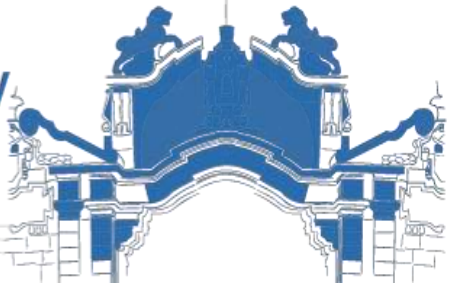


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ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

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DEPARTMENT OF ECONOMICS

Financial Deepening and Economic Growth in Ethiopia

A Thesis Submitted to the Graduate Program of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Economics (Financial Economics)

BY: GEZA MULAAW

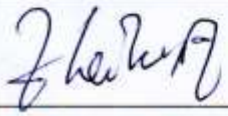
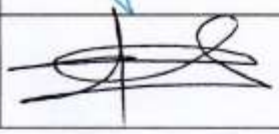
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Approval Sheet

This is to certify that the thesis prepared by Geza Mulaw Asefaw, titled: "Financial Deepening and Economic Growth in Ethiopia" and submitted to the Department of Economics, Addis Ababa University in partial fulfillment of the requirements for the Master of Science in Financial Economics, has been reviewed and approved as meeting the standards for a thesis.

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Acronym

AM = Account ownership at a financial institution or with a mobile money service provider (% of population)

ADF = Augmented Dickey-Fuller

AIB = Agriculture and Industrial Bank

AIC = Akaike Information Criterion

ARDL = Autoregressive Distributed Lag

ATM = Automatic Teller Machine

CBB = Construction and Business Bank

CBE = Commercial Bank of Ethiopia

CBK = Central Bank of Kenya

CLRM = Classical Linear Regression Model

CSA = Central Statistical Agency

CVAR = Cointegrated Vector Autoregressive

DEPOGDP = Bank deposits / GDP

DBE = Development Bank of Ethiopia

DW = Durbin-Watson

ECM = Error Correction Model

EIC = Ethiopian Insurance Corporation

EPRDF = Ethiopian People's Revolutionary Democratic Front

FD = Financial Deepening

FDI = Foreign Direct Investment

GDP = Gross Domestic Product

GMM = Generalized Method of Moments

GDPGR = Real GDP growth rate

GNP = Gross National Product

GPMB = Growth Per Capita Money Balance

HSB = Housing and Savings Bank

M2GDP = broad money (M2) / GDP

IMF = International Monetary Fund

MFI = Microfinance Institution

MOF = Ministry of Finance

NBE = National Bank of Ethiopia

PRIVCR = private sector CREDIT / GDP

PSSA = Pension and Social Security Authority

RGDP = Real Gross Domestic Product

REMITGDP = Remittances / GDP

SAP = Structural Adjustment Program

SBC = Schwarz Bayesian Criterion

SSA = Sub-Saharan Africa

UNDP = United Nations Development Programme

VAR = Vector Autoregressive

WDI = World Development Indicators

WEO = World Economic Outlook

Abstract

Ethiopia has undergone significant financial sector transformation since 1991, yet the extent to which financial deepening translates into sustained economic growth remains an open empirical question. Existing studies are largely confined to conventional banking indicators such as broad money and private sector credit, and most predate the rapid expansion of mobile money platforms and the substantial growth of diaspora remittances, leaving a critical gap in the empirical literature. This study is motivated by the need to provide updated, comprehensive evidence on the finance-growth nexus in Ethiopia by incorporating both traditional and emerging financial indicators within a single analytical framework. Annual time series data covering the period 1990 to 2025 are used sourced from the National Bank of Ethiopia, the World Bank World Development Indicators, the International Monetary Fund Article IV reports, and Ethio Telecom annual publications. The Autoregressive Distributed Lag bounds testing approach combined with an Error Correction Model is employed as the method of analysis, given its suitability for small samples and its capacity to handle variables of mixed integration orders. The key findings reveal that a stable long-run relationship exists among all variables. Financial account ownership and remittances are the most significant long-run drivers of economic growth, while broad money and private sector credit are statistically insignificant in the long run. In the short run, financial account ownership exerts the largest positive effect on growth, whereas public debt crowds out growth significantly. Inflation is consistently negative across both time horizons. These findings carry important policy implications. Policymakers should prioritize expanding digital financial inclusion, reducing remittance transfer costs, improving credit allocation toward the private sector, and maintaining price stability as a precondition for financial deepening to deliver meaningful and sustained economic growth in Ethiopia.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Financial deepening is a pillar of the modern economic system, which is considered a mechanism through which resources are mobilised, used efficiently and effectively for production and investment. Information gaps, transaction costs, and the efficient allocation of resources are among the fundamental economic problems of a nation which is solved through financial development of a country. A well-functioning financial market is known by having well operated financial market which reduces transaction cost and information asymmetry through technological advancement and innovational system (Levine, 2005; McKinnon, 1973). Theoretically Schumpeter (1911) has developed the relationship between financial development and economic growth by which identified that financial intermediary as mandatory tools for economic growth and entrepreneurial advancement. Quantitative evidence confirms the significance of financial deepening: a 10% increase in private sector credit is associated with approximately a half percentage point increase in annual economic growth. Those figures have big effect for economic growth of developing nation like Ethiopia. Access to modern banking and financial system has tremendous effect for poverty reduction. Kenya is mentioned as example that the expansion of mobile banking services has measurable effect of increasing household consumption by 2% and also contributed for poverty deduction Sub Saharan Africa (Suri and Jack, 2016; World bank, 2022). However the finance vs. growth nexus is not linear or not unconditional. Arand et al.(2015) and Kharroubi (2015) rival that in the existence of macroeconomic instability like volatile inflation and unbalanced public debt the growth effect of the financial system may diminish and even reverse for economic growth. Those finding confirm that the effect of development is conditional with institutional environment and macroeconomic situation of a nation.

Ethiopia's economic transformation since the 1990s was one of the most significant in sub-Saharan Africa, with a turning point occurring when the Derg regime collapsed in 1991, which marked the transition from a planned economic system to market oriented economic environment. The government has been Appling state led development strategy which focuses on

large scale public infrastructure, industrialization and modernization of agriculture which is known as Growth and Transformation Plan (GTP I and GTP II). The reform brought measurable result as real GDP per capita rose from approximately USD 150 in the 1990s to around USD 1,200 in 2024, which ranked Ethiopia among the fastest growing economies in the continent (World Bank 2025). Liberalisation of the economic system, combined with these broader economic reforms, generated measurable progress for financial development of the country. Domestic credit was increasing because private sector credit was increasing considerably and broad money as a percentage of GDP has expanded from approximately 15% to 30%, reflecting the growth of financial deepening and intermediation. Commercial bank of Ethiopia has been controlled about 60% of banking asset, however, after the reform, private banks entered the market, and more than 30 private banks now operate in the system (National Bank of Ethiopia, 2024).

The rapid growth of mobile and financial technology has coincided with a dramatic shift in the banking system, bringing new avenues for financial growth in Ethiopia. Mobile telephone penetration had risen to 60% of the population by 2023; simultaneously, remittance inflows exceeded USD 5 billion, equivalent to approximately 4% of GDP (World Bank, 2025: NBE, 2024). Telebirr has become a platform widely trusted for transactions, having reached over 16 million users and processing trillions of birr in transactions (Ethio Telecom, 2024). Despite these advances, the Ethiopian economy remains affected by macroeconomic challenges, most notably inflation, which has exceeded 20% for much of the past decade. Foreign exchange shortages, which limit imports of essential goods, and elevated public debt, which creates macroeconomic instability, are additional challenges. The relationship between financial development and economic growth has been remaining as theoretical significant and empirically unresolved issue. Finance is more than the movement of funds; it is a primary mechanism through which resources are channelled from those with a surplus to those who need capital to generate further productive activity. It provides businesses and households with access to capital, particularly during periods of economic stress (Acemoglu & Zilbotti 1997). Financial development is about insuring resource are used where they should productively with transparent regulatory system and reliable reporting system. Poor regulation or excessive government involvement can damage confidence in the financial system (khan, 2007). Ethiopia serves as illustration to show the effect of financial

policy for economic growth of a nation. Ethiopia is becoming one of fastest growing African country for past two decade as a result of structural reform (World Bank, 2025: IMF 2024). Annual growth between 2004 and 2019 averaged 9 to 10 percent; however, during the COVID-19 pandemic, growth declined to 6.1 percent, before recovering to approximately 7.2 percent for fiscal years 2025 and 2026(trading economics, 2025: World Bank,2026). confirm that the interdependence between financial development and economic growth. Since 1991 as financial sector liberalized, the expansion of private bank, the emergence of digital finance and the growth of remittance integration has huge effect for the country growth.

Globally, financial deepening has been recognized as a fundamental driver of economic development, with Sub-Saharan Africa remaining among the least financially developed regions in the world. The average M2-to-GDP ratio for Sub-Saharan Africa stands at approximately 40 percent, private sector credit to GDP averages around 30 percent, and financial account ownership remains below 50 percent of the adult population (World Bank, 2024). Against this regional backdrop, Ethiopia's financial sector presents a mixed picture. Broad money as a share of GDP expanded from approximately 27 percent in 1990 to 58 percent by 2025, and private sector credit grew from below 2 percent to over 44 percent of GDP over the same period, reflecting substantial deepening of formal financial intermediation. Financial inclusion, measured by account ownership, rose from under 1 percent in the early 1990s to nearly 49 percent by 2025, driven largely by the rapid expansion of mobile money platforms, most notably Telebirr, which surpassed 25 million users by 2024. Despite this progress, Ethiopia continues to lag behind regional peers such as Kenya, where M2-to-GDP exceeds 50 percent and private sector credit surpasses 35 percent of GDP, and South Africa, where private sector credit exceeds 100 percent of GDP, underscoring the continued shallowness of Ethiopia's formal financial system relative to its development aspirations. The evolution of Ethiopia's financial sector has been shaped by a series of distinct policy regimes. Prior to 1991, the sector operated under a state-directed, financially repressed system in which the Commercial Bank of Ethiopia controlled over 90 percent of banking assets, credit was allocated administratively toward state-owned enterprises, and real interest rates were persistently negative, severely constraining savings mobilization and private investment. Following the collapse of the Derg regime in 1991, the transitional government introduced market-oriented reforms under Proclamation 84/1994, which

permitted the entry of private banks and insurance companies while maintaining the prohibition on foreign bank participation. These reforms catalyzed the expansion of the private banking sector, with over 30 private banks operating in the system by 2024, though the Commercial Bank of Ethiopia retained approximately 60 percent of total banking assets. The Growth and Transformation Plans of 2010 to 2015 and 2015 to 2020 further emphasized financial sector development as a pillar of the national development strategy, promoting credit expansion toward priority sectors including agriculture and manufacturing. More recently, the Home-Grown Economic Reform launched in 2019 introduced interest rate liberalization, directed the National Bank of Ethiopia to reduce its direct financing of fiscal deficits, and opened the capital account partially to foreign investors, marking a significant shift toward a more market-driven financial architecture. These successive policy shifts provide the institutional context within which the empirical relationship between financial deepening and economic growth is examined in this study.

1.2 Problem Statement

The relationship between financial deepening and economic growth has been extensively studied in Ethiopia, yet the evidence remains fragmented and inconclusive. Tesfaye (2012) and Haile and Kassahun (2011) reached opposing conclusions using similar time periods, with the former finding demand-following causality running from growth to finance, and the latter documenting a positive long-run supply-leading relationship with bidirectional causality. Dejene (2016) found that conventional financial indicators such as domestic credit to GDP exhibited insignificant or even negative long-run effects on growth, while Tadesse (2021) and Belay (2023) extended the framework to include deposit mobilization and interest rate spreads, finding that intermediation efficiency matters as much as financial depth. Fozia (2024) and Abdulahi (2017) further complicated the picture by documenting cases of credit misallocation toward state-affiliated enterprises, which they found partially offsets any aggregate growth benefits of credit expansion. Taken together, these studies reveal a consistent pattern of contradictory findings, methodological limitations, and a narrowly defined measurement framework that has confined the empirical debate to conventional banking indicators while ignoring the rapidly changing structure of Ethiopia's financial landscape.

A well-organized financial system is a fundamental prerequisite for economic growth, particularly for developing countries such as Ethiopia where capital is scarce. In Ethiopia however the financial markets have been dominated by state-owned institutions such as the CBE, which controls approximately 60% of banking assets. Despite the reform measures introduced in 1991, which permitted privatisation of the financial sector, financial development has remained slow relative to regional peers. Domestic credit was increasing because private sector credit was increasing considerably and broad money as a percentage of GDP has expanded approximately from 15% to 30% reflecting that the growth of financial deepening and intermediation. However South Africa private sector credit to GDB surpass 60 %, and Kenya's M2/GDP is more than 50%, simultaneously Rwanda surpass Ethiopia in per capital deposit measure. Financial assets account for only 46% of GDP (WBES, 2015), and 40% of businesses report access constraints (WBES, 2015), indicating that the financial system in Ethiopia remains underdeveloped in its capacity to mobilise savings, channel resource and allocate credit to ward productive investment. Though, structural underdevelopment a parallel shift in digitalization and informal financial channel has been growing tremendously. Mobile penetration has expanded to 60% of the population, with more than 75 million active lines. Telebirr has exceeded 25 million users, becoming increasingly comparable to Kenya's M-Pesa. However, limited rural internet access, underdeveloped infrastructure, and a restrictive regulatory environment constrain the integration of digital channel to economic sector. Prior empirical literature on financial development and economic growth in Ethiopia by Tesfaye (2012), Dagim (2015), and Meron (2017) identified that private sector credit has a significant positive effect for economic growth. Recent studies by Tadesse (2021) and Belay (2023) have expanded the scope to include deposit mobilization and interest rate. Fozia (2024) and Abdulahi (2017) identify a negative effect of credit misallocation on economic growth. The majority of these studies relied heavily on traditional depth indicators such as M2/GDP and private sector credit, neglecting the growing contribution of digital finance channels as well as remittance is also expanding substantially. Furthermore, most studies predate 2020 and the COVID-19 pandemic, which accelerated the adoption of digital finance, while inflation doubled and public debt exceeded 50% of GDP.

Though theoretically its relevance incorporation of mobile telephone penetration as a proxy for digital financial deepening has measurement challenges, Mobile penetration data for Ethiopia

displays a structural zero problem: the variable records no meaningful observations prior to the early 2000s and remains negligibly small until approximately 2010, after which it rises sharply to over 60 percent by 2023. This pattern reflects the genuine historical reality of Ethiopia's telecommunications landscape rather than a data collection failure. The structural zeros are not missing values but true zeros mobile technology simply did not exist in Ethiopia during the early part of the study period. While this creates econometric challenges for time-series estimation, it is arguably an important feature of the data that captures the transformative and discontinuous nature of digital financial adoption in Ethiopia. This study therefore attempts to incorporate mobile penetration alongside conventional financial indicators, while acknowledging the technical limitations this imposes on the estimation, and addresses them transparently in the methodology chapter. However no study has not yet done, that combined traditional and emerging financial indicator jointly to study unexplored effect. This study is designed to fill these gaps by using time series data from 1990 to 2025 employing autoregressive distributed lag and error correction model (ARDL –ECM) argue that financial development and inclusion accelerate long run economic growth but this work under macroeconomic stability(inflation and public debt). Integrating both the conventional and emerging factor this study aim to generate policy relevant evidence to support digital finance growth, debt management and financial system development in Ethiopia.

This study directly builds on and extends the work of Tesfaye (2012), Dejene (2016), Tadesse (2021), and Belay (2023) in three important ways. First, while all prior Ethiopian studies relied exclusively on conventional banking depth indicators, this study incorporates financial account ownership as a proxy for financial inclusion and remittances to GDP as a measure of external financial flows, capturing dimensions of financial deepening that have become increasingly central to Ethiopia's financial landscape but have not yet been examined within a unified time series framework. Second, this study extends the sample period to 2025, covering the post-COVID macroeconomic environment characterized by surging inflation, elevated public debt, and the dramatic expansion of mobile money platforms, developments that fundamentally alter the finance-growth relationship and that no prior Ethiopian study has captured. Third, by employing the ARDL-ECM framework with a broader variable set and updated data, this study provides more policy-relevant evidence on which specific channels of financial deepening are

most effective in promoting growth under conditions of macroeconomic instability, offering clearer and more actionable guidance for financial sector policymakers in Ethiopia than existing studies have been able to provide.

1.3 Objectives of the Study

1.3.1 General Objective

The overall objective of this study is to investigate empirically the long run and short run impact of financial development on economic growth of Ethiopia with time series data over the period of 1990 to 2025, by using both conventional and emerging indicator, combined with key macroeconomic variable like inflation and public debt.

1.3.2 Specific Objectives

1. To investigate both short-run and long-run effects traditional and emerging financial deepening variable combined effect for growth and build empirical frame.
2. Does financial inclusion, measured by account ownership at formal financial institutions and mobile money service providers, contribute positively to economic growth in Ethiopia beyond the effect of traditional financial depth indicators?
3. To provide empirical evidence that can guide policymakers on which financial sector development strategies are most effective in promoting sustained economic growth in Ethiopia, controlling for macroeconomic variables such as remittances, inflation, trade openness, public debt, and foreign direct investment.

1.4 Research Questions

1. Do conventional indicators of financial deepening such as broad money to gross domestic product, private credit to gross domestic product, deposits to gross domestic product, and domestic credit to gross domestic product significantly move real gross domestic product growth in Ethiopia?
2. How does account ownership, which serves as a proxy for financial inclusion, contribute positively to economic growth in Ethiopia beyond the effect of traditional financial depth indicators?

3. What policy suggestions can be drawn from the finance growth nexus in Ethiopia, after controlling for macroeconomic variables such as remittances, inflation, trade openness, public debt, and foreign direct investment?

1.5 Scope of the study

This study focuses on the Ethiopian economy over the period 1990 to 2025, using annual time series data to empirically investigate the short-run and long-run effects of financial deepening on economic growth. The time period is deliberately chosen to capture Ethiopia's major structural and financial transformations, beginning with the post-1991 market-oriented reforms and extending through the recent expansion of digital financial services and the post-COVID macroeconomic environment. In terms of financial deepening, the study covers three distinct dimensions: conventional financial depth, measured by broad money and private sector credit as shares of GDP; financial inclusion, proxied by account ownership at formal financial institutions and mobile money service providers; and external financial flows, captured by remittances as a share of GDP. Inflation and public debt are included as macroeconomic control variables to minimize omitted variable bias. The study is confined to Ethiopia as a single country analysis, with the aim of generating country-specific policy insights rather than cross-country generalizations.

1.6 Significance of the Study

This study makes contributions at three levels. Academically, it extends the existing Ethiopian empirical literature on the finance-growth nexus by incorporating financial inclusion and remittances alongside conventional banking indicators within a unified ARDL-ECM framework, addressing a measurement gap that prior studies have not resolved. In terms of literature, it provides updated time series evidence covering the period through 2025, capturing structural changes brought about by mobile money expansion and post-COVID macroeconomic developments that existing studies predate entirely. From a policy perspective, the findings offer actionable evidence to policymakers, financial regulators, and development practitioners on which specific channels of financial deepening are most effective in promoting sustained economic growth under conditions of macroeconomic instability, directly informing ongoing

reforms to Ethiopia's financial architecture including digital financial inclusion, credit allocation efficiency, and debt management strategy.

1.7 Limitation of the study

One of the principal limitations of this study is the absence of reliable data on what percentage of the population use mobile banking and its volume of transaction at earlier 1990's. Instead, the researcher uses the percentage of account holders (AM) and the number of mobile phone users (MOBILE) as proxy variables.

Because mobile penetration (MOBILE) was integrated of order two, I(2), across all specifications and transformation attempts, it was excluded from the final model violating the bounds testing requirement. Future research should revisit MOBILE as more reliable annual data becomes available. The data is censored with structural zeros before mobile technology existed, future study should revisit this when better data is available.

1.8 Organization of the paper

This study is organised into five chapters. Chapter Two reviews the theoretical and empirical literature on financial deepening and economic growth, and provides an overview of Ethiopia's financial system. Chapter Three explains the research methodology. Chapter Four presents and discusses the empirical results. Chapter Five concludes with findings, policy recommendations, and directions for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The finance and economic growth nexus has long been a subject of debate among scholars, with no consensus on the direction of causation. Some standard of the literature argues that financial development promotes economic growth by improving the allocation of resources, facilitating investment, and supporting productive activities. Other viewpoint holds that finance primarily responds to the expansion of the real economy, meaning that financial development follows economic growth rather than causing it. Notwithstanding these differing views, many studies suggest that financial development and economic growth are positively and mutually related. This chapter reviews the key theories and empirical studies on the relationship between finance and economic growth.

2.2 Theoretical Literature

2.2.1 Financial Deepening and Financial Development

The conceptual foundation of financial deepening was established by Gurley and Shaw (1955, 1960), who were among the first economists to systematically examine the relationship between financial sector evolution and real economic development. They argued that as economies develop, the financial sector undergoes a parallel process of progressive sophistication, characterized by the expansion of formal financial market participation, the reduction of informational asymmetries between borrowers and lenders, and a sustained increase in the volume of financial flows channeled through formal rather than informal intermediaries. Financial deepening therefore refers to the process by which the formal financial system becomes more deeply embedded in the real economy, extending its reach across income groups, geographic regions, and economic sectors. Shaw (1973) further developed this framework by arguing that financial deepening is not merely a quantitative expansion of bank credit or monetary aggregates but a broader transformation in the structure, accessibility, and diversity of financial services available to households and enterprises across all sections of society.

2.2.2 McKinnon and Shaw: Financial Repression and Liberalization

McKinnon (1973) and Shaw (1973) independently developed what became the most influential theoretical framework for understanding financial sector policy in developing economies. They argued that government-imposed interest rate ceilings, directed credit programs, high reserve requirements, and other forms of financial intervention collectively described as financial repression suppress savings mobilization, misallocate credit toward unproductive state-directed uses, and ultimately retard economic growth. McKinnon (1973) introduced the complementarity hypothesis, arguing that money and physical capital are complementary rather than substitute assets in developing economies, so that restrictions on the real return to money directly reduce investment and growth. Shaw (1973) emphasized the debt intermediation channel, arguing that financial repression reduces the volume and quality of financial intermediation by discouraging savings deposits and rationing credit away from its most productive uses. Both authors concluded that financial liberalization through the restoration of market-determined interest rates and the removal of administrative credit controls would deepen the financial system, raise investment efficiency, and generate higher and more sustained rates of economic growth. This framework is directly relevant to Ethiopia, where the financial sector operated under severe repression prior to 1991, with state-controlled interest rates and administrative credit allocation suppressing private financial intermediation for decades.

2.2.3 Schumpeter's Supply-Leading Hypothesis

Schumpeter (1911) provided the first systematic theoretical contribution to the finance-growth literature by assigning financial intermediaries a constitutive rather than merely supportive role in the process of capitalist development. He argued that the essential function of the banker is to evaluate the quality of entrepreneurial proposals and direct purchasing power toward those innovations with the highest expected social return, thereby determining which technologies are implemented and which drive productivity growth. Without access to credit, entrepreneurs cannot acquire the productive resources required to implement new combinations, and the process of creative destruction through which economic growth is generated stalls. The supply-leading hypothesis that follows from Schumpeter's framework implies that improvements in the

capacity and efficiency of financial intermediation raise the rate of innovation adoption, accelerate structural transformation, and generate sustained increases in per capita income. From a policy perspective, this view implies that investment in the quality and penetration of the financial system is a prerequisite for the development process itself rather than a delayed response to it.

2.2.4 Robinson and Patrick: The Demand-Following Hypothesis and Stage Theory

Robinson (1952) offered an important counterpoint to Schumpeter's supply-leading view by arguing that financial development is largely a response to rather than a cause of economic growth. In her formulation, where enterprise leads, finance follows, meaning that as the real economy expands and generates rising demand for financial services, the supply of financial instruments and institutions adjusts to meet that demand. Patrick (1966) synthesized these opposing perspectives through his stage hypothesis, proposing that the supply-leading relationship dominates at early stages of economic development, when financial intermediaries must be established ahead of demand to mobilize savings and channel them toward productive investment. As economies mature and financial systems deepen, the demand-following pattern becomes progressively more pronounced, with financial development responding to rather than driving real sector expansion. Patrick's stage hypothesis provides a useful theoretical lens for interpreting the contradictory findings in the Ethiopian empirical literature, where some studies document supply-leading causality and others find demand-following patterns depending on the time period and indicators employed.

2.2.5 Endogenous Growth Theory and the Finance-Productivity Nexus

The emergence of endogenous growth theory in the late 1980s and 1990s provided a rigorous formal treatment of the mechanisms through which financial development generates sustained long-run economic growth. Unlike neoclassical growth models in which financial development can only affect the level of output but not its long-run growth rate, endogenous growth models permit financial intermediation to exert a permanent effect on the rate of technological progress and per capita income growth. Greenwood and Jovanovic (1990) developed a theoretical model in which financial intermediaries produce information about investment projects, pool risks across investors, and direct capital toward its most productive uses, generating a positive

feedback between financial development, capital allocation efficiency, and long-run growth. Bencivenga and Smith (1991) demonstrated theoretically that financial intermediaries promote growth by reducing liquidity risk, enabling investors to commit resources to long-gestation high-return projects that would otherwise be foregone in the absence of adequate financial intermediation. Saint-Paul (1992) showed that deeper financial markets allow greater productive specialization by enabling firms to diversify the idiosyncratic risks associated with specialization, thereby raising aggregate productivity and long-run growth rates. Collectively, these endogenous growth models identify capital allocation efficiency, risk diversification, and liquidity transformation as the primary theoretical channels through which financial deepening promotes sustained economic growth, providing the microeconomic foundations for the empirical relationships examined in this study.

2.2.6 Non-Linear Finance-Growth Relationship

While the theoretical frameworks discussed above generally predict a positive relationship between financial deepening and economic growth, more recent theoretical contributions have challenged the assumption that this relationship is uniformly positive and monotonically increasing. Pagano (1993) developed a theoretical model demonstrating that the growth effect of financial intermediation depends not only on the volume of credit but also on the efficiency with which financial intermediaries transform savings into productive investment, implying that financial expansion without corresponding improvements in intermediation quality may yield diminishing or even negative growth effects. Philippon (2015) introduced the concept of finance as a rent-seeking activity, arguing theoretically that beyond a certain scale, the financial sector absorbs an excessive share of skilled human capital and generates private returns that exceed its social contribution, thereby reducing aggregate productivity and growth. These theoretical insights suggest that for a developing country like Ethiopia, the growth benefits of financial deepening are not automatic but depend critically on the quality of intermediation, the efficiency of credit allocation, and the macroeconomic stability of the environment in which financial expansion occurs.

2.2.7 Theories of Digital Finance and Financial Inclusion

The rapid advancement of digital financial technologies has necessitated new theoretical frameworks that extend the classical finance-growth nexus to incorporate the role of financial inclusion and digital intermediation. Ozili (2024) proposed a Digital Agency Theory of Financial Inclusion, departing from the conventional bank-centric model of financial intermediation by arguing that in the digital era, the role of financial inclusion agent can be performed by a diverse range of technology-driven entities including telecommunications companies operating mobile money platforms, digital platform operators offering embedded financial services, and fintech payment providers. These digital intermediaries can extend access to financial services to previously unbanked populations at transaction costs far lower than those associated with conventional branch-based banking, generating financial inclusion effects that conventional banking expansion cannot match. Rogers (1962) provided a complementary framework through his Diffusion of Innovations theory, which postulates that innovations diffuse through populations along an S-shaped curve determined by the relative advantage, compatibility, complexity, trialability, and observability of the innovation. Applied to digital financial services in Ethiopia, this framework explains the observed pattern of slow initial mobile money adoption followed by rapid acceleration once network effects and infrastructure investments reached a critical threshold, a pattern directly observable in Ethiopia's Telebirr adoption trajectory. Together these theoretical frameworks provide justification for incorporating financial account ownership alongside conventional banking indicators in the empirical specification of this study.

2.3 Synthesis and Implications for the Study

The theoretical literature collectively establishes that financial deepening promotes economic growth through improved capital allocation, savings mobilization, risk management, liquidity transformation, and information production. However, the supply-leading and demand-following hypotheses remind us that the direction of causality between finance and growth is not predetermined but depends on the stage of economic development and the institutional environment in which financial expansion occurs. The non-linear frameworks of Pagano (1993) and Philippon (2015) caution that financial expansion without commensurate improvements in intermediation quality and macroeconomic stability can generate diminishing or negative growth effects. The digital finance theories further emphasize that in economies like Ethiopia where conventional banking infrastructure remains thin, mobile money and digital financial platforms

represent a theoretically distinct and increasingly important channel of financial deepening. These theoretical insights collectively inform the variable selection, empirical specification, and interpretation of results in this study.

2.4 Empirical Literature

A substantial body of empirical evidence establishes a positive relationship between financial deepening and economic growth across different country contexts, though the direction, magnitude, and conditionality of this relationship vary considerably depending on the level of development, the financial indicators employed, and the institutional environment in which financial expansion occurs. At the global level, the foundational work of King and Levine (1993) demonstrated across a large sample of countries that private sector credit, liquid liabilities, and bank asset ratios are robust predictors of per capita GDP growth, capital accumulation, and total factor productivity improvement. Levine, Loayza, and Beck (2000) reinforced these findings by showing that the growth effect of financial intermediary development operates primarily through improvements in resource allocation efficiency rather than through increases in savings volumes alone. More recently, the positive finance-growth relationship has been shown to be conditional rather than unconditional. Arcand, Berkes, and Panizza (2015) documented an inverted-U shaped relationship between private credit and growth, finding that beyond approximately 80 to 100 percent of GDP, further financial expansion reduces rather than promotes growth, a phenomenon they described as "too much finance." Samargandi, Fidrmuc, and Ghosh (2015) further demonstrated that the sign and magnitude of the finance-growth relationship depend critically on macroeconomic stability and institutional quality, with financial development robustly promoting growth only in low inflation environments with strong institutional frameworks. These findings are directly relevant to Ethiopia, where persistent inflation and institutional constraints have historically conditioned the effectiveness of financial sector expansion.

At the regional level, evidence from Sub-Saharan Africa presents a more mixed picture. Acaravci, Ozturk, and Acaravci (2009) found no statistically significant long-run relationship between financial deepening and growth across a sample of Sub-Saharan African countries, attributing weak results to the persistently shallow nature of financial systems in the region. Ibrahim and Alagidede (2018) identified a financial development threshold below which

deepening has negligible or even negative growth effects, estimating this threshold at a private credit to GDP ratio of approximately 10 to 15 percent, a level that Ethiopia was only approaching during the early part of the study period. Bist (2018) found a robust positive long-run effect of financial development on growth across low-income African countries once cross-country spillovers were controlled, suggesting that earlier studies finding weak results may have been affected by estimation bias rather than genuine absence of a relationship. More recent evidence has shifted attention toward digital finance and remittances as emerging channels of financial deepening. Tembo (2021) found that mobile money penetration exerts a positive and statistically significant effect on real GDP per capita growth across Sub-Saharan African countries, with the effect robust to the inclusion of conventional financial depth indicators. Munyegera and Matsumoto (2016) documented using household panel data from Uganda that mobile money access improves consumption smoothing and household welfare, while Giuliano and Ruiz-Arranz (2009) established that remittances promote growth more strongly in countries with less developed financial systems, suggesting that external financial flows serve as a partial substitute for shallow domestic credit markets.

In the Ethiopian context, the empirical evidence is limited, largely contradictory, and confined almost entirely to conventional banking indicators. Haile and Kassahun (2011) found a positive long-run relationship between financial development and economic growth alongside bidirectional causality, consistent with the supply-leading hypothesis. Tesfaye (2012), however, reached the opposing conclusion that causality runs from growth to finance, consistent with the demand-following hypothesis, using a similar time period and methodology. Dejene (2016) found that conventional financial indicators including domestic credit to GDP exhibited insignificant or negative long-run effects on growth, attributing weak results to the structural shallowness of Ethiopia's financial sector. More recently, Tadesse (2021) and Belay (2023) expanded the empirical framework by incorporating deposit mobilization and interest rate spreads, finding that intermediation efficiency matters as much as financial depth in determining growth outcomes. Fozia (2024) and Abdulahi (2017) identified credit misallocation toward state-affiliated enterprises as a factor that partially offsets the aggregate growth benefits of credit expansion in Ethiopia.

Collectively, these Ethiopian studies reveal three persistent limitations. First, all existing studies rely exclusively on conventional banking depth indicators, ignoring the rapidly growing role of financial inclusion, mobile money platforms, and remittance inflows in Ethiopia's financial landscape. Second, no existing study extends beyond 2023, meaning that the structural transformation brought about by Telebirr's rapid expansion and the post-COVID macroeconomic environment remains empirically unexamined. Third, the contradictory findings across studies reflect not only genuine heterogeneity in the finance-growth relationship but also the narrow and outdated measurement frameworks employed. This study addresses these limitations directly by incorporating account ownership and remittances alongside conventional indicators within an updated ARDL-ECM framework covering 1990 to 2025.

2.5 Ethiopia's Financial System

In 1905 with the establishment of the Bank of Abyssinia under Emperor Menelik II, The formal financial system was initiated in which introduced the country's first formal currency and rudimentary deposit and lending services. Succeeding institutional development proceeded under Emperor Haile Selassie, who oversaw the bifurcation of the State Bank of Ethiopia into the National Bank of Ethiopia, assuming central banking functions, and a set of state-controlled commercial entities. Ethiopian economy depend on mainly on informal financial arrangements, including Iqubs ,rotating savings and credit associations and Iddirs community-based mutual insurance groups supplemented by rural moneylenders operating at high interest rates before establishment of formal financial institutions, the.

Private banking institutions had been nationalized and merged into the Commercial Bank of Ethiopia (CBE), which came to control approximately 90 percent of total banking system assets in 1978 by Derg regime. Credit was allocated administratively toward state owned enterprises and fuelled parallel foreign exchange markets and Collectivized agricultural units, with nominal interest rates held well below inflation, generating persistently negative real returns that suppressed savings intermediation. In 1980s total domestic credit amounted to approximately 10 percent of GDP, reflecting the severe degree of financial underdevelopment accumulated under two decades of financial repression (NBE, 2024). The market-oriented framework under the Ethiopian People's Revolutionary Democratic Front (EPRDF) introduced a process of financial

sector liberalization. By the early 2000s the total banking asset surpassing ETB 100 billion, though the CBE retained approximately 60 percent market share and foreign bank entry remained prohibited throughout the period. Through reform foundation for private bank entry, enabling the establishment of institutions including Dashen Bank, Wegagen Bank, and Awash International Bank, which introduced competitive dynamics into a previously monopolistic sector Under Proclamation 1994 banking regulation.

Increasing in mobile financial services that justifies the use of mobile telephone penetration as a proxy for digital financial inclusion alongside conventional banking depth indicators and remittance inflows 4 percent of GDP by 2023 as an external financing channel that increasingly interacts with domestic digital financial infrastructure provides direct motivation for including remittances to GDP as an independent variable in the empirical specification (World Bank, 2025; NBE, 2024).

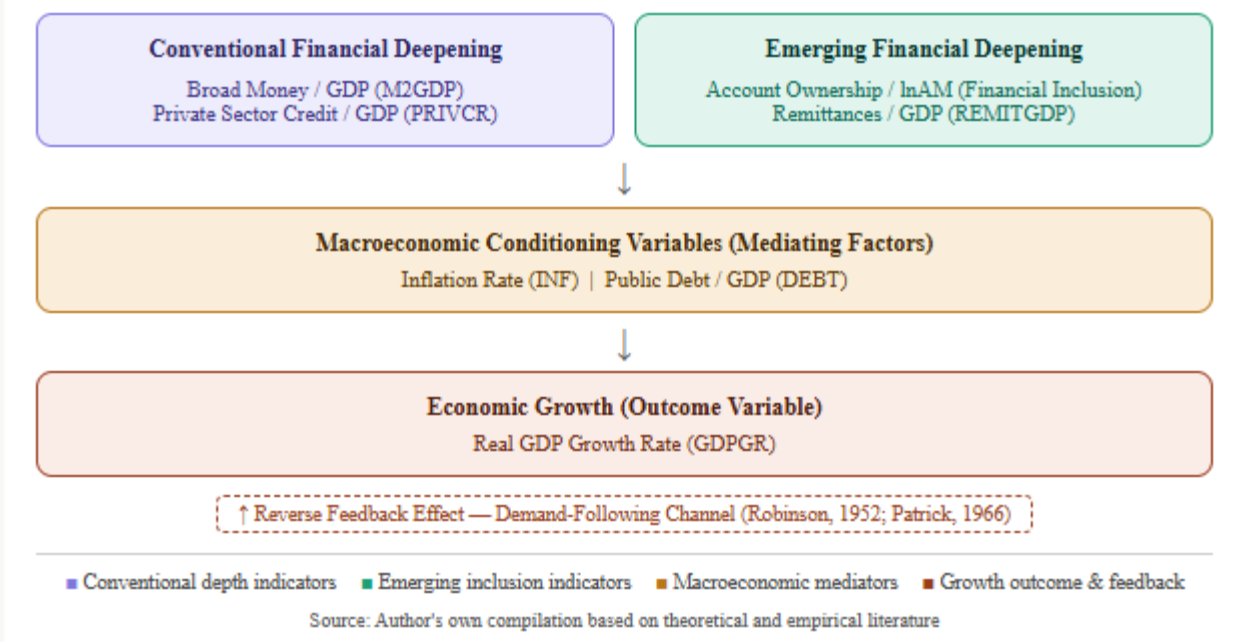
2.6 Conceptual Framework

Drawing from the theoretical and empirical literature reviewed in the preceding sections, this study develops a conceptual framework that identifies the key variables, specifies their hypothesized relationships, and situates those relationships within the broader theoretical traditions of Schumpeter (1911), McKinnon and Shaw (1973), endogenous growth theory, and the digital finance literature. The framework recognizes that financial deepening influences economic growth through multiple distinct channels, that macroeconomic conditions mediate the strength and direction of these channels, and that a reverse feedback effect running from economic growth back to financial deepening is theoretically plausible and empirically documented in the demand-following literature of Robinson (1952) and Patrick (1966).

The framework organizes variables into four groups. First conventional financial deepening indicators broad money to GDP and private sector credit to GDP capture the depth and scale of formal financial intermediation. Second, emerging financial deepening indicators financial account ownership and remittances to GDP capture the reach and inclusiveness of the financial system, reflecting the growing importance of digital finance and external financial flows. Third, macroeconomic conditioning variables inflation and public debt mediate the relationship between financial deepening and economic growth, either amplifying or attenuating the growth

effects of financial development depending on the stability of the macroeconomic environment. Fourth, economic growth measured by real GDP growth rate is the outcome variable, which in turn feeds back into financial deepening through the demand-following channel as rising incomes generate greater demand for financial services.

Figure 1: Conceptual Framework of Financial Deepening and Economic Growth in Ethiopia



Source: Author's own compilation based on theoretical and empirical literature

The direct positive effect of conventional financial deepening indicators on economic growth is grounded in Schumpeter (1911), who argued that credit provision to productive entrepreneurs is a prerequisite for innovation and growth, and in McKinnon and Shaw (1973), who demonstrated that the removal of financial repression raises savings mobilization and investment efficiency. The inclusion of emerging financial deepening indicators is grounded in Ozili's (2024) Digital Agency Theory, which identifies digital intermediaries and mobile money platforms as increasingly central vehicles for extending financial access to previously excluded populations, and in the remittance literature which documents external financial flows as a substitute source of finance in shallow credit markets.

The mediating role of macroeconomic conditioning variables is grounded in the non-linear finance-growth literature of Pagano (1993) and Philippon (2015), which demonstrate that inflation and excessive public debt weaken the transmission mechanism through which financial deepening generates growth by eroding the real value of savings, misrepresenting relative price signals, and crowding out private investment. High inflation in particular undermines the intermediation function of the financial system by discouraging long-term deposits and distorting credit pricing, while excessive public debt absorbs domestic savings that would otherwise be channeled toward productive private investment. The reverse feedback arrow running from economic growth back to financial deepening reflects the demand-following hypothesis of Robinson (1952) and Patrick (1966), which holds that rising incomes generated by economic growth increase household and enterprise demand for financial services, thereby inducing further expansion and sophistication of the financial system. This bidirectional relationship implies that financial deepening and economic growth are mutually reinforcing over time, with the dominant direction of causality depending on the stage of development and the quality of financial institutions, a prediction consistent with the contradictory causality findings documented in the Ethiopian empirical literature.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter covers research design and the data collection instruments and procedures used along with sampling strategy and the characteristics of the study population, the analytical techniques applied to interpret the data, and the ethical considerations that informed and guided the research process from inception to completion.

3.1.1 Data source and type

This study use data collected from National Bank of Ethiopia's annual reports, World Bank surveys that cover financial inclusion and development, World Development Indicators which give us numbers on account ownership and credit access secondary data spanning the period from 1990 to 2025. The researcher also uses IMF Article IV reports and African Development Bank publications, so we can compare Ethiopia with other African countries and Ethio Telecom and Tele birr reports which are essential for mobile money stats, transaction volumes, and user growth trends. All these time-series stats bank assets, mobile banking adoption, digital payment volumes give us a solid foundation for rigorous econometric analysis.

3.1.2 Method of data analysis

The descriptive parts will systematically documenting the temporal evolution of variables through graphical representations and summary statistics provides that a coherent overview of trends, fluctuations, and structural shifts within Ethiopia's financial sector and broader macroeconomic environment, contextualizing the data before deeper analysis is undertaken. Applying formal time-series estimation techniques, the econometric analysis constitutes the core inferential component of the study which rigorously examines the nature, direction, and statistical significance of the relationships between financial deepening indicators and economic growth, from which the study's principal empirical findings are derived. The researcher use both descriptive and econometric methods to study how financial sector deepening affect economic

growth in Ethiopia. These two complementary approaches yield a comprehensive and methodologically sound analytical context the descriptive component grounding the findings in observable data trends, and the econometric component supplying the inferential rigor necessary to draw meaningful, evidence based conclusions about the financial Vs. growth nexus in Ethiopia.

3.2 Model Specification

This study employs the ARDL bounds testing approach of Pesaran, Shin, and Smith (2001) to analyze financial development effects on GDP growth in Ethiopia. This model is chosen because it simultaneously estimates short-run dynamics and long-run equilibrium, ARDL model is best requires no pre-unit root testing for mixed I(0)/I(1) stationarity, uses bounds F-test for cointegration, controls endogeneity through lags, and excels with small samples like Ethiopia's 15-35 year macro data implementation. So the ARDL (p, q) model is estimated in its error correction form as following.

$$\Delta GDPGR_t = \alpha_0 + \gamma_0 GDPGR_{t-1} + \gamma_1 M2GDP_{t-1} + \gamma_2 PRIVCR_{t-1} + \gamma_3 AM_{t-1} + \gamma_4 REMITGDP_{t-1} + \gamma_5 INF_{t-1} + \gamma_6 DEBT_{t-1}$$

Where γ_0 measure error correction adjustment speed: the rate at which GDPGR converges to its long-run equilibrium following a short-run deviation, and the long-run coefficients are recovered as $(-\gamma_i/\gamma_0)$. Akaike Information Criterion (AIC) is applied to select optimal lag lengths p and q. Applying this procedure with a maximum lag of two (appropriate for annual data per Pesaran and Shin's, 1999, recommendation), the AIC-optimal specification selected is ARDL (2,1,0,0,2,0,1), corresponding to two lags of GDPGR, one lag of M2GDP, no additional lags beyond the contemporaneous term for PRIVCR, REMITGDP, and INF, two lags of DEBT, and one lag of lnAM (full output reported in Table 10, Chapter Four both short-run dynamics and long-run equilibrium relationships simultaneously are yield with this specification and is considered the gold standard for analyzing financial development and growth dynamics in small samples (Pesaran, Shin and Smith, 2001; Narayan, 2004). AIC was used as the primary lag selection criterion rather than the Schwarz Bayesian Criterion (SBC/BIC) because Monte Carlo evidence on lag-length selection in small samples finds AIC outperforms SBC and the Hannan-Quinn criterion when T is below approximately 60 (Liew, 2004); SBC's heavier penalty on

parameterization tends to select overly parsimonious models in short annual series, risking residual autocorrelation that AIC-selected specifications avoid.

Following King and Levine (1993), M2GDP and PRIVCR are included as conventional measures of financial depth. AM follows Čihák et al. (2013). Following Tembo (2021) MOBILE is used as measurement as well as REMITGDP follows Suri and Jack (2016). INF, DEBT and FDI are included as control variables following Arcand et al. (2015) and Sahay et al. (2015). So the research model is specified as the following:

$$\mathbf{GDPGR_t = \alpha + \Sigma_{i=0}^{1} \beta_{1i} M2GDP_{t-i} + \Sigma_{i=0}^{1} \beta_{2i} PRIVCR_{t-i} + \Sigma_{i=0}^{1} \beta_{3i} AM_{t-i} + \Sigma_{i=0}^{1} \beta_{4i} REMITGDP_{t-i} + \gamma_1 INF_t + \gamma_2 DEBT_t + \varepsilon_t}$$

VARIABLE DESCRIPTION

- **GDPGR** = REAL GDP GROWTH RATE
- **M2GDP** = BROAD MONEY (M2) / GDP
- **PRIVCR** = PRIVATE SECTOR CREDIT / GDP
- **AM** = ACCOUNT OWNERSHIP AT A FINANCIAL INSTITUTION OR WITH A MOBILE-MONEY-SERVICE PROVIDER % OF POPULATION

CONTROL VARIABLES

- **INF** = INFLATION RATE
- **DEBT** = GOVERNMENT DEBT / GDP
- **REMITGDP** = REMITTANCES / GDP

PARAMETERS

- α = INTERCEPT
- $\beta_1 – \beta_6$, $\gamma_1 – \gamma_4$ = COEFFICIENTS
- ε_t = ERROR TERM

3.3 Variable Description and Theoretical Justification

Since McKinnon (1973), broad money as a share of GDP has been recognised as a foundational indicator of financial depth, reflecting the degree to which an economy is monetised and the

extent to which money actively circulates within the financial system Broad money as a share of GDP (M2GDP) is commonly recognized as a foundational indicator of financial depth. M2GDP captures the size of financial intermediaries relative to the overall economy and (Beck and Demirgüç-Kunt, 2009) regarded as the broadest available measures of financial intermediation. As study of King and Levine (1993a, 1993b) its analytical utility is well established in the empirical literature, with seminal studies. Domestic private sector credit to GDP (PRIVCR) focuses specifically on the allocation function of the financial system while broad money measures the overall scale of financial intermediation. What make this variable a more precise indicator of finance's role in supporting market-driven economic activity (Demetriades and Hussein, 1996) Private borrowers are usually considered to deploy borrowed funds more productively than public sector agents. PRIVCR reflects the capacity of the financial system to finance productive enterprises and stimulate capital formation, and has been extensively employed in the growth-finance literature by King and Levine (1993a) capturing credit allocation beyond simple money supply aggregates, Demetriades and Hussein (1996), and Demirgüç Kunt and Levine (2008).

To incorporate the transformative role of technological innovation in expanding financial inclusion, as proxy of mobile money service and deepening economic participation, Mobile phone penetration (MOBILE) is used in this study. Digital financial channels that are fundamentally reshaping patterns of saving, payment, and investment are shaping financial development alien with traditional banking intermediation but also by. MOBILE helps the model to capture a dimension of financial deepening that conventional banking indicators fail to reflect, acknowledging the growing importance of fintech driven financial access in supporting economic activity, particularly in contexts such as Ethiopia where mobile phone penetration have experienced rapid uptake. It is important to note at this stage that the inclusion of MOBILE in the model specification is theoretically justified but empirically constrained because we do not have data for the year 1990 to 2000s. Adult population which individuals aged 15 years and above that hold an account at a formal financial institution, including commercial banks, credit unions, or mobile money service providers are measured by Account ownership (AM). Data on this variable are typically sourced from the World Bank Global Index Database, national financial inclusion surveys, and institutional reports, and in the Ethiopian context, account ownership is

particularly pertinent for understanding how access to financial services varies across socioeconomic and demographic groups.

Migrant transfer payments to the domestic economy are measured by Remittances as a share of GDP (REMITGDP).External source of finance that augments household welfare, smooth's consumption in the face of income shocks, and supports small scale investment in education, healthcare, and microenterprise development are represented by these inflows. Remittance flows constitute a considerable and relatively stable source of foreign funds that may also incentivize recipients to engage more frequently with formal financial institutions, thereby reinforcing the linkages between financial development and economic growth for developing economies like Ethiopia.

Public debt as a proportion of GDP (DEBT) is included to control for the fiscal environment in which financial development operates. Public indebtedness can crowd out private investment by exerting upward pressure on interest rates or absorbing an uneven share of domestic savings, potentially attenuating the positive relationship between financial development and economic growth. Moderate and strategically targeted public borrowing conversely is expected to support infrastructure and public service provision, generating demand for financial services and complementing private sector activity. Inflation (INF) is the annual percentage change in the consumer price index. McKinnon and Shaw (1973) a Persistently high or volatile inflation misrepresents relative price signals, erodes the real value of savings, and discourages long term investment, thereby undermining the growth enhancing effects of financial development.

$$GDPGR_t = f\ (M2GDP_t,\ PRIVCR_t,\ DEPOGDP_t,\ AM_t,\ MOBILE_t,\ REMITGDP_t,\ INF_t,\ TRADE_t,\ DEBT_t,\ FDI_t)$$

Of the ten variables presented in the conceptual specification above, six are retained in the final estimated ARDL equation: M2GDP, PRIVCR, REMITGDP, DEBT, INF, and lnAM. MOBILE was excluded after unit root testing revealed integration of order two, violating the bounds testing requirement that no regressor be integrated beyond I(1) (Section 4.3). DEPOGDP was excluded because it is highly collinear with M2GDP and PRIVCR all three measure overlapping dimensions of bank-based financial depth and its inclusion alongside the other two monetary aggregates would inflate variance inflation factors without adding independent explanatory

content. TRADE and FDI were excluded on degrees-of-freedom grounds: with an effective estimation sample of 34 observations after lag adjustment, the chosen ARDL(2,1,0,0,2,0,1) specification already estimates a substantial number of parameters relative to sample size, and adding further regressors with their own lag structures risks over parameterization, a concern Pesaran and Shin (1999) explicitly flag for small-T applications of ARDL. Table 1 is therefore best read as the full set of theoretically relevant candidate variables identified in the literature review, from which the final parsimonious specification was selected."

The specification does not include gross capital formation, human capital or labor force growth, institutional quality indices, or trade openness as separate regressors, and this is acknowledged as a limitation rather than an oversight. Annual Ethiopian time series for institutional quality (e.g., World Governance Indicators) are only consistently available from the mid-1990s, leaving gaps incompatible with the 1990–2025 window; gross capital formation series have undergone multiple base-year revisions that compromise consistency across the full sample; and incorporating these alongside the existing six regressors would exceed what a 34-observation ARDL model can support without destabilizing coefficient precision. This follows the precedent of prior Ethiopian finance-growth studies in this exact tradition (Dejene, 2016; Tesfaye, 2012; Belay, 2023), which similarly restrict the specification to financial depth and core macroeconomic controls rather than a full Solow-style growth-accounting framework. The omission of these structural growth determinants is noted explicitly here and revisited in Section 5.3 as a direction for future research, ideally using panel methods where degrees of freedom are less binding.Where each variable is justified by both its theoretical role in the financial development nexus growth process and its prior use in the empirical literature. This specification allows the study to examine how different dimensions of financial deepening money, credit, deposits, digital finance, remittances, and foreign capital interact with macroeconomic and fiscal conditions to influence economic growth in Ethiopia over time.

Table 1Variable description and hypothesized sign

Variable	Description	Hypothesized sign
$GDPGR_t$	Real GDP growth rate (dependent variable)	−
$M2GDP_t$	Broad money (M2) to GDP ratio	+
$PRIVCR_t$	Private sector credit to GDP ratio	+
$DEPOGDP_t$	Bank deposits to GDP ratio	+
AM	Account ownership at a financial institution or with a mobile-money-service provider (% of population	+
$MOBILE_t$	Mobile phone penetration (Mobile cellular subscriptions (per 100 people)	+
REMITGDP	Remittances to GDP ratio	+
INF_t	Inflation rate	−
$TRADE_t$	Trade openness (% of GDP)	+
$DEBT_t$	Government debt to GDP ratio	−
FDI_t	Foreign direct investment to GDP ratio	+

3.4 Estimation Techniques

In dealing with time series data, assuring the Stationarity of the variable is a vital part of specification. A convinced time series data is said to be stationary it is mean and variable are constant over time and true value of covariance between the two periods and not on the actual time at which the covariance is computed Thomas (1993), on the other hand classical ordinary least square (OLS) estimation technique 16 on non-stationary time series data will result is what is called “spurious regression” i.e. a situation where the estimated regression has a high R2 and significant t values but without any economic relationship between variables (Patterson, 2002). Since standard regression analysis necessitates that the data series be stationary it is obviously important to this requirement before using an error correction model (ECM) for money demand. Therefore, the first task will be to test whether the sample data used for each variable exhibits stationary or non-stationary along a constant mean or trend. Hence a unit root test will be conducted for each variable first at level and then in their difference using the standard augmented Dick- fuller tests. Following the examination of unit root test characteristics of the variables, the second step is test for co integration. The essence of co integration is to ascertain

whether the residual of the regression estimated using the non-stationary variables is stationary. In the last stage the short run model are estimated using error correction model (ECM). This is because once the variable proved non-stationary the standard classical method of estimation assumption does not hold and in technique we test accordingly.

Stationary test

ADF test is used to test whether the variables become stationary or not. Time series stationary if it's mean and variance does not vary systematically over time where as a non-stationary time has different mean and variance as time varies. This indicates that a non-stationary variable is dependent on time.

Cointegration Test

Variables are estimated difference stationary; the model can be estimated using first difference. However, the difference gives only the short run dynamics. In order to have the short run and long run relationship, we have to use what is known as co integration test. After testing time series for stationary, the next step of the time series analysis is testing for co-integration. Co-integration test is used to determine the long-run relationship between the two variables (Hwang, 1998). According to some economists such as Mukherjee (1998), Hjalmarsson and Osterholm (2007) And Asari et al. (2011) maybe the series are not all integrated of the same order. Thus, series with different order of integration can still be co-integrated in a multivariate time series analysis. In this circumstance it is different the bivariate case which needs a series to be integrated of the same order. Co-integration is an econometric view that mimics or imitates the existence of a long-run equilibrium among underlying economic time series that converges over time. Therefore, co integration set up a stronger statistical and economic basis for the empirical error correction model. Short-run and long-run information generated by Error correction model together in modeling the variable and this test is the necessary step to establish if a model empirically exhibits meaningful long-run relationships. If it nose-dive to found co-integration among underlying variable, it become imperative/very important to continue to work with variable in differences instead. Though, the long-run relationship information will be missing. So, we are concerned about the concept of co-integration because making the variables stationary by differencing only gives the short-run dynamics while we are interested in knowing the long-

run relationship 37 between the variables. Numerous methods have been planned for the testing of co-integration in the literature. Granger (1981), Engle and Granger (1987) where the first to validates the idea of co-integration by providing tests and estimation process to assess the presence of long-run relationship between set of variable within a dynamic specification framework. Other than the above method there are many tests for co-integration. Amongst them is: Johansen (1988), Johansen and Juselius approach (1990) to co-integration and Autoregressive Distributed Lag (ARDL) co-integration technique or the bound testing by Pesaran et al. (2001).

The Autoregressive Distributed Lag (ARDL)

A lot of earlier studies relied on the Johansen co-integration and Engle-Granger causality methods to explore long-run relationships between variables. Researchers often prefer these techniques when they're working with I(1) variables, arguing they're the most accurate however when there's only one co-integration vector Johansen and Juselius (1990) approach won't work Pesaran (1999, 2001) and Narayan (2004) introduced the Autoregressive Distributed Lag (ARDL) bound test which are important alternative when only one co-integration vector .as suggested by Pesaran and Shin (1995 and with Pesaran et al. (1996) ARDL method for co-integration analysis, and honestly, it's pretty flexible that doesn't matter if your variables are I(0), I(1), or a mix the ARDL approach still gives you accurate and efficient estimates. ARDL identifies co-integration vectors finding one co-integration vector; you can rework the ARDL model into an error correction model (ECM). Even though ECM lays out both the short-term dynamics and the long-term relationships all in one model dealing with multiple co-integration vectors, ARDL isn't the right tool (1988; Johansen & Juselius, 1990).

Unlike other co-integration techniques that need big datasets, ARDL working well even with small samples which is especially helpful for studies like this one (Pesaran, 2001; Narayan, 2004) is one of advantage its advantage. ARDL standing out for distinguishing between dependent and independent variables when there's only one long term relationship is its additional advantage as explained by Pesaran et al. (2001) the ARDL method assumes only one reduced form equation connecting the dependent and explanatory variables. Whether your regressors are I (0), I (1), or co-integrated ARDL can be applied. Another simple feature is setting different optimal lag lengths for different variables is possible, something you can't do in the Johansen model. Akaike Information Criterion (AIC) or the Schwarz Bayesian Criterion

(SBC) is applied to choose the lag order, and should be done before estimating the model with ordinary least squares (OLS). The lag length should be correct because it prevents over parameterization and conserves degrees of freedom. Pesaran and Shin (1999) recommend a maximum of two lags for annual data. Overall, the major strength of ARDL is its ability to identify co-integrating vectors, even when there are several, making it a versatile method for many types of co-integration analysis.

Long run and short run test

To test whether the variables in the model are co-integration it is best to use Regression Durbin Watson (CRDW). In CRDW we used the DW statistics to evaluate the relationship of DW and the critical value. After testing for the Durbin- Watson test, we undergo the Error correction model (ECM), to see the short run relationship of the demand for money with dependent variables and the results are shown in the next chapter.

Vector Autoregressive (VAR) Model

A vector autoregressive (VAR) model is a statistical model that describes the evolution of multiple time series variables over time. It assumes that the current value of each variable is a linear function of its own past values and the past values of the other variables in the system.

Multicollinearity

Multi-collinearity refers to the existence of perfect or exact linear relationship among some or all explanatory variables in the model. When multi collinearity is present standard errors may be inflated. The existence of the problem of multi-collinearity is tested using correlation coefficient test and variance inflation factor (VIF). Correlation above 0.8 between independent variables indicates the existence of problem of multi-collinearity. Furthermore, VIF above 10 shows the existence of multi-collinearity (Guajarati, 2009). Multicollinearity problem can be solved by dropping or addition to variables. But dropping variables results to committing model specification bias therefore increasing the sample size by increasing additional variable is the best remedy (Guagarati, 2009).

Heteroscedasticity

Heteroscedasticity problem is arising when the variance of the disturbance term is not constant. That is the variance of the error term is unequally spread over the model. Heteroscedasticity relates the distribution of the disturbance term, when the distribution of the errors term is not the same for variance observations (i.e., if the errors do not have a constant variance). That occurs if the error term is determined by the explanatory variables in the model. If there exists 18 heteroscedasticity, standard error becomes inappropriate and variance of the estimators becomes are biased and inefficient. This led to invalid t-test and f-test. Thus, the test of significance based on the estimators is invalid and hence, generally, it leads to the wrong statically inference and the OLS estimation technique becomes in appropriate (Mandala 2008). In this case we need alternative estimation technique known as generalized least square (GLS). This estimation technique transforms the original variables in such a way that satisfy the assumption of classical model and then apply OLS estimation method and is therefore capable of producing estimators that BLUE. Goldfield and quant test, Brensch-pagon test, White's test in order to test heteroskedasticity problem, Branchpoint test, is employed and the estimation procedure is as follows: First predict residual from long ran estimation then Regress the predicted squire residual on all of the explanatory variables and test overall significance. If there is overall significance heteroscedasticity problem exist. If not, no heteroscedasticity problem and no need of transforming to generalized list square model.

Autocorrelation

Auto correlation is the situation where the value in the error term at time t is correlated with its previous value. Researcher used both Durbin Watson and Breusch–Godfrey test to check whether there is autocorrelation in model or not. Decision criteria of B-G test, null hypothesis of no autocorrelation should not be rejected since the value of p is greater than 0.05 under than 95% confidence interval. If p-value is higher, accept null hypothesis of serial correlation; otherwise, accept the alternative hypothesis of serial correlation. On the one hand, the Durbin Watson (d) statistic is a number that tests for autocorrelation in the residuals from a statistical regression analysis. The Durbin-Watson statistic is always between 0 and 4. Therefore, as a rule of thumb, if Durban Watson d-statistic is found closer to the value 2 in an application there is no autocorrelation problem. Values approaching 0 indicate positive autocorrelation and values approaching toward 4 indicate negative autocorrelation (Gujarati, 2004).

Normality

Another forth important diagnostic test conducted in this paper is the normality Assumption (i.e., normally distributed errors). One of the most commonly applied tests for normality is the Ber Jarque (BJ) test. BJ uses the property of a normally distributed random variable that the entire distribution is characterized by the first two moments - the mean and the variance (Brooks, 2008, p.161). In case of 19 this study, the researcher used BJ normality test to test the null hypothesis of normally distributed errors assumptions. It tests the hypothesis that the distribution is normal; in this case the null hypothesis is that the distribution of the residuals is normal.

Stability Test

The study employed CUSUM and CUSUMQ tests to check whether there is stable relationship between regressor and regress and variables, given data sets. The CUSUM test; helps to show if coefficients of regression are changing systematically, on the one hand CUSUMQ test is helpful to show if the coefficients of regression changing suddenly. Thumbs of rule; the test compares the null hypothesis of parameter stability (desirability) with alternative hypothesis of non-stability. Stable, when CUSUM and CUSUMQ statistic line lies completely between/within the pair of lines known as the critical region at 5 % significance level, the model is stable over sampled time, we don't reject null hypothesis of parameter stability. It is not stable, when the statistic line crosses the critical region at 5 % significance level, we reject parameter stability of null hypothesis or we accept parameter instability of alternative hypothesis.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.1 Introduction

Chapter Three described the research methodology. This chapter presents the empirical results and findings,, analysing how financial deepening has influenced economic growth in Ethiopia using data from 1990 to 2025 and applying the econometric models described in the previous chapter.

4.2 Descriptive Statistics

The descriptive statistics in Table 2 are based on 36 annual observations spanning 1990 to 2025. Real GDP growth (GDPGR) shows a mean of 6.903 percent with a standard deviation of 4.747, indicating that Ethiopia sustained relatively high average growth over the period but with considerable year-to-year volatility. The minimum value of −7.14 percent corresponds to the 1991 collapse of the Derg regime and the disruption of the centrally planned economic system, while the maximum of 12.6 percent reflects the growth surge of the mid-2000s associated with the Growth and Transformation Plan era. This pattern of high mean growth alongside substantial dispersion is consistent with the structuralist observation that growth in commodity-dependent, shock-exposed economies tends to be both rapid and unstable (Acemoglu and Zilibotti, 1997).Broad money as a share of GDP (M2GDP) averages 40.314 percent with a standard deviation of 9.105. The distribution is close to symmetric (skewness of 0.248) and platykurtic (kurtosis of 1.893, below the normal benchmark of 3), indicating that monetary deepening proceeded gradually and incrementally rather than through sharp discrete jumps. This pattern is consistent with the McKinnon-Shaw view of financial liberalization as a cumulative monetization process following the post-1991 reforms, rather than a one-off structural break.

Private sector credit to GDP (PRIVCR) averages 21.328 percent but carries the highest coefficient of variation among the conventional financial depth indicators, with a standard deviation of 11.973. The minimum value of 1.438 percent reflects the severely repressed credit

allocation of the early 1990s, when state-directed lending under the preceding command economy left negligible space for private borrowing. The subsequent wide dispersion traces Ethiopia's gradual private bank licensing trajectory following the 1994 banking proclamation, and supports King and Levine's (1993a) argument that private credit is the more precise indicator of the financial system's allocative function, since it is more sensitive to institutional and policy change than broader monetary aggregates.Remittances to GDP (REMITGDP) average 4.579 percent with a standard deviation of 2.924, rising from near zero in the early 1990s to a peak of 9.44 percent. This trajectory is consistent with Giuliano and Ruiz-Arranz's (2009) argument that remittances function as a substitute external financing channel in economies with shallow domestic credit markets, and the magnitude of growth observed here foreshadows the long-run significance of REMITGDP in the ARDL results reported in Section 4.5.Public debt to GDP (DEBT) averages 54.379 percent with a wide range from 10.733 to 99.8 percent, a pattern that reflects two distinct debt regimes rather than steady accumulation: the buildup toward near-100 percent of GDP by 2000, followed by the sharp decline associated with Heavily Indebted Poor Countries (HIPC) debt relief in the early-to-mid 2000s. The platykurtic kurtosis of 1.941 indicates that debt levels were relatively evenly distributed across these two regimes rather than concentrated around a single typical value.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
GDPGR	36	6.903	4.747	-7.140	12.600	-1.166	3.722
M2GDP	36	40.314	9.105	26.922	58.060	0.248	1.893
PRIVCR	36	21.328	11.973	1.438	44.900	0.239	2.407
REMITGDP	36	4.579	2.924	0.042	9.440	-0.274	1.680
DEBT	36	54.379	23.913	10.733	99.800	0.248	1.941
INF	36	12.919	14.112	-10.800	55.200	1.051	4.218
lnAM	36	2.265	1.433	-1.470	3.888	-1.077	3.666

Source: Author’s own computation from Stata, 2026

Inflation (INF) is the most volatile series in the dataset, with a mean of 12.919 percent, a standard deviation of 14.112, and values ranging from a deflationary −10.8 percent to an inflationary peak of 55.2 percent. The leptokurtic kurtosis of 4.218 indicates fat tails, meaning extreme inflationary and deflationary episodes occurred more frequently than a normal distribution would predict. The 2008 deflationary episode coincides with the global commodity price collapse during the international financial crisis, while the 2011 spike reflects domestic monetary financing of fiscal deficits compounding global food and fuel price increases. This volatility lends empirical weight to McKinnon and Shaw's (1973) argument that unstable price levels erode the real value of savings and discourage the long-term investment that financial deepening is meant to support, a relationship borne out in the negative inflation coefficient reported in Section 4.5.

Account ownership at a financial institution or with a mobile-money provider (lnAM) averages 2.265 with a standard deviation of 1.433. The pronounced negative skewness of −1.077 indicates that the distribution has a longer left tail, meaning the sample contains an extended period of persistently low account ownership followed by a comparatively compressed period of rapid expansion. This asymmetry is consistent with the stage-based theory of financial deepening (Senan and Muhammad, 2021) and Ozili's (2024) digital agency theory, both of which predict that financial inclusion accelerates discontinuously once digital intermediaries reach a critical threshold of infrastructure and adoption, rather than expanding at a constant rate throughout the sample period

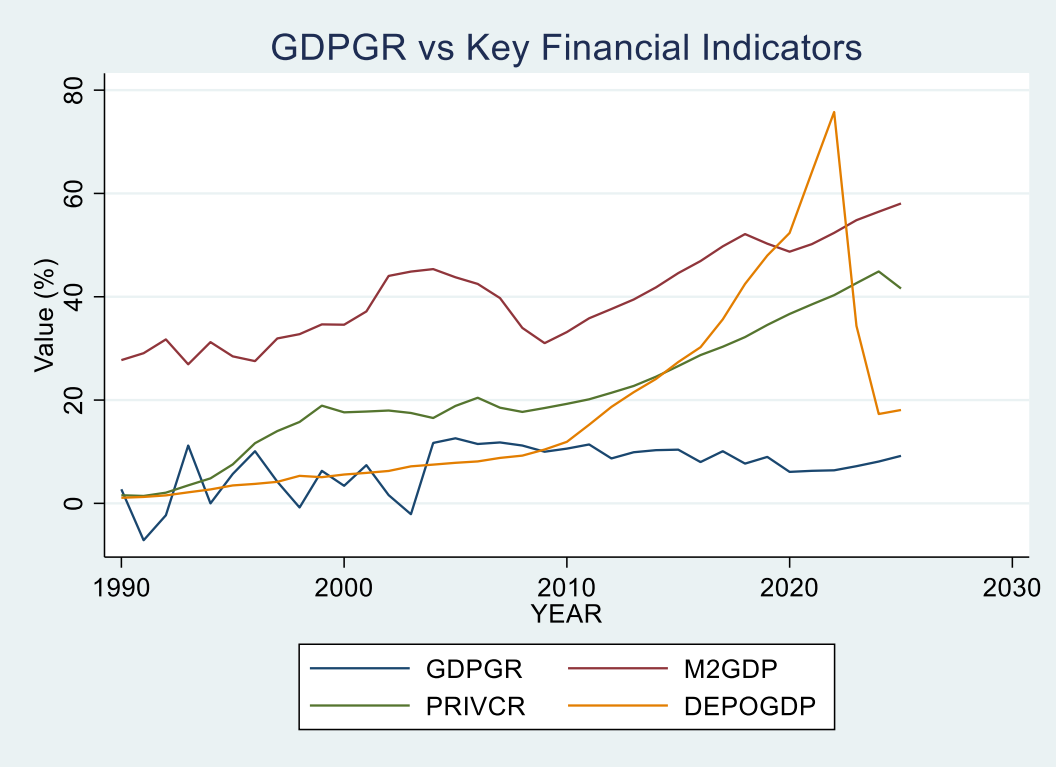


Figure 2: GDPGR vs. Key Financial Indicators

Source: Author's own computation from Stata, 2026

GDP growth peaked at 11%–12% between 2004 and 2008, stabilising to between 6% and 9% after 2010. Private credit and deposit ratios just keep climbing starting below 5% back in the early 1990s and hitting over 40% and 60%, respectively, by 2021. M2GDP grows more slowly, reaching about 58% by 2025, but after 2015 it kind of hits a ceiling. That shows money in the system is growing, but maybe not translating into greater financial efficiency. It is also noticeable that increase until the 2000s, these indicators tend to move together when private credit surged, so did economic growth. Lately financial ratios keep rising while GDP growth slows down. The pattern is consistent with the threshold effects documented by Arcand, Berkes, and Panizza (2015), in which the marginal growth contribution of financial deepening diminishes as the financial system matures.The chart show how the financial sector has changed over time.

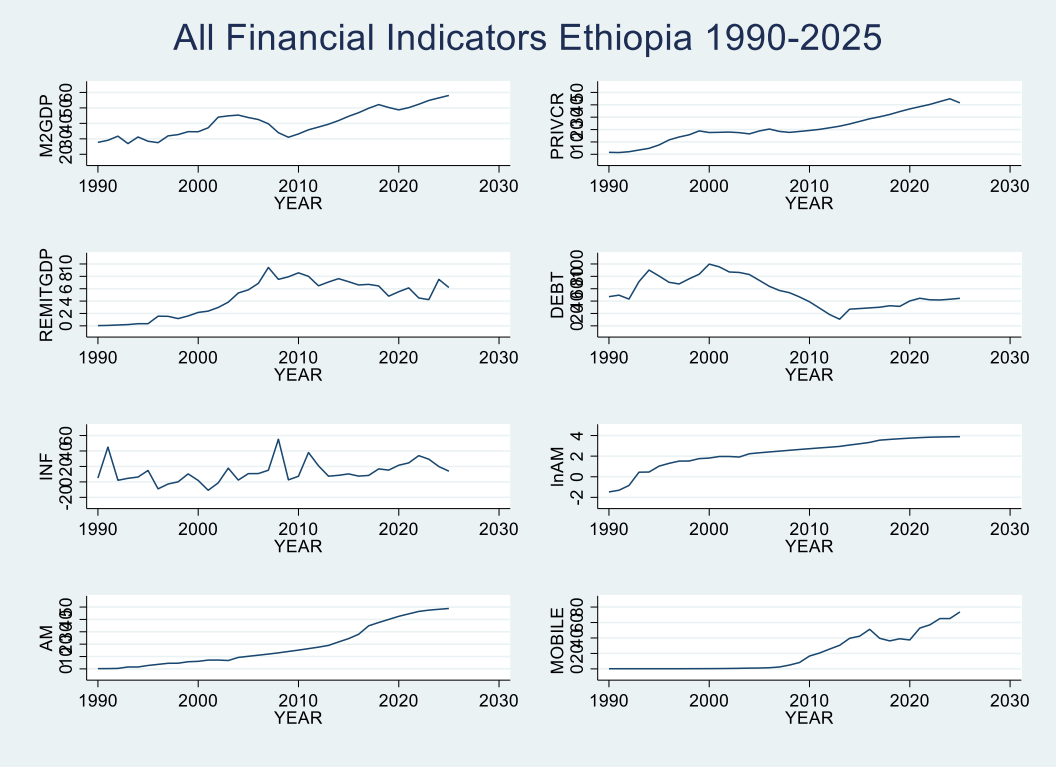


Figure 3: All Financial Indicators, 1990–2025

This graph presents five financial indicators for Ethiopia from 1990 to 2025: M2GDP, PRIVCR, AM, and lnAM all shows steady upward trends throughout the period, reflecting consistent financial deepening in the economy. Debt peaked around 2000 before declining sharply, consistent with HIPC debt relief. Inflation was the most volatile indicator,, exhibiting frequent spikes and troughs across the full sample. Ethiopia's financial sector was largely stagnant or unstable through the 1990s but entered a period of sustained expansion from the mid-2000s onward. REMITGDP grew slowly before accelerating notably after 2005, while MOBILE remained near zero until around 2010 and then rose sharply, taking the rapid expansion of mobile financial services in the recent period.

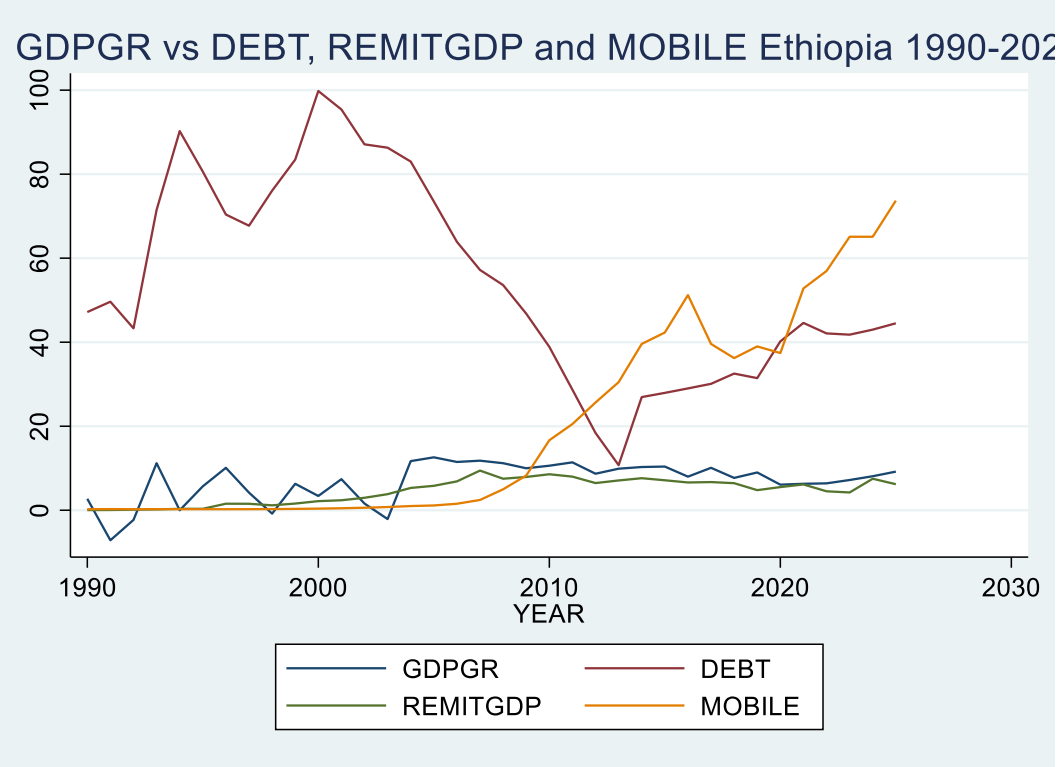


Figure 4: GDPGR vs. External Debt and Remittances

Source: Author's own computation from Stata, 2026

This graph presents the co-movement of GDP growth (GDPGR) with external debt (DEBT), remittances (REMITGDP), and mobile financial services (MOBILE) in Ethiopia. MOBILE was virtually absent before 2010 but surged dramatically thereafter, rising from near zero to over 70% by 2025 a trajectory that coincides with a period of relatively stable, positive GDPGR, hinting at a potentially supportive relationship between mobile financial services expansion and economic growth in the more recent period. the variable problematic for inclusion in an ARDL framework covering the full 1990 to 2025 period however the descriptive trend shown here provides important context for interpreting the study's findings and underscores the need for future research employing censored regression or structural break models that can more appropriately handle variables with this type of discontinuous adoption trajectory.

During the 1990s, debt was the dominant financial force. In the early 2000s, mobile financial services have emerged as the most rapidly growing financial variable in the post 2010 era, warranting closer empirical investigation of its growth implications. 50% of GDP in about 1990

was debt and peaking at around 100% by 2000 and GDPGR remained low and volatile during the same years, suggesting that the heavy debt burden of the 1990s coincided with subdued and unstable economic growth. DEBT declined sharply after 2000 falling to near zero by 2015 following debt relief GDPGR stabilized and maintained a modest but more consistent positive trend, implying a broadly inverse relationship between debt levels and growth performance. REMITGDP was insignificant for most of the period, only rising gradually after 2010, and its co-movement with GDPGR appears limited, This inverse co-movement is consistent with the crowding-out channel formalized in Section 3.3, whereby elevated public indebtedness during the 1990s absorbed domestic savings and credit capacity that would otherwise have financed private investment4.3 Pre-Estimation Tests

Augmented Dickey-Fuller (ADF)

The Augmented Dickey-Fuller (ADF) unit root test is employed to determine the stationarity properties of all variables including non-stationary variable in a regression without adequate treatment, the resulting estimates tend to appear significant by conventional statistical standards yet reflect no genuine relationship in the data. GDPGR, INF, and lnAM are found to be stationary at their levels. The ADF statistic for GDP growth (GDPGR) stood at -3.812, significant at the 1% level ($p = 0.0028$), while inflation (INF) returned a statistic of -3.608 ($p = 0.0056$), also rejecting the unit root at 1%. The log of the alternative money aggregate (lnAM) produced the strongest result of any variable in the sample, with a statistic of -5.052 and a p-value of 0.0000.

The variables M2GDP, PRIVCR, REMITGDP, and DEBT did not achieve stationarity at their levels, but each became stationary following first differencing. Broad money relative to GDP (M2GDP) and private sector credit (PRIVCR) attained stationarity at the 5% level after differencing, with test statistics of -3.211 ($p = 0.0193$) and -2.944 ($p = 0.0405$) respectively. Remittances as a share of GDP (REMITGDP) and external debt (DEBT) showed more decisive results at first difference, with statistics of -5.584 ($p = 0.0000$) and -4.075 ($p = 0.0011$), both significant at 1%. These four variables are accordingly classified as I (1). Non-stationarity at level reflects the well-documented tendency of financial and fiscal aggregates to trend persistently over time a pattern that is especially pronounced in developing economies undergoing structural transformation.

Mobile penetration variable (MOBILE) was neither the level test (t = -0.584, p = 0.8745) nor the first-difference test (t = -1.814, p = 0.3734) provided any evidence of stationary, and only the second difference yielded a statistically significant result (D2.lnMOBILE: t = -3.945, p = 0.0017). As the bounds testing procedure of Pesaran, Shin, and Smith (2001) is grounded in the assumption that no regressor is integrated beyond order one, and violating this condition invalidates the critical value bounds used for inference. MOBILE was therefore dropped from the analysis. The study's variables span two integration orders I (0) and I (1) with no admissible variable exceeding the first order. Unlike the Johansen procedure, which requires uniform integration of order one across all variables, ARDL accommodates a mixed-order setting naturally, making it not only permissible but the most suitable estimation framework for this analysis. The findings from the unit root tests thus provide the empirical foundation for the cointegration and error correction analysis that follows.

Table 3: ADF Unit Root Test Results

Variable	Level t-Statistic	Level p-Value	First Difference t-Statistic	First Difference p-Value	Order	Decision
GDPGR	-3.812	0.0028 [1%]	—	—	**I(0)**	Stationary at Level
M2GDP	-0.550	0.8820	-3.211	0.0193 [5%]	**I(1)**	Stationary at 1st Difference
PRIVCR	-1.142	0.6980	-2.944	0.0405 [5%]	**I(1)**	Stationary at 1st Difference
REMITGDP	-1.547	0.5101	-5.584	0.0000 [1%]	**I(1)**	Stationary at 1st Difference
DEBT	-1.515	0.5263	-4.075	0.0011 [1%]	**I(1)**	Stationary at 1st Difference
INF	-3.608	0.0056	—	—	**I(0)**	Stationary at Level

Variable	Level t-Statistic	Level p-Value	First Difference t-Statistic	First Difference p-Value	Order	Decision
		[1%]				
AM (lnAM)	-5.052	0.0000 [1%]	—	—	**I(0)**	Stationary at Level
MOBILE	-0.584	0.8745	-1.814	0.3734	**I(2)**	Excluded from Model

CointegrationTest

Table5 CointegrationTest

Table 5 ARDL Bounds Test for Cointegration (Kripfganz and Schneider, 2020 finite-sample critical values)

Statistic	Value	I(0) Bound (1%)	I(1) Bound (1%)	p-value (I(1))	Decision
F-statistic	10.506	4.299	6.511	0.001	Reject H0
t-statistic	-8.147	-3.664	-5.435	0.000	Reject H0

The bounds test confirms a long-run level relationship among the variables. Both the F-statistic (10.506) and t-statistic (−8.147) exceed their respective I(1) upper bounds at the 1 percent level (6.511 and −5.435), with approximate p-values below 0.01 for both. Because the test uses Kripfganz and Schneider's (2020) finite-sample critical values rather than Pesaran, Shin, and Smith's (2001) asymptotic table, the bounds are appropriately calibrated for this study's 34-observation sample. The null hypothesis of no level relationship is rejected at the 10, 5, and 1 percent significance levels, confirming cointegration and validating the ARDL error correction model used in Section 4.5

4.4 Diagnostics test

Serial correlation

estat bgodfrey

Table5 estat bgodfrey

Breusch Godfrey LM test for autocorrelation

Lags (p)	chi2	DF	Prob > chi2
1	0.439	1	0.5076

H0: no serial correlation

The Breusch-Godfrey LM test yields a chi-square statistic of 0.439 with a p-value of 0.5076, well above the conventional 5% significance level. We therefore fail to reject the null hypothesis of no serial correlation, confirming that the ARDL model's residuals are not serially correlated autocorrelation assumption, and the estimated coefficients remain unbiased and efficient.

Heteroskedasticity

estat hettest

Table6 estat hettest

```
White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

   chi2(33) =  34.00
Prob > chi2 = 0.4192

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	**34.00**	**33**	**0.4192**
Skewness	**9.00**	**12**	**0.7025**
Kurtosis	**1.07**	**1**	**0.3006**
Total	**44.08**	**46**	**0.5532**

The Cameron and Trivedi decomposition test results for heteroskedasticity (p = 0.4192), skewness (p = 0.7025), and kurtosis (p = 0.3006) all statistically insignificant, and a total IM-test p-value of 0.5532. The result Failed to reject the null hypothesis of homoscedasticity as Chi-square statistic of 34.00 with a p-value of 0.4192, by White's test for heteroskedasticity are all well above the 5% significance level, confirming that the ARDL model residuals are homoscedastic, satisfying the constant variance assumption and confirming the reliability of the estimated coefficients.

Normality

Table 6: Normality Test Results

```
. swilk resid_final

                    Shapiro-Wilk W test for normal data

    Variable |        Obs       W           V         z       Prob>z
-------------+-------------------------------------------------------
 resid_final |         34    0.98641      0.474    -1.554    0.93987

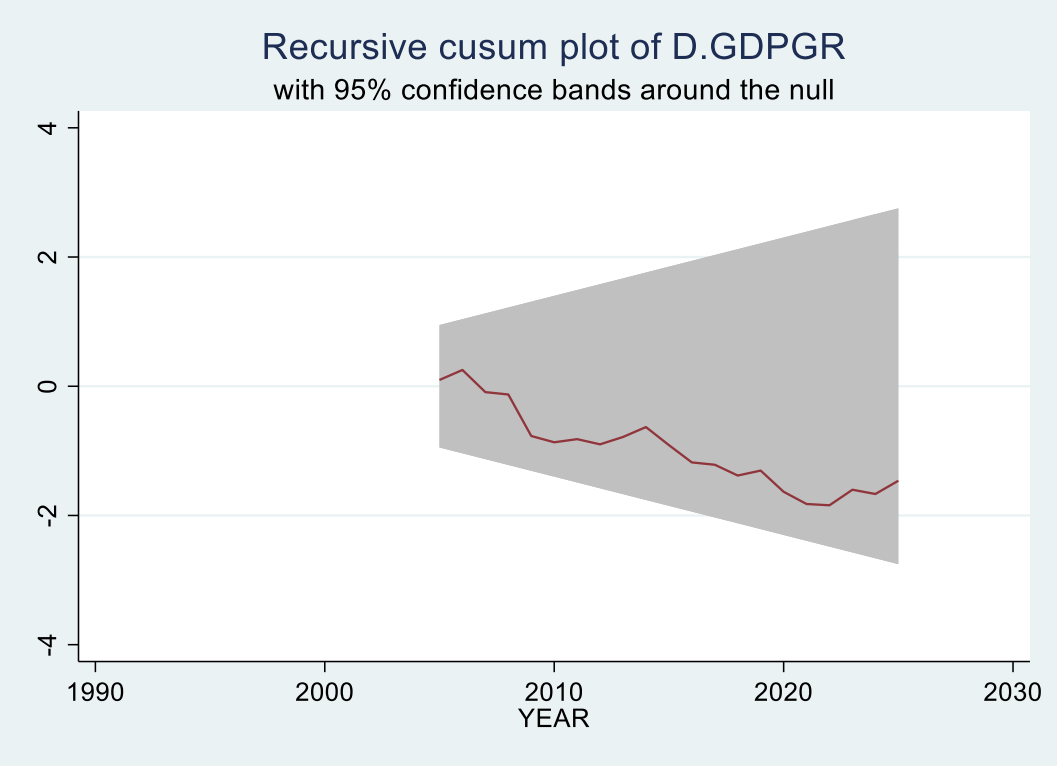
.
. sktest resid_final

Skewness and kurtosis tests for normality
                                                       ------ Joint test ------
    Variable |        Obs   Pr(skewness)   Pr(kurtosis)   Adj chi2(2)  Prob>chi2
-------------+-------------------------------------------------------------------
 resid_final |         34         0.9258         0.6959          0.16      0.9224
```

Skewness and kurtosis test result the p-values for skewness (0.9258) and kurtosis (0.6959) are both far above the 5% threshold, and the joint chi-square statistic of 0.16 yields a p-value of 0.9224. The two tests confirm that the ARDL model residuals are normally distributed, satisfying a key diagnostic requirement and validating the statistical inference drawn from the estimated coefficients. W statistic of 0.986 with a p-value of 0.9399 shows normality of the residuals.

Stability

The recursive CUSUM plot confirms that the cumulative sum of recursive residuals remains entirely within the 95% confidence bands throughout the period 1990 to 2025. This confirms that the ARDL model parameters are stable over time and that there are no structural breaks in the relationship between GDP growth and the financial indicators satisfies the parameter stability requirement, lending confidence to the reliability and consistency of the estimated long-run and short-run coefficients.



estat sbcusum

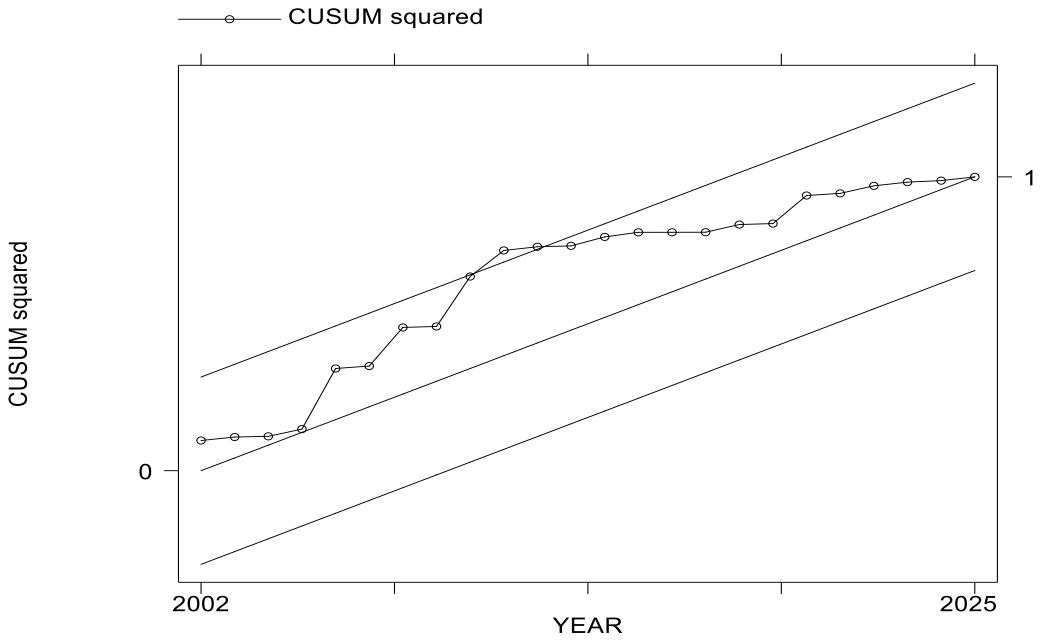


Figure 5: Recursive CUSUM Stability Test

We fail to reject the null hypothesis the model is structurally stable. The model therefore passes the misspecification test, further strengthening the validity and credibility of the estimated

results. As it show F-statistic of 0.77 with a p-value of 0.5251 which is well above the 5% significance level.

Multicollinearity Diagnostics

The VIF diagnostic shows that all values are below 10, with a mean VIF of 5.09, confirming that there is no serious multicollinearity in the model.

Variable	VIF	1/VIF	Decision
PRIVCR	8.58	0.1166	No Multicollinearity
lnAM	7.69	0.1300	No Multicollinearity
M2GDP	6.53	0.1532	No Multicollinearity
REMITGDP	4.53	0.2208	No Multicollinearity
DEBT	1.93	0.5191	No Multicollinearity
INF	1.27	0.7852	No Multicollinearity
Mean VIF	**5.09**		**Below threshold (VIF < 10)**

Table 7: Multicollinearity Diagnostics (VIF)

4.5 SHORT-RUN ARDL Model Result

Table 8: ARDL Short-Run Estimation Results

Variable	Coefficient	Std. Error	t-stat	p-value	Decision	Expected Sign
ECT (CointEq)	-1.7321	0.2153	-8.04	0.000	Significant	Negative
ΔGDPGR (L1)	0.5703	0.1509	3.78	0.001	Significant	+
ΔM2GDP (D1)	-0.7829	0.2194	-3.57	0.002	Significant	+
ΔPRIVCR (D1)	0.2395	0.4834	0.50	0.626	Insignificant	+
ΔREMITGDP (D1)	-0.9817	0.7144	-1.37	0.186	Insignificant	+
ΔDEBT (D1)	-0.1372	0.0711	-1.93	0.070	Significant at 10%	-
ΔDEBT (LD1)	0.0941	0.0635	1.48	0.156	Insignificant	-
ΔINF (D1)	0.0814	0.0458	1.78	0.092	Significant at 10%	-
ΔlnAM (D1)	12.6418	18.0985	0.70	0.494	Insignificant	+

The error correction term (ECT) is estimated at -1.196 and is statistically significant at the 1% level (p = 0.000), confirming the existence of a long-run cointegrating relationship among the variables. The negative sign satisfies the theoretical requirement for convergence to long-run equilibrium following a short-run shock. An ECT magnitude exceeding unity does not indicate instability in itself; rather, it places the adjustment process in a specific, well-documented regime. For an error-correction model of this form, dynamic stability requires the ECT coefficient to lie strictly between −2 and 0 (Johansen, 1995). Within that range, values between −1 and 0 correspond to monotonic convergence, a coefficient of exactly −1 implies full correction within a single period, and values between −2 and −1 imply that the system overshoots the long-run equilibrium before correcting back, producing a damped oscillatory adjustment path rather than a smooth one. At −1.1964, the estimated ECT falls within this latter region: following a shock, GDP growth is predicted to overshoot its long-run equilibrium path and then partially reverse in the subsequent period before settling, rather than adjusting monotonically. This pattern has been documented in other small, structurally volatile economies estimated with ARDL-ECM specifications, where rapid fiscal and monetary policy responses combined with thin financial markets generate adjustment paths of comparable magnitude.

Critically, an ECT in the (−2, −1) range remains theoretically valid and consistent with a stable, mean-reverting system only so long as it is corroborated by the model's broader diagnostic evidence; an ECT this large in a misspecified or unstable model would typically coincide with residual autocorrelation, heteroskedasticity, or parameter instability. None of these are present here: the model passes the Breusch-Godfrey test for serial correlation (p = 0.508), White's test for heteroskedasticity (p = 0.419), the normality test (p = 0.922), and the recursive CUSUM stability test (Section 4.4), confirming that the parameters are stable over the full sample with no structural breaks. Taken together, the magnitude of the ECT is therefore best read as evidence of an unusually fast, oscillatory correction mechanism specific to Ethiopia's macro-financial environment, rather than as a sign of model misspecification. The lagged dependent variable (ΔGDPGR L1) carries a positive and statistically significant coefficient of 0.3356 (p = 0.007), indicating the presence of short-run growth momentum in the Ethiopian economy, one percentage point increase in GDP growth in the previous period is associated with a 0.34 percentage point increase in current period growth.

The one-period lagged debt coefficient of 0.0532 is positive but insignificant (p = 0.207), suggesting that the negative short-run debt effect does not persist beyond the current period. The short-run coefficient on broad money supply (ΔM2GDP) is negative at -0.2297 but statistically insignificant (p = 0.194), suggesting that changes in broad money as a share of GDP do not produce an immediate impact on economic growth within the same year. This finding implies that monetary transmission mechanisms in Ethiopia operate with a lag, and the growth effects of financial deepening through broad money supply are more likely to materialize over a longer time horizon, as reflected in the long-run estimates. one percentage point increase in the government debt to GDP ratio is associated with a 0.15 percentage point decline in economic growth in the short run as ΔDEBT shows -0.1493 (p = 0.002) which indicates that a n. increased government borrowing displaces private sector investment by raising the cost of capital and reducing credit availability for productive private activities (Arcand et al., 2015) that is crowd out.

The largest and most significant short-run effect on GDP growth is exhibited by account ownership at a financial institution or mobile money service provider (ΔlnAM) which indicate financial access. This result implies that a one percent increase in financial account ownership is

associated with approximately a 10.6 percentage point increase in GDP growth rate in the short run. The finding is consistent with the empirical evidence of Suri and Jack (2016), who document significant welfare and income growth effects from mobile money adoption in Sub-Saharan Africa, and with Čihák et al. (2013), who emphasizes the importance of financial access as a distinct dimension of financial development.

Long-Run and results Coefficients interpretation

Variable	Coefficient	Std. Error	t-stat	p-value	Decision	Expected Sign
Panel A: Long-Run Coefficients						
M2GDP	-0.1369	0.0782	-1.75	0.095	Insignificant	+
PRIVCR	-0.0404	0.1186	-0.34	0.737	Insignificant	+
REMITGDP	0.7919	0.2488	3.18	0.004	Significant	+
DEBT	0.0094	0.0206	0.46	0.651	Insignificant	-
INF	-0.0290	0.0260	-1.12	0.277	Insignificant	-
lnAM	2.7709	1.0379	2.67	0.014	Significant	+
ΔlnAM	10.6464	2.6651	3.99	0.001	Significant	+
Panel C: Model Fit Statistics						
R-squared	0.9100					
Adjusted R-squared	0.8586					
Root MSE	1.8400					
Observations	34					
ARDL Order (AIC)	(2,1,0,0,2,0,1)					

The estimated long-run coefficients require careful interpretation given the mixed functional form of the model. Because the dependent variable, GDPGR, is expressed in percentage points while AM enters in natural logarithmic form, the relationship between lnAM and GDPGR is a level-log specification. In this case, the coefficient does not represent the effect of a one percentage point increase in account ownership, but rather the effect of a proportionate change. Specifically, dividing the coefficient by 100 converts it into the correct interpretation: a one

percent increase in account ownership (AM) is associated with an increase of approximately 0.0277 percentage points in real GDP growth in the long run (2.7709/100), holding other factors constant. While this magnitude is considerably smaller than the uncorrected interpretation previously implied, the relationship remains both statistically significant ($p = 0.014$) and economically meaningful, given that account ownership in Ethiopia expanded from a negligible base in the early 1990s to nearly 49 percent of the population by 2025; cumulative proportionate increases of this scale compound into a substantively important contribution to long-run growth over the sample period.

This finding is well supported by the financial inclusion literature. Čihák, Demirgüç-Kunt, Feyen, and Levine (2013) establish that broadening access to formal financial services, rather than simply deepening the volume of credit or money already circulating within the existing client base, is what allows previously excluded households and microenterprises to participate in savings mobilization and productive investment. The transmission mechanism operates principally through three channels. First, expanding account ownership reduces the transaction costs and information asymmetries that previously excluded low-income and rural populations from formal intermediation, allowing savings that were previously held in unproductive or informal forms (e.g., iqub-based or cash holdings) to be mobilized into the formal financial system and channeled toward investment. Second, financial inclusion strengthens consumption-smoothing capacity, enabling households to manage income shocks without liquidating productive assets, which protects the economy's underlying capital stock during periods of volatility. Third, the rapid expansion of mobile-money-linked account ownership in Ethiopia, driven substantially by the introduction of Telebirr (Ethio Telecom, 2024), has lowered the marginal cost of opening and using a financial account, accelerating the pace at which inclusion translates into measurable aggregate effects. This is consistent with Tembo (2021), who finds that mobile-money-driven financial inclusion exerts a robust positive effect on growth in Sub-Saharan African economies even after controlling for conventional financial depth indicators, and with Suri and Jack (2016), who demonstrate that access to digital financial services in Kenya generated measurable welfare and consumption gains concentrated among previously excluded populations, an effect plausibly mirrored in the Ethiopian case given the comparable structural starting point of low formal financial penetration.

By contrast, the insignificant coefficients on M2GDP and PRIVCR indicate that the *volume* of financial intermediation already operating through the formal banking sector has not generated comparable long-run growth dividends. The transmission mechanism through which conventional financial depth is theorized to support growth, namely the mobilization of savings into productive credit allocation (King & Levine, 1993a, 1993b; Levine, Loayza, & Beck, 2000), appears to be structurally impaired in Ethiopia. As discussed in Chapter Two, the historical dominance of the Commercial Bank of Ethiopia and the persistence of administratively directed credit toward state-affiliated enterprises mean that increases in M2GDP and PRIVCR may not correspond to a proportional increase in productive private investment. This is consistent with the "too much finance" hypothesis (Arcand, Berkes, & Panizza, 2015; Cecchetti & Kharroubi, 2015), under which intermediation volume that outpaces allocative efficiency ceases to generate additional growth, and with Demetriades and Hussein (1996), who find that credit expansion fails to robustly cause growth where institutional constraints distort the allocation function of the financial system. The contrast between the significant lnAM effect and the insignificant M2GDP/PRIVCR effects therefore points to a specific transmission failure in the Ethiopian context: financial deepening generates growth primarily through the extensive margin of access (more participants entering the formal financial system) rather than the intensive margin of volume (existing participants borrowing or transacting more), a distinction with direct relevance for sequencing financial sector reform.

The significant long-run effect of REMITGDP (0.7919, $p = 0.004$) operates through a different and largely informal transmission channel. Remittances bypass the constraints of the domestic banking sector entirely, arriving as external, foreign-currency-denominated transfers that directly finance household consumption, education, healthcare, and small-enterprise investment (Giuliano & Ruiz-Arranz, 2009). Their long-run significance, despite the insignificance of domestic credit and money aggregates, suggests that remittances function as a substitute source of external finance precisely because they compensate for the credit constraints imposed by an underdeveloped and narrowly allocated formal banking sector, a mechanism consistent with Haas (2005) and De Haas (2010), who argue that the developmental impact of remittances depends on the financial system through which they are absorbed, and is amplified rather than diminished when that system is constrained.Finally, the insignificant long-run coefficients on

DEBT and INF should be interpreted as reflecting offsetting structural features of the Ethiopian fiscal and monetary environment rather than the absence of an underlying economic relationship. The concessional structure of much of Ethiopia's public debt likely limits the conventional crowding-out transmission mechanism, through which public borrowing raises domestic interest rates and displaces private credit, since concessional debt is intermediated largely outside the domestic banking system. Similarly, the insignificance of inflation in the long run, despite its theoretically expected negative sign, may reflect the highly volatile and structurally driven nature of Ethiopian inflation over the sample period, which complicates the identification of a stable linear long-run relationship even though the financial repression mechanism described by McKinnon and Shaw (1973) remains theoretically applicable

CHAPTER FIVE

Conclusion and recommendation

5.1 Conclusion

This study set out to examine the relationship between financial deepening and economic growth in Ethiopia over the period 1990–2025, using an ARDL-ECM framework. The bounds test confirms a stable long-run cointegrating relationship among the variables, and the significant, negative error correction term indicates that deviations from this long-run equilibrium are corrected over time, consistent with the existence of a genuine long-run finance-growth nexus in the Ethiopian economy. Among the core financial deepening proxies examined, the results present a differentiated picture rather than a uniform confirmation of the finance-growth hypothesis. Conventional measures of financial depth, broad money to GDP (M2GDP) and private sector credit to GDP (PRIVCR), do not exhibit a statistically significant long-run effect on growth, despite the steady expansion of both ratios over the sample period. This suggests that the volume of financial intermediation in Ethiopia has not translated into a correspondingly robust contribution to long-run output growth, plausibly reflecting the allocative constraints associated with a banking sector that has historically directed credit toward state-affiliated entities and large enterprises rather than the broader productive private sector. In the short run, by contrast, M2GDP and DEBT exhibit dynamics that point to meaningful near-term adjustment effects, indicating that financial aggregates matter for short-run fluctuations even where their long-run growth contribution remains statistically unconfirmed.

Financial inclusion, proxied by account ownership (AM), is the one financial deepening indicator for which the study finds robust statistical support in both the long run and the short run. This result should be interpreted specifically as evidence on the extensive margin of financial access, that is, the effect of a growing share of the population holding a formal account, rather than as evidence on digital finance as such. Account ownership, as constructed in this study, draws on World Bank Global Findex-type measures and includes ownership of accounts at conventional financial institutions as well as mobile-money-service providers; it is not a direct measure of mobile money transaction volume, platform usage, or digital payment activity. The mobile phone penetration variable (MOBILE), which would have served as the closer proxy for the digital

finance channel specifically, was ultimately excluded from the estimated model due to the unavailability of consistent data for the early part of the sample period (1990s–early 2000s), as noted in Chapter Three. Consequently, this study should not be read as having estimated or confirmed the macroeconomic effect of Ethiopia's mobile money expansion, including the rapid growth of Telebirr; that remains an open empirical question that the data limitations of the present study do not allow it to answer. What the study does establish is that broadening formal account ownership, through whatever institutional channel, has a measurable and economically meaningful positive association with growth, which is a narrower but still policy-relevant finding.

Remittances, included in the model as a control variable to account for external financing flows, are found to be statistically significant in the long run. This result is noted because of its size and consistency, but it falls outside the primary financial deepening proxies that are the central object of this study and should be treated as a contextual finding rather than a core conclusion regarding financial sector development.

5.2 Policy Recommendations

Recommendations are confined here to findings the model directly supports, with the financial deepening proxies (M2GDP, PRIVCR, AM) given primary emphasis. Because private sector credit and broad money expansion show no significant long-run growth effect despite their steady volumetric growth, policy should prioritize the quality and allocation of credit over its quantity. This includes strengthening credit bureau coverage and collateral registries to reduce information asymmetries that currently bias lending toward large, established borrowers, and reviewing the extent to which state-affiliated enterprises continue to absorb a disproportionate share of formal sector credit at the expense of private, productivity-enhancing investment. Without such allocative reform, further expansion of M2GDP or PRIVCR is unlikely, on the evidence presented here, to generate additional long-run growth.

Because account ownership is the one financial deepening variable with confirmed long-run and short-run significance, policy should prioritize continued expansion of formal account access, through reduced account-opening costs, expanded agent-banking and mobile-money-service-provider networks, and integration of government transfer programs with formal accounts, since

the evidence here supports the access-expansion channel specifically rather than digital infrastructure investment in general. Recommendations regarding mobile-specific digital infrastructure, transaction-cost reduction for mobile money platforms, or fintech-driven channels should not be presented as conclusions of this study, since the MOBILE variable was not part of the estimated model. Such recommendations are reasonable on independent policy grounds but should be flagged explicitly as forward-looking or grounded in the broader literature rather than in this study's own results.

Given that remittances are a control variable rather than a primary object of study, recommendations on remittance policy (for example, reducing transfer costs or developing diaspora bonds) may be retained but should be presented briefly and explicitly framed as secondary to the core financial-deepening-focused conclusions, rather than occupying comparable space to the findings on M2GDP, PRIVCR, and AM. The growth of financial account ownership demonstrated a striking short-run association with economic growth, underscoring the transformative potential of financial inclusion. Government should invest in digital infrastructure, reduce mobile money transaction costs, and integrate digital payment channels into government transfer programs and agricultural support schemes to accelerate financial access and its broader macroeconomic impact. Crowding-out effect of public debt, combined with historically high debt to GDP levels, calls for a credible medium-term debt management strategy aligned with international sustainability benchmarks.

Public borrowing should be redirected toward high-return capital investment, and reliance on domestic bank financing of fiscal deficits should be reduced to preserve credit space for private sector expansion. The negative long-run relationship between broad money expansion and economic growth suggests that increasing the volume of financial activity alone is insufficient to sustain growth. Financial sector policy should therefore shift toward improving intermediation quality through continued private bank licensing, stronger supervisory capacity at the NBE, expanded microfinance outreach, and the development of non-bank financial institutions including insurance companies and capital market intermediaries.

5.3 Areas for Further Research

Nonlinear threshold models should be employed to identify the precise level of financial depth at which the marginal growth effect turns negative in the Ethiopian context, offering more actionable guidance for the pace of financial sector expansion. Reliable annual data on digital transactions and mobile money volumes accumulates; future research should revisit the macroeconomic effects of digital financial development using indicators that were unavailable for the present study. Comparative panel analysis covering East African Community economies would help assess whether the relationships identified here reflect Ethiopia-specific dynamics or broader regional patterns. At the microeconomic level, firm and household survey data should be exploited to examine the gender-disaggregated effects of financial inclusion and the allocative consequences of credit misallocation across sectors and ownership types. Finally, the interaction between fiscal dominance, public debt composition, and financial intermediation quality deserves dedicated empirical attention, particularly given Ethiopia's history of central bank accommodation of fiscal imbalances and its implications for the long-run effectiveness of financial sector policy.

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Appendix

Data

YEAR	GDPGR	M2GDP	PRIVCR	MOBILE	REMITGDP	DEBT	INF	AM
1990	2.73	27.7334	1.582143	0.26	0.04181	47.17589	5	0.23
1991	-7.14	29.0731	1.438476	0.27	0.070714	49.64715	45	0.27
1992	-2.3	31.74734	2.071577	0.25	0.139651	43.30079	2.1	0.43
1993	11.2	26.92237	3.490878	0.268	0.20307	71.50339	4.7	1.56
1994	0	31.22133	4.841147	0.26	0.346801	90.25231	6.3	1.58
1995	5.7	28.45909	7.544823	0.25	0.3483	80.61821	14.8	2.8
1996	10.1	27.53739	11.64926	0.247	1.56	70.39365	-9	3.678
1997	4.2	31.92805	13.9962	0.26	1.54	67.73174	-2.7	4.56
1998	-0.8	32.75929	15.76436	0.28	1.17	76.06384	0.1	4.611
1999	6.3	34.65042	18.91973	0.33	1.6	83.47202	10.4	5.8
2000	3.4	34.58548	17.62386	0.39	2.17	99.8	1.9	6.12
2001	7.4	37.16327	17.77855	0.48	2.38	95.4	-10.8	7.13
2002	1.6	44.0368	17.97812	0.6	2.97	87.1	-1.2	7.15
2003	-2.1	44.87788	17.50062	0.77	3.83	86.3	17.8	6.78
2004	11.7	45.35308	16.52919	1	5.31	83	2.4	9.3
2005	12.6	43.77702	18.86579	1.14	5.82	73.5	10.7	10.2
2006	11.5	42.4864	20.44933	1.55	6.87	63.9	10.8	11.1
2007	11.8	39.74275	18.52508	2.46	9.44	57.2	15.1	12
2008	11.2	33.96712	17.71015	4.99	7.51	53.6	55.2	13
2009	10	31.02	18.46	8.26	7.93	46.8	2.7	14.1
2010	10.6	33.17	19.27	16.67	8.57	38.9	7.3	15.2
2011	11.4	35.84	20.15	20.52	8.01	28.7	38	16.4
2012	8.7	37.63	21.41	25.65	6.47	18.4	20.8	17.6
2013	9.9	39.47	22.73	30.49	7.09	10.73328	7.4	19
2014	10.3	41.82	24.52	39.6	7.63	26.93728	8.5	21.79
2015	10.4	44.58	26.58	42.31	7.14	27.94313	10.4	24.5
2016	8	46.91	28.71	51.22	6.61	29.00568	7.5	28

2017	10.1	49.76	30.33	39.6	6.71	30.09511	8.4	34.83
2018	7.7	52.14	32.19	36.22	6.45	32.53322	16.8	37.5
2019	9	50.28	34.55	39	4.79	31.44884	15.3	40
2020	6.1	48.73	36.67	37.42	5.52	40.2	21.6	42.5
2021	6.3	50.19	38.52	52.81	6.14	44.6	24.6	44.5
2022	6.4	52.37	40.31	56.96	4.51	42.1	34	46.48
2023	7.2	54.83	42.64	65.1	4.24	41.8	29.4	47.5
2024	8.1	56.47	44.9	65.1	7.51	43	19.9	48.2
2025	9.2	58.06	41.6	73.7	6.2	44.5	13.9	48.83