, education expenditure has a significant positive effect on economic growth (coefficient = 0.352, $p = 0.004$), suggesting that increased investment in education enhances immediate growth. However, the lagged short-run effect (-0.199, $p = 0.171$) is negative and insignificant, implying that its influence diminishes over time. In the long run, education expenditure remains significant (coefficient = 0.491, $p = 0.036$), reinforcing the importance of education as a critical driver of sustainable growth in Uganda. This highlights the role of education in supporting both short-term and long-term economic performance.

4.5.3 Effect of Population Growth on Economic Growth

In the short run, population growth shows a negative relationship with economic growth (coefficient = -0.383, $p = 0.509$), though the result is statistically insignificant. The lagged effect is positive but also insignificant (0.303, $p = 0.584$), indicating that fluctuations in population growth do not yield meaningful short-term changes in growth. Over the long run, population growth displays a positive coefficient (1.321, $p = 0.465$), yet this outcome is statistically insignificant. While an expanding population could enlarge the labor force and consumption base, the findings do not provide strong evidence for its role as a growth driver under this framework.

4.5.4 Model Summary

The error correction term (ECT) for GDP per capita is -0.2113 and found to be statistically significant ($p = 0.026$), implying that about 21% of short-run disequilibrium is corrected each period. The negative coefficient confirms the expected adjustment mechanism, suggesting that the model steadily returns to long-run equilibrium after shocks. This indicates a moderate adjustment speed, meaning Uganda's economy requires several periods to fully stabilize after disruptions.

The ARDL (2,2,2,2,2) results confirm a good model fit for the data spanning 1988 to 2021. The R-squared value (0.7493) reveals that approximately 75% of the variation in growth is explained by the independent variables, while the adjusted R-squared (0.6239) provides further evidence of strong explanatory power. The model's reliability is reinforced by a significant log-likelihood statistic (39.15), a low Root MSE (0.0951), and minimal prediction errors. These outcomes affirm

that the ARDL model effectively captures both short-run and long-run dynamics of the variables under investigation.

4.6 Post estimation diagnostic tests

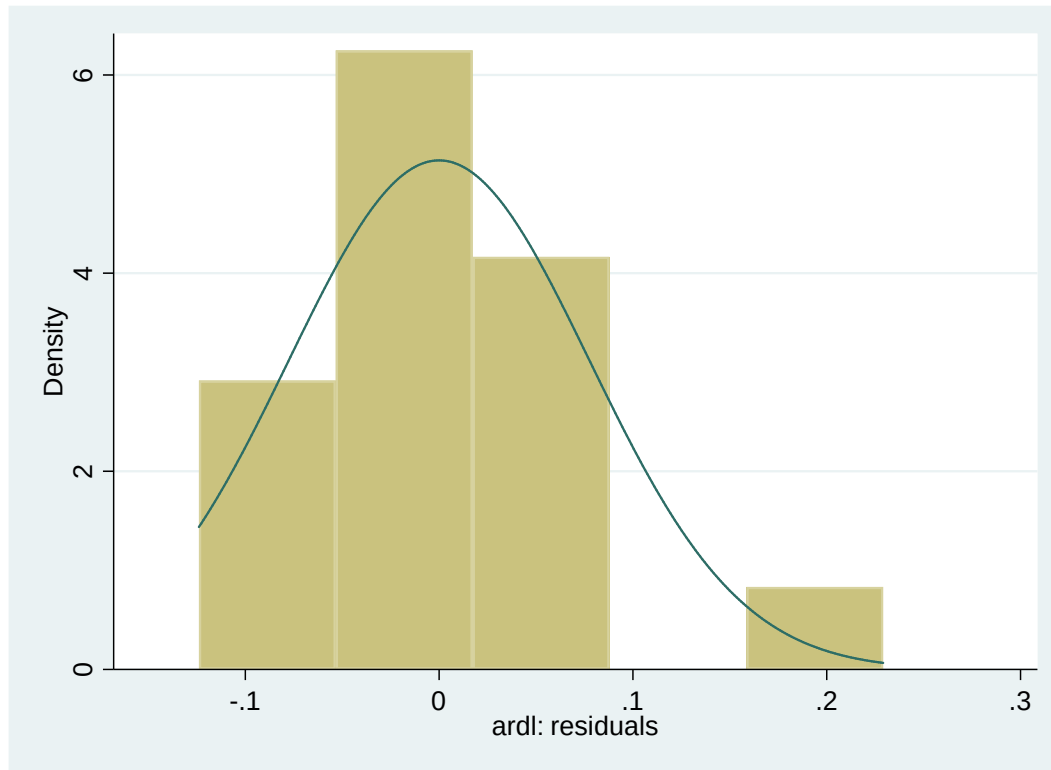
4.6.1 Heteroscedasticity

Test Component	Chi ²	df	p-value
White Test (Overall)	34	33	0.4192
Heteroskedasticity	34	33	0.4192
Skewness	11.42	11	0.4085
Kurtosis	2.39	1	0.1223
Total (IM-test)	47.81	45	0.3593

Source: (Secondary Data, 2025)

The White test for heteroskedasticity, together with Cameron & Trivedi's decomposition of the information matrix (IM) test, confirms that the regression estimates are not affected by heteroskedasticity. The White test produced a chi-square value of 34.00 with 33 degrees of freedom and a p-value of 0.4192, exceeding the 5 percent significance threshold. Similarly, the decomposed components showed that heteroskedasticity ($p = 0.4192$), skewness ($p = 0.4085$), and kurtosis ($p = 0.1223$) were statistically insignificant. The IM-test also reported a non-significant p-value of 0.3593. These outcomes uphold the null hypothesis that the error variance is constant, confirming that the model is free from heteroskedasticity and that the estimated standard errors are reliable.

4.6.2 Non normality of residuals



Source: (Secondary Data, 2025)

The histogram of residuals from the ARDL model, combined with a normal density curve, indicates that the residuals are approximately normally distributed. The distribution shows a slight right skew, reflected in the extended tail on the right, although most residuals remain centered around zero and generally follow a bell-shaped pattern. Minor deviations from normality are observed, but they do not present significant concerns regarding severe non-normality.

4.6.3 Serial correlation test

The Breusch-Godfrey LM test was employed to detect serial correlation in the regression residuals. This procedure evaluates the null hypothesis of no autocorrelation up to a specified lag. The decision rule is straightforward: if the p-value exceeds 0.05, the null hypothesis is retained, implying that autocorrelation is absent. Conversely, when the p-value is below 0.05, the null hypothesis is rejected, confirming the presence of autocorrelation in the model. The Breusch-Godfrey LM test is particularly advantageous because it can identify higher-order autocorrelation and is well-suited for models that include lagged dependent variables.

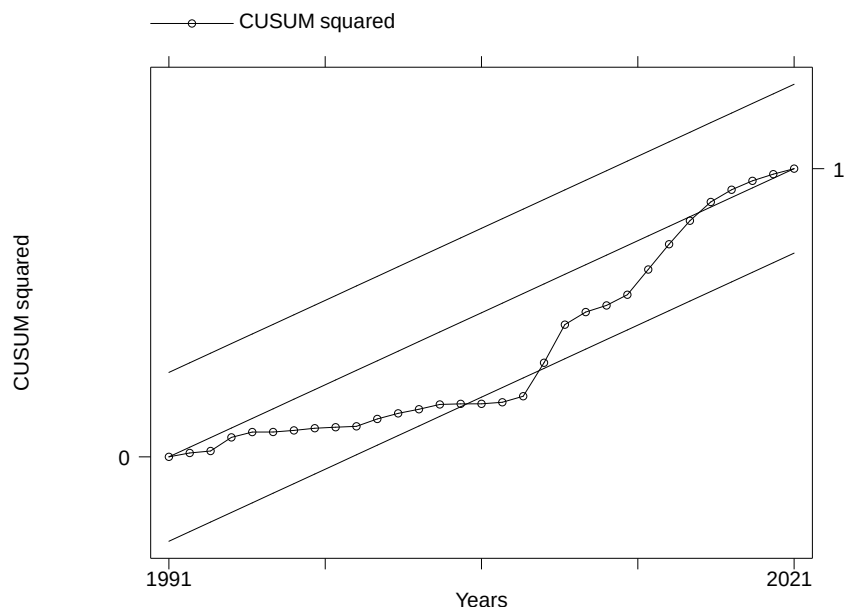
Lags (p)	F-statistic	Degrees of Freedom (df)	p-value (Prob > F)
2	0.309	(2, 20)	0.7376

Source: (Secondary Data, 2025)

The Breusch-Godfrey LM test for autocorrelation showed no evidence of serial correlation in the residuals of the regression model. Using two lags, the F-statistic was 0.309 with degrees of freedom (2, 20). The corresponding p-value of 0.7376 is much higher than the conventional 0.05 threshold, which means the null hypothesis could not be rejected. This confirms that the residuals are not serially correlated. Consequently, the assumption of no autocorrelation in the error terms is upheld, indicating that the model is free from issues linked to autocorrelated residuals, such as inefficiency in standard error estimation or misleading statistical inference.

4.6.4 Model stability test

The study used the cumulative sum test as shown below



Source: (Secondary Data, 2025)

The CUSUM squared plot shown suggests a potential issue with parameter stability over time. In this chart, the CUSUM squared statistic begins within the confidence bands (typically at the 5% level) but gradually moves toward and closely follows the upper boundary, although it does not cross it. This pattern indicates that while the model was initially stable, there may have been gradual structural changes or increasing instability in the latter part of the sample period (post-

2005). Since the line remains within the critical bounds, the null hypothesis of parameter stability at the 5% level cannot be rejected. However, the slight upward trend near the boundary indicates the need for caution and suggests that additional tests for structural breaks, such as the Chow test or Bai-Perron test, may be appropriate.

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATION

5.0 Introduction

This chapter presents the main discussions and conclusions derived from the analysis of economic growth and its determinants, focusing on population growth, labor force, and gross fixed capital formation. It also outlines practical recommendations for policymakers, stakeholders, and practitioners to promote sustainable industrial and economic development.

5.1 Discussion of the study findings

5.1.1 Gross capital formation and economic growth in Uganda

The findings revealed that gross capital formation had a positive but statistically insignificant influence on economic growth in both the short and long run. This outcome suggests that although Uganda has invested heavily in physical infrastructure such as dams, roads, and industrial parks, these investments have not consistently translated into substantial growth results. In many instances, public investment has been constrained by inefficiencies, cost overruns, and governance challenges that weaken the effectiveness of capital spending (Mugume & Kagawa, 2021). Consequently, while gross capital formation increases the stock of physical capital, it does not necessarily lead to higher productivity or sustained growth unless supported by effective management and complementary reforms.

From a theoretical perspective, this outcome challenges the neoclassical proposition advanced in the Solow (1956) model, which argues that increases in physical capital accumulation should raise output until diminishing returns set in. In Uganda's context, the weak and statistically insignificant role of capital indicates that physical investment by itself cannot drive sustained economic expansion without complementary elements such as a skilled labor force, effective institutions, and technological advancement (Barro & Sala-i-Martin, 2004). This interpretation is consistent with extensions of growth theory that emphasize the central role of institutions in shaping the productivity of capital (Aghion & Howitt, 2009). Consequently, Uganda's experience demonstrates the limitations of relying solely on capital-deepening strategies in low-income economies where institutional capacity and absorptive ability remain underdeveloped.

Comparatively, these results are consistent with studies from other Sub-Saharan African economies. For instance, Gelb *et al.* (2020) show that African economies often record large public investment projects but with limited impact on growth due to misallocation and weak absorptive capacity. Similarly, Moyo & Le Roux (2024) emphasize that in countries like Kenya and Nigeria, capital formation contributes positively but insignificantly to growth, primarily because of governance failures and inefficiencies in resource use. On the contrary, empirical evidence from rapidly developing Asian economies, including China and South Korea, demonstrates that gross capital formation was a major driver of growth where investments were targeted at productive sectors and supported by institutional reforms (Oluwatobi & Olumide, 2023).

In Uganda, the findings emphasize that mere accumulation of physical capital does not automatically translate into sustainable growth unless supported by reforms that enhance efficiency, strengthen governance, and integrate technological innovation (Atuheire *et al.*, 2020). This indicates that policymakers should focus not only on the volume of capital investment but also on the quality, direction, and institutional framework within which these investments occur. Thus, the study contributes to the understanding that capital formation on its own is inadequate to drive growth. Uganda's future strategies must therefore emphasize productivity enhancement and stronger governance as a way of unlocking the full benefits of capital investment.

5.1.2 Labour Force (Education Expenditure) and Economic Growth in Uganda

The study established that education expenditure, taken as a proxy for labour force development, had a significant and positive effect on economic growth in both the short and long run. This implies that investment in human capital plays a vital role in improving productivity and supporting sustainable economic transformation. In Uganda, this outcome is reflected in the government's increased budgetary commitment to education, though the levels remain below global standards. These investments have contributed to improved enrolment rates and gradual enhancement of workforce skills (Ainebyona & Kisembo, 2021). The significant coefficients from both short-run and long-run regressions confirm that educational investment contributes to immediate productivity gains while simultaneously providing cumulative long-term benefits through human capital accumulation.

Theoretically, these results resonate with Lucas (1988), who emphasized the role of human capital as an endogenous driver of long-term growth. They also build on the Solow-Swan model, which, while originally exogenous, recognizes that human capital investments can enhance labour productivity and accelerate convergence to a higher steady state (Barro & Sala-i-Martin, 2003). In this study, education expenditure not only supports short-term growth but also aligns with the endogenous growth framework proposed by Romer (1990), which highlights knowledge accumulation and innovation as engines of sustained economic performance. Thus, Uganda's case reinforces the theoretical position that human capital is indispensable for both immediate and sustained growth outcomes.

Comparative evidence reinforces this interpretation. Psacharopoulos & Patrinos (2018), in their global review, confirmed that returns to investment in education are consistently high, particularly in developing economies. Similarly, Odhiambo (2024) established that in Sub-Saharan Africa, education expenditure significantly drives economic growth when supported by strong governance and institutional frameworks. At the national level, Kizza *et al.* (2020) showed that Uganda's enrolment rates across primary, secondary, and tertiary education exert long-run causal effects on GDP growth, highlighting the close linkage between education and macroeconomic performance. These findings collectively affirm that human capital formation stands out as one of the most reliable and consistent drivers of economic growth.

From a practical perspective, the evidence suggests that Uganda's policy agenda should place sustained emphasis on expanding and improving education across all levels. As Tumusiime *et al.* (2022) contend, investment in human capital not only raises labour productivity but also strengthens complementary sectors such as healthcare, innovation, and industrial activity. The findings of this study underscore that education investment remains one of the most powerful instruments for Uganda to foster inclusive and sustainable economic growth.

5.1.3 Population Growth and Economic Growth in Uganda

The study found that population growth had no statistically significant effect on economic growth in Uganda, with negative coefficients in the short run and positive but insignificant coefficients in the long run. This indicates that Uganda's high population growth rate, estimated at around 3% annually, has not yet been harnessed effectively to drive growth. The results point to structural

barriers such as insufficient job creation, inadequate capital deepening, and poor infrastructure, which limit the country's ability to translate demographic expansion into economic opportunities (Barungi *et al.*, 2021).

From a theoretical angle, these results diverge from the Solow (1956) model, which predicts that high population growth reduces capital per worker and thus slows down per capita income growth. At the same time, the findings also fail to confirm the demographic dividend hypothesis described by Bloom *et al.* (2019), which suggests that high population growth can stimulate growth when supported by improvements in productivity and institutional quality. Instead, Uganda appears to be caught in a demographic transition where rapid population growth creates pressure on resources without generating substantial economic gains.

The analysis revealed that population growth did not exert a statistically significant influence on economic growth in Uganda. The coefficients showed negative effects in the short run and positive but insignificant effects in the long run. This outcome indicates that Uganda's relatively high population growth rate, estimated at approximately 3% annually, has not been effectively harnessed to stimulate growth. Structural challenges such as limited job creation, weak capital deepening, and inadequate infrastructure continue to restrict the potential of demographic expansion to translate into economic opportunities (Barungi *et al.*, 2021).

From a theoretical perspective, these findings deviate from the Solow (1956) model, which posits that rapid population growth reduces capital per worker and slows per capita income growth. Similarly, the results do not support the demographic dividend hypothesis advanced by Bloom *et al.* (2019), which emphasizes that population growth can contribute to economic performance when matched with improvements in productivity and institutional quality. In Uganda's case, rapid population growth appears to exert pressure on available resources without yielding substantial economic benefits, suggesting a demographic transition without corresponding economic transformation.

Regional and national evidence provides further context. For example, Kisembo & Tumwine (2020) showed that Uganda's labour force expansion, driven by high population growth, increased pressure on public services and reduced productivity gains when not accompanied by investment in human capital. Likewise, Siifa *et al.* (2023) reported that Uganda's high dependency ratio

constrained per capita growth and deepened poverty, underscoring the risks of demographic expansion without absorptive capacity. On the other hand, studies such as Peter & Bakari (2019) highlight that in contexts with strong governance and effective human capital development, population growth can enhance economic performance.

In the Ugandan context, the evidence indicates that population growth alone is not a reliable engine of economic transformation. Its effect is largely contingent on the country's ability to absorb the growing labour force through deliberate strategies in job creation, education, and infrastructure development (Nabende & Mukasa, 2021). Without such interventions, rapid population growth risks becoming a structural burden rather than a demographic dividend. The results therefore emphasize the need for policies that transform demographic expansion into productive human capital, rather than depending solely on population growth as a driver of economic development.

5.2 Conclusion from findings

First, the study reveals that gross capital formation exerts a theoretically positive but empirically weak influence on Uganda's economic growth. Although the coefficients were positive, they were statistically insignificant in both the short and long run. This implies that while capital investment remains important, inefficiencies such as corruption, poor project implementation, and weak institutional capacity limit its effectiveness. Uganda's growth trajectory therefore cannot rely exclusively on physical capital accumulation without addressing structural constraints.

Second, the findings underscore the role of education expenditure, used as a proxy for human capital, as the most consistent and statistically significant driver of economic growth in Uganda. Both in the short and long term, education expenditure enhances growth, reflecting its contribution to human development and long-term productivity. This supports the view that investments in education not only provide immediate benefits by building a skilled labor force but also lay a solid foundation for sustainable growth.

Third, the analysis shows that population growth does not significantly drive Uganda's economic growth. While it has the potential to expand the labor force and consumption base, the lack of statistical significance in both the short and long run suggests that rapid population expansion, without sufficient job creation and infrastructure, strains resources rather than fueling growth. This

highlights the necessity for policies that transform demographic trends into opportunities through employment generation, skills development, and family planning to achieve a demographic dividend.

5.3 Study recommendations from findings

First, since gross capital formation exerts a positive but insignificant effect on economic growth, Uganda should focus on enhancing the efficiency and productivity of investment rather than simply increasing its volume. This can be realized by strengthening institutional frameworks, reducing corruption in public projects, and ensuring that capital investments such as infrastructure are directed toward sectors that deliver long-term growth and productivity.

Second, as education expenditure consistently supports economic growth in both the short and long run, the government should increase and strategically allocate funding for education. Priority should be given to improving both access and quality by investing in teacher training, technical and vocational programs, and curriculum reforms aligned with labor market needs. Such measures will ensure that education translates into a skilled and productive workforce capable of sustaining Uganda's development agenda.

Third, since population growth does not significantly contribute to economic growth under current conditions, policies should aim to transform rapid population growth into a demographic dividend. This requires a dual approach: promoting family planning to manage dependency ratios, while simultaneously expanding employment opportunities through industrialization, entrepreneurship support, and skills development programs. By doing so, Uganda can better harness its youthful population as a growth asset rather than a burden.

5.4 Study limitations

The study is constrained by its focus on a limited set of variables such as gross capital formation, education expenditure, and population growth, while excluding other relevant factors including institutional effectiveness, technological advancement, foreign direct investment, and trade integration. Since economic growth is shaped by multiple interrelated drivers, leaving out such variables may introduce model misspecification or omitted variable bias, which could either understate or exaggerate the role of the included factors.

Reliance on secondary time-series data introduces possible concerns related to measurement accuracy, inconsistencies, and data gaps, especially in a context like Uganda where statistical systems are still evolving. For example, education expenditure may not adequately reflect the quality dimension of education, while figures on gross capital formation may not fully capture inefficiencies in resource use. These shortcomings reduce the accuracy of the results and limit the capacity to fully explain the qualitative aspects of growth dynamics.

Although the econometric approach employed is suitable for examining both short-run and long-run dynamics, it faces the challenge of limited generalizability. Since the analysis is country-specific and based on historical data, the findings may not automatically extend to other contexts or future periods, particularly as Uganda continues to undergo structural changes in demographics, education, and industrialization. In addition, the presence of heteroskedasticity and potential autocorrelation in residuals, as indicated in diagnostic checks, implies that some model assumptions may not hold perfectly, which could affect the reliability of the estimates.

5.5 Areas for further study

Future research should broaden the scope of explanatory variables by incorporating additional macroeconomic and institutional factors such as foreign direct investment, trade openness, technological innovation, governance quality, and inflation. Including these variables would provide a more complete picture of the drivers of economic growth in Uganda and help reduce the risk of omitted variable bias, thereby improving the robustness of future models.

Future studies should also prioritize improving data quality and considering alternative indicators for the key variables. For instance, rather than relying solely on education expenditure, researchers could use measures such as student-teacher ratios, literacy levels, or labor force skill indices to capture the qualitative dimensions of human capital. Similarly, disaggregating gross capital formation into categories like public and private investment, or sectoral allocations such as infrastructure, agriculture, and industry, could yield deeper insights into how different types of investment influence economic growth.

Future research could further enhance methodological approaches by employing panel data across multiple countries for comparative analysis or by applying advanced econometric techniques such

as vector error correction models, generalized method of moments, or nonlinear ARDL models. Such approaches would strengthen generalizability and account for structural dynamics in Uganda's economy. Additionally, the use of scenario analyses such as examining the implications of Uganda's rapid demographic transition or the effects of industrialization policies would enable policymakers to anticipate and manage future economic shifts more effectively.

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APPENDICES

Appendix A: Budget

Description	Unit	Cost/Unit	Total Cost
Airtime (Monthly bundles x 3 months)	1	30,000	90,000
Internet bundles (monthly bundles 20 GBs x 3 months)	1	50,000	150,000
Roller tip pens	5	15,000	75,000
Papers- printing	5	25,000	125,000
Flash Disks-16GB	1	25,000	25,000
Subsistence and accommodation	5	70,000	350,000
Draft Report printing	2	30,000	60,000
Final report	5	30,000	150000
Total		275,000	1,025,000

Appendix B: Work-Plan 2024/2025

	2024		2025								
Activities	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
Concept development											
Proposal writing											
Proposal approval											
Secondary data collection											
Data analysis and draft report writing											
Report writing and submission											
Submission of Final Dissertation											