

ADDIS ABABA UNIVERSITY

COLLEGE BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

MSc. in Financial Economics

"The Effect of Remittances on Economic Growth in Ethiopia: An ARDL Approach with Structural Break Analysis"

By

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GSE/3561/16

A Thesis Submitted in Partial Fulfilment of the Requirements

For the Master of Science Degree in Financial Economics

June , 2026

Addis Ababa University

School of Graduate Studies

Department of Economics

Approval Sheet

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Acknowledgement

First and foremost, I would like to thank Almighty God and His mother, the Saint Virgin Mary, for their blessings, guidance, and protection during all periods of my academic life. Saint Virgin Mary has always remained an inspiration to me throughout my life. I would also like to acknowledge Dr. Mengesha Yayo, my thesis advisor, for all his valuable contributions, suggestions, and advice during all stages of this study. His helpful comments and constructive advice were very instrumental in completing this research.

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List of acronyms

ADF ……Augmented Dickey-Fuller

ARDL…... Autoregressive Distributed Lag

CUSUM…...Cumulative Sum

CUSUMSQ……Cumulative Sum of Squares

ECM ……. Error Correction Model

ECT ……...Error Correction Term

FDI ……Foreign Direct Investment

GDP…….. Gross Domestic Product

GCF ……...Gross Capital Formation

IMF ……International Monetary

LN ……...Fund Natural Logarithm

NBE ……National Bank of Ethiopia

OLS ……. Ordinary Least Squares

PP……. Phillips-Perron

RGDP ……Real Gross Domestic Product

REM ……. Remittances

SSA ……...Sub-Saharan Africa

UNCTAD ……...United Nations Conference on Trade and Development

USD ……...United States Dollar

VAR ……Vector Autoregression

VECM ……. Vector Error Correction Model

WDI…… World Development Indicators

Abstract

This study examined the effect of remittances on economic growth in Ethiopia using annual time-series data covering the period 2000–2024. The study employed the Autoregressive Distributed Lag (ARDL) approach to investigate both the short-run and long-run relationships between remittances and economic growth while accounting for structural breaks associated with the COVID-19 pandemic. Real Gross Domestic Product (RGDP) was used as a proxy for economic growth, whereas remittances, gross capital formation, foreign direct investment, financial development, trade openness, inflation, and a COVID-19 dummy variable were included as explanatory variables.

Secondary data were obtained from the World Bank, the International Monetary Fund (IMF), and the National Bank of Ethiopia (NBE). The stationarity properties of the variables were examined using Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Zivot-Andrews structural break tests. The ARDL bounds test confirmed the existence of a long-run cointegrating relationship among the variables. The long-run estimation results indicate that foreign direct investment and financial development have a positive and statistically significant effect on economic growth in Ethiopia. In contrast, the COVID-19 structural break variable exerts a significant negative effect on economic growth. Although remittances exhibit a positive coefficient, their effect is statistically insignificant in both the long run and short run. Similarly, gross capital formation, trade openness, and inflation were found to have insignificant effects on economic growth. The error correction model confirms a stable long-run equilibrium relationship, with a significant speed of adjustment toward equilibrium following short-run shocks.

The study concludes that remittances contribute positively to the Ethiopian economy; however, their growth-enhancing impact remains limited because a substantial proportion of remittance inflows is directed toward household consumption rather than productive investment. The study recommends strengthening financial sector development, promoting formal remittance channels, encouraging productive investment of remittance inflows, and creating an enabling environment for foreign direct investment to enhance sustainable economic growth in Ethiopia.

Keywords: ***Remittances, Economic Growth, ARDL, Financial Development, Foreign Direct Investment, Structural Break, Ethiopia.***

Chapter one

Introduction

1.1 Background of the Study

Nowadays, remittances represent one of the largest and fastest growing sources of international financial flows in the world economy. Compared to foreign direct investment (FDI) and official development assistance (ODA), remittances are more stable and directly reach households from migrant workers in developing countries. Inflows of funds from migrant workers play an important role in enhancing household well-being through consumption, improving standards of living, and paying for necessities such as health care, education, housing, and small investments (Ratha, 2003; Adams & Page, 2005; World Bank, 2024; Ratha et al., 2023).

Globally, remittance flows have remained a major source of external financing for developing economies, although their growth rates vary across years. In 2023, total global remittances were estimated at approximately USD 857–865 billion, while inflows to low- and middle-income countries (LMICs) accounted for about USD 656 billion (World Bank, 2024). In 2024, remittance flows to LMICs increased modestly to around USD 685 billion, reflecting continued resilience despite tighter global financial conditions and slower economic growth in major sending countries (World Bank, 2024; KNOMAD, 2024).

Remittances are one of the most prominent sources of external financing and household incomes in developing nations. Remittance flows provide a critical role in supporting consumption, lowering poverty rates, enhancing human capital development and maintaining external balance. Unlike FDI that is sector-specific and largely influenced by business conditions and foreign aid, remittances do not depend on the economic circumstances prevailing in donor countries and governments. The transfers reach individual households and do not significantly fluctuate during times of economic instability (Gupta et al., 2009; World Bank, 2018b; Ratha et al., 2023).

As such, remittances have become a crucial component of development finance in countries with poorly developed financial markets and domestic savings. Remittances continue to be one of the most significant sources of foreign exchange earnings and income in Sub-Saharan Africa.

In Sub-Saharan Africa, remittance inflows are highly concentrated in a small number of recipient economies, reflecting differences in migration intensity, diaspora size, and labor market integration abroad. Nigeria is consistently among the largest recipients in the region, although its inflows vary across years and are typically estimated in the mid-teens of billions of US dollars in recent World Bank reports. Egypt also represents a major recipient, often accounting for the largest share of remittances in North Africa, while countries such as Kenya and Ghana receive comparatively smaller but still significant inflows (World Bank, 2024; KNOMAD, 2024).

Macroeconomic environment exerts a strong impact on the trends of remittances not only globally but also regionally. The rate of global GDP growth dropped from 3.1% in 2022 to 2.9% in 2023 because of tougher monetary policies, geopolitical problems, and poor trade performance (IMF, 2024). Economic growth in Sub-Saharan Africa rose from 3.6% in 2022 to around 3.8% in 2023, yet future growth will slow down owing to elevated debt levels, inflationary pressure, and limited fiscal space (World Bank, 2024). Nevertheless, these challenges did not affect remittance flows much (World Bank, 2024; IMF, 2024).

Indeed, the significance of remittances in Ethiopia has grown in recent years as a result of increased international migration and enhanced mechanisms for transferring funds across borders. The Ethiopian expatriates living in North America, Europe, the Middle East, and other African nations have become an important source of monetary contributions to their home communities. According to recent estimates, the remittance receipts of the country surpassed USD 6 billion for the fiscal year 2023/24, and in the beginning of the fiscal year 2024/25, the country received more than USD 5 billion worth of remittances (National Bank of Ethiopia, 2024; Ministry of Finance, 2024; World Bank, 2024).

Indeed, the relevance of remittances in Ethiopia became even greater starting from 2020. With the outbreak of the COVID-19 pandemic, along with problems related to global supply chains, internal economic issues, pressure on exchange rates, and the shortage of foreign currency, the opportunities to attract finances from traditional sources were sharply constrained. However, the receipts of remittances proved to be relatively resilient, recovering faster than most other external finances. For this reason, remittances have turned out to be a vital economic

stabilization factor amid uncertain times and economic crises (World Bank, 2022; IMF, 2024; National Bank of Ethiopia, 2024).

The importance of studying remittances becomes apparent considering that their role in the economy of Ethiopia varies widely compared to foreign direct investments (FDIs) and foreign aids. Indeed, while the major contributions made by FDIs consist of capital accumulation, technology transfer, and job creation, their amount largely depends on political uncertainties and investment and economic risks (Borensztein et al., 1998; Alfaro et al., 2004). Moreover, foreign aids can be conditional on the policies and initiatives set forth by governments and donors (Burnside & Dollar, 2000; Easterly, 2003). Meanwhile, the use of remittances by households ensures consumption expenditure satisfaction, savings, investments in human capital and entrepreneurship, and remains rather stable throughout economic crises (Adams & Page, 2005; Ratha, 2003; World Bank, 2024). Therefore, given the persistent lack of foreign exchange resources and funding for development projects in Ethiopia, it has become necessary to study the effects of remittances on economic development.

The link between remittances and economic growth is made through various channels. Remittances lead to higher household income, increased consumption, higher savings, investment, and the development of the financial sector. By all these means, remittances can help generate capital, create jobs, and foster economic growth.. However, the magnitude of these effects depends on the efficiency of financial institutions, macroeconomic stability, and the broader policy environment (Ratha, 2003; Giuliano & Ruiz-Arranz, 2009; Adams & Page, 2005; World Bank, 2024).

Against this background, the present study examines the effect of remittances on economic growth in Ethiopia over the period 2000–2024. Particular attention is given to structural changes associated with major economic shocks, especially the COVID-19 pandemic and the post-2020 economic environment. The study employs the Autoregressive Distributed Lag (ARDL) model with structural breaks to capture both the short-run and long-run effects of remittances on economic growth while accounting for potential structural changes in the Ethiopian economy.

1.2 Statement of the Problem

Remittances have emerged as a vital form of external financing for developing countries, serving as a reliable source of foreign exchange earnings, improving household welfare, and contributing to economic growth and development. Over the last two decades, remittance inflows to developing countries have increased substantially, and in many countries these flows have exceeded Foreign Direct Investment (FDI) and Official Development Assistance (ODA) as major sources of external finance. One distinguishing characteristic of remittances is their relative stability during periods of economic uncertainty, making them an important mechanism for household consumption smoothing and poverty reduction (Ratha, 2003; Adams & Page, 2005; World Bank, 2022; IMF, 2023).

In Ethiopia, the importance of remittances has grown significantly in recent years. Persistent foreign exchange shortages, rising import dependency, trade imbalances, and other macroeconomic challenges have increased the economy's reliance on remittance inflows. Consequently, remittances have become a major source of foreign exchange earnings and household income. According to recent reports, Ethiopia received more than USD 6 billion in remittances during the 2023/24 fiscal year, while remittance inflows exceeded USD 5.1 billion during the first nine months of the 2024/25 fiscal year, highlighting the substantial contribution of the Ethiopian diaspora to the national economy (NBE, 2024; ENA, 2025; Ethiopian Business Review, 2025).

Despite the remarkable increase in remittance inflows, Ethiopia continues to face challenges related to unstable economic growth, inflationary pressures, balance of payments deficits, and foreign exchange constraints. Although remittances are expected to stimulate economic growth through increased consumption, savings, investment, and human capital development, their actual contribution to economic growth remains uncertain. This raises an important policy question regarding whether remittances have been effectively transformed into productive investments that support sustainable economic growth and development (World Bank, 2022; IMF, 2023).

From a theoretical perspective, remittances can influence economic growth through several channels. The New Economics of Labor Migration (NELM) theory argues that remittances help households overcome liquidity constraints, smooth consumption, and finance productive

investments. Similarly, endogenous growth theory suggests that remittances can promote economic growth by increasing investment in physical capital, human capital, and financial sector development (Stark & Bloom, 1985; Romer, 1990).

However, the empirical literature provides mixed evidence regarding the relationship between remittances and economic growth. While some studies report positive effects of remittances on investment and economic growth, others argue that remittances may create dependency, reduce labor force participation, and discourage productive economic activities. Furthermore, several studies suggest that the impact of remittances depends on country-specific factors such as institutional quality, financial development, and macroeconomic stability (Chami et al., 2005; Barajas et al., 2009; Catrinescu et al., 2009; Levine, 2005).

Evidence from Ethiopia is similarly inconclusive. Although some studies find that remittances contribute positively to economic growth through increased investment and consumption, others report weak or statistically insignificant effects. These conflicting findings indicate that the remittance–growth nexus remains unresolved in the Ethiopian context and warrants further empirical investigation. Moreover, much of the existing evidence is based on older datasets and therefore may not adequately capture recent developments in Ethiopia, particularly the substantial increase in remittance inflows observed after 2020 (Berhane & Hailu, 2016; Getinet & Hirut, 2018).

In addition to the empirical inconsistencies, previous studies exhibit several methodological limitations. First, many studies employ restrictive model specifications that exclude important macroeconomic variables such as financial development, trade openness, inflation, and foreign direct investment, potentially resulting in omitted variable bias. Second, many studies rely on conventional econometric approaches that do not adequately account for structural changes in the Ethiopian economy. Finally, most studies fail to consider structural breaks associated with major economic events (Levine, 2005; Barajas et al., 2009).

Accounting for structural breaks is particularly important in Ethiopia because the economy has experienced substantial changes over time, including exchange rate reforms, financial sector reforms, trade policy adjustments, political instability, and the COVID-19 pandemic. Ignoring such structural changes may lead to biased and inconsistent parameter estimates. Therefore,

significant research gaps remain in the literature regarding the relationship between remittances and economic growth (Perron, 1989; Zivot & Andrews, 1992; Stock & Watson, 2015).

To address these gaps, this study examines the effect of remittances on economic growth in Ethiopia using annual time-series data covering the period 2000–2024. The study employs the Autoregressive Distributed Lag (ARDL) approach, which allows the estimation of both short-run and long-run relationships among variables. Moreover, structural breaks analysis is included in the analysis in order to take into account the impact of any significant structural changes that have occurred within the economy of Ethiopia during the research period. The research will also contribute to the existing literature on this subject matter by including a wider range of macroeconomic variables such as gross capital formation, foreign direct investment, financial development, trade openness, and inflation.

1.3. Research Questions

1. What are the effects of remittances on the economic growth of Ethiopia in the short term and the long term?

2. Do the key macroeconomic variables used in the model exhibit structural breaks during the study period?

1.4. Research Objectives

1.4.1 General Objective

The main objective of this study is to examine the effect of remittances on Ethiopia's economic growth over the period 2000–2024, while accounting for key macroeconomic determinants and structural changes in the economy.

1.4.2 Specific Objectives

The specific objectives of the study are:

1. To analyse the short-run and long-run effects of remittances (REM) on real GDP (RGDP) in Ethiopia.
2. To identify structural breaks in the macroeconomic time series used in the model over the period 2000–2024.

1.5. Significance of the Study

The significance of this paper lies in its ability to offer a better assessment of the role of remittances in economic growth of Ethiopia by taking into account some of the flaws in earlier papers. Majority of the earlier papers on this topic have made use of classical regression techniques as well as linear Autoregressive Distributed Lagged Models (ARDL). These models use only a few explanatory variables. In contrast, the current paper makes a contribution by including additional macroeconomic variables like gross capital formation, inflation rate, foreign direct investments, trade openness, and financial development. The role played by structural breaks arising from changes in economic policy and exogenous shocks has also been considered. This will allow us a better understanding of the interaction between remittances and macroeconomics.

Last but not least, this paper is of great significance in terms of its practical utility. Some of the conclusions drawn could be useful for the government of Ethiopia, financial institutions and others in formulating economic policies to enhance the productive use of remittance flows. Such policies can include encouraging foreign investments, improving financial intermediation, increasing exports, and stabilizing macroeconomic indicators. Also, structural break analysis can provide an additional basis for the formulation of economic policies in the future.

1.6. Limitations of the Study

This study is subject to several limitations that should be considered when interpreting the results. First, the analysis is based on a relatively small sample of 24–25 annual observations, which restricts the degrees of freedom and may affect the robustness of the econometric estimates.

Second, the model includes eight explanatory variables, which, given the limited time-series length, increases the risk of over-parameterization and potential multicollinearity issues. This may reduce the precision of individual coefficient estimates.

Third, the empirical strategy assumes a single structural break in the series. In reality, the Ethiopian economy has likely experienced multiple shocks over the study period, including policy shifts, external shocks, and institutional changes. Focusing on one break may therefore oversimplify the underlying dynamics.

Fourth, the study relies on official remittance data from the National Bank of Ethiopia (NBE). These figures do not fully capture informal transfer channels such as hawala systems, which are known to be significant in Ethiopia. As a result, remittance inflows may be systematically underestimated, potentially biasing the estimated relationship with economic growth.

Finally, some variables exhibit unresolved issues related to their order of integration and transformation, which may affect the stability and interpretation of both short-run and long-run estimates.

1.7. Organization of the Study

This study is organized into five chapters. Chapter one presents the introduction, which includes the background of the study, statement of the problem, research objectives, significance of the study, limitations of the study and the organization of the thesis. Chapter two reviews relevant theoretical and empirical literature related to remittances and economic growth and develops the conceptual framework of the study. Chapter three describes the research methodology, including the research design, data sources, model specification, variable definitions, and econometric techniques employed in the analysis. Chapter four presents the empirical results and discusses the findings obtained from the descriptive statistics, unit root tests, cointegration analysis, ardl estimation, diagnostic tests, and stability tests. Finally, chapter five provides the summary of findings, conclusions, policy recommendations, and suggestions for future research.

Chapter two

Literature review

2.1 Introduction

This part presents an evaluation of the relevant theoretical and empirical literature that discusses the impact of remittances on economic growth. It seeks to lay down the conceptual groundwork for discussing the manner by which remittances affect economic performance and developmental results. First, theories about remittances and their connection to economic growth are presented. Then, previous empirical studies regarding the subject are discussed, paying attention to those conducted in different locations around the world. In particular, emphasis will be made on those conducted in developing countries, especially Ethiopia.

2.2. Theoretical literature review

2.2.1. Theoretical Linkages between Remittances and Economic Growth

The linkage between the flows of remittances and economic growth has received much attention in the academic studies of economic theories and economics. For developing nations, remittances play a vital role as an important source of foreign finance, which will help households generate income that can be utilized to alleviate financial problems, increase their consumption level, make investments for education and health-related purposes, and engage in productive investments. Through all these processes, remittances will aid in generating economic growth either directly through investment and demand or indirectly through financial sector and human capital development (Ratha, 2013).

Remittances' effects on economic growth can be viewed from many angles. However, one of the main theoretical mechanisms explaining this influence is the effect of remittances on consumer spending. As stated in Keynesian theory, an increase in disposable income translates into an increase in demand for goods and services. As a result of the money that migrants send back home, there will be improved purchasing power of the receiving households who can therefore

acquire more food, accommodation, education, healthcare, and other goods and services. Increased consumption will lead to increased production, which will in turn spur economic growth (Adams & Page, 2005).

Remittances have the potential to spur economic growth through savings and investments. Remittances will be saved in commercial banks, resulting in increased savings within the banking sector. This strengthens financial intermediation by enabling banks to extend more credit to businesses and investors. Increased access to finance supports entrepreneurial activities, capital accumulation, and expansion of productive sectors in the economy. Remittances thus have an indirect impact on promoting economic growth through

investment and development of financial sector (Aggarwal et al., 2011). Moreover, the idea of endogenous growth model argues that investment in human and physical capital contributes to the process of economic growth. Families receiving remittances can invest in education, training, health services, and even small businesses. Such investments help to boost labor productivity and create more income-generating opportunities, thus increasing the productive capacity of the economy. This means that remittances also help in boosting productive efficiency and human capital formation (Giuliano & Ruiz-Arranz, 2009).

On the other hand, as per NELM, the decision to migrate is undertaken by families collectively in order to hedge against income volatility and risks associated with imperfect credit and insurance markets. In this context, remittances work as a risk-sharing tool that helps households stabilize their incomes when facing various forms of risks such as economic crises, unemployment, or crop failure. This, in turn, results in macroeconomic stability and economic performance of countries (Stark & Bloom, 1985).

The New Economics of Labor Migration (NELM) theory further explains that migration decisions are made collectively by households to diversify income sources and minimize risks arising from imperfect credit and insurance markets. Under this framework, remittances serve as a risk-sharing mechanism that stabilizes household income during periods of economic uncertainty, unemployment, or agricultural failure. By reducing income volatility and consumption shocks, remittances contribute to macroeconomic stability and economic performance (Stark & Bloom, 1985).

Even as such arguments may prove effective in theory, there have been suggestions that remittances might lead to the occurrence of negative impacts on economic growth. For instance, remittances may encourage people to withdraw from labor force due to dependence on foreign incomes. Remittance flows, if high enough, could lead to higher labor productivity, and could discourage efforts for entrepreneurship. In addition, remittance flows may lead to inflation, thus affecting the country's currency through exchange rate appreciation as well as making exports less competitive by increasing the costs associated with production through the Dutch Disease effect (Chami et al., 2005).

Therefore, remittances impact on economic growth will depend on how the remitted incomes are put into use within the economy. It will depend whether the money is invested effectively in productive activities and whether financial systems support the growth process. Otherwise, remittances used mostly for consumption purposes are less likely to be effective in promoting economic development (Pradhan et al., 2008).

2.2.2. Theoretical Linkages between Structural Breaks (COVID-19) and Economic Growth

Structural breaks are abrupt and important alterations in the behavior or trend of economic variables caused by significant economic, political, technological, or exogenous shocks. Structural breaks arise in time series analysis when there is a shift in the underlying relationship of variables within a certain period. The occurrence of structural breaks destabilizes economic models and affects their long-term economic performance. Some examples of events that cause structural breaks in macroeconomic data include financial crises, regime shifts, wars, and diseases (Perron, 1989).

One of the most important global structural breaks in contemporary economics is the COVID-19 pandemic. Due to the COVID-19 pandemic, production activities, international trade, labor markets, foreign investments, and financial systems were greatly disrupted around the globe. Governments adopted several measures to limit the spread of the virus, including implementing lockdowns, restricting travels, and practicing social distancing. This led to a slowdown in the economic activities and global output (World Bank, 2020).

According to the Keynesian theory, the COVID-19 outbreak caused negative effects on aggregate demand because it lowered household consumption, investment, and international

trade. Income loss, unemployment rates, and uncertainty have resulted in a decrease in production and economic downturn. Besides, due to disruptions in the value chain and operations of enterprises, aggregate supply was lowered, creating demand and supply shocks at the same time (International Monetary Fund [IMF], 2020).

Another economic theory is the neoclassical growth theory stating that economic growth relies on labor supply, capital accumulation, and innovations. As for the COVID-19 situation, labor productivity decreased due to mobility restrictions, workplace closures, and growing health risks. Additionally, uncertainty and poor profitability led to slower investment rates. All of this led to the reduction of physical and human capital accumulation and thus had a negative impact on economic growth (Solow, 1956).

Structural shocks such as COVID-19 can also affect the economic growth of a country through the external sector. There was a fall in exports, FDI, tourism receipts, and remittances in developing nations during the COVID-19 period. The lower foreign exchange earnings resulted in low investment capabilities and macroeconomic stability. Economic performance and the growth prospects of highly external finance-dependent countries have been greatly hampered by the shocks in the pandemic period (United Nations Conference on Trade and Development [UNCTAD], 2020). Additionally, according to endogenous growth theory, economic shocks can affect innovation, productivity, and efficiency in the economy. The pandemic period has caused disruptions in the education system and low investments in technology by businesses. It could have far-reaching consequences for productivity and economic growth if appropriate steps are not taken (Romer, 1990).

When conducting time-series econometrics analysis, it is very important to take into consideration the possible occurrence of structural breaks since ignoring significant shocks or changes to the economy would result in inconsistent parameters and misleading results. Structural changes have the potential not only to alter the nature of the relationship between the macroeconomic variables but also affect the characteristics of the underlying data, like stationarity. In order to be able to account for structural breaks in empirical models, economists use unit root tests for structural breaks, such as the Zivot–Andrews unit root test that identifies endogenously determined break points in time series data (Zivot & Andrews, 1992).

For Ethiopia, the outbreak of the coronavirus has brought about several economic disturbances through trade decline, decreased remittances, reduced investments, and disturbances in sectors that provide goods and services. The above shocks are likely to have influenced the effect of remittances on the country's economic growth over the study period. Thus, it is necessary to consider structural breaks due to the coronavirus crisis to reflect changes in the economic dynamics over the period.

2.3. Empirical Literature review

The existing empirical studies on the effect of remittances on economic growth present conflicting and inconclusive findings. On one side, remittances are said to boost economic growth through enhanced consumption, saving, and investments, whereas on the other hand, it is argued that remittances may adversely affect economic growth by lowering labor force participation and dependency. Moreover, shocks such as the pandemic can change the association between remittances and economic growth by affecting economic activities, trading, investment, and financial flows. Consequently, several empirical studies have been conducted with various econometric methodologies to analyse the correlation between remittances and economic growth. This section examines some of the studies conducted at international, regional, and Ethiopian levels.

2.3.1. Empirical Evidence from Developed Country

Many empirical research studies have explored the relation between remittances and economic growth in developed economies with different econometrics approaches and datasets. Nonetheless, the results remained ambiguous and inconsistent among different nations and time periods under review. Remittances were found to be positively contributing to economic growth by raising household consumption, savings, investment, and financial development. Giuliano & Ruiz-Arranz (2009) studied the contribution of remittances towards economic growth and revealed that remittances boost economic growth, especially in developing countries, through mitigating liquidity constraints and making possible productive investments.

In the same way, Aggarwal et al. (2011) examined the association between remittances and financial development, concluding that remittances lead to the development of banking sector,

which is evident in the form of increased deposits and credit. Such financial development contributes positively to economic growth.

On the other hand, Chami et al. (2005) suggested that remittances might have an adverse effect on economic growth when consumed rather than invested for growth-oriented purposes. The study suggested that high remittance flow could reduce labor force involvement and lead to dependency among recipient families, which would minimize their contribution to economic growth in the long run.

Additionally, according to the empirical studies conducted in advanced economies, the structural break resulting from the global financial crisis and the coronavirus pandemic has greatly influenced economic growth and remittance flow. Changes in the labor market, international migration, and economic activities during crises modified the linkage between remittances and economic performance (World Bank, 2020).

In general, the effects of remittances on economic growth are influenced by efficient financial systems, the state of the macroeconomy, and the productive use of the remitted funds in the economy (Giuliano & Ruiz-Arranz, 2009; Aggarwal et al., 2011; Chami et al., 2005).

2.3.2. Empirical Evidence from Developing Countries

The empirical findings on the relationship between remittances and economic growth in developing countries have revealed that remittances have a substantial contribution to making economic activities possible in those economies. Nonetheless, the nature of this contribution may differ from one economy to another, and thus, the degree of influence is determined by the approach followed. However, in general, remittances contribute significantly to providing finance for economic activities since remittances are relatively more stable than any other form of external finance like foreign direct investments or development aid (Adams & Page, 2005).

There is a substantial body of research that suggests that remittances have positive effects on economic growth due to their effects on consumption and investment. First, at the household level, the use of remittances in consumption leads to an increased disposable income level and greater expenditure on consumption of goods such as basic necessities (food, education,

housing), as well as health care. Increased consumption leads to a greater level of production within the country to satisfy the growing demands from consumers; therefore, the economy benefits through growth in employment and incomes. Second, remittances are also known for their influence on economic development through financial and investment channels. Financial markets in developing countries are usually shallow, and there is a lack of credit facilities within the banking sector. However, the use of remittances allows people to save and deposit money in banks, thereby improving the liquidity of financial resources available in the banking sector. These resources are then used to develop productive activities and invest in new ventures (Giuliano & Ruiz-Arranz, 2009).

Nevertheless, there are also some empirical studies that suggest that remittance does not have positive effects on growth. It is possible to assume that remittances might lower the employment rate and cause dependency. In fact, numerous empirical studies have shown that remittances have the ability to affect economic growth via consumption and investment mechanisms. First of all, remittances increase disposable income at household level. It follows that the households gain better conditions for spending more on necessities such as nutrition, education, houses, and healthcare. Moreover, growing consumption can increase aggregate demand, thereby causing production to increase and leading to job creation and income growth (Pradhan et al., 2008).

Additionally, remittances may help foster growth through the effects they have on investment and financial intermediation. Due to limited access to finance and credit facilities, most developing nations face challenges in achieving high levels of investment. But thanks to the flow of remittances, there can be less restriction in this case because remittances enable families to save money and make more deposits in banks. Through this, they are able to generate more money to borrow and invest. The money that is lent by banks can be utilized in entrepreneurship to boost investments in the economy (Giuliano & Ruiz-Arranz, 2009).

To conclude, research conducted in developed countries suggests that the correlation between economic growth and remittances is rather dynamic because it depends on certain variables including financial institutions and their effectiveness, macroeconomic environment, and the ways in which remittances are utilized (Giuliano & Ruiz-Arranz, 2009; Aggarwal et al., 2011; Chami et al., 2005).

2.3.3. Empirical Evidence from Ethiopia

The studies have shown conflicting views about the link between remittances and economic growth carried out in Ethiopia. Due to the high number of diaspora members living in Ethiopia, remittances have gained importance due to their ability to contribute significantly to foreign currency and household incomes. In addition, these resources have assumed great importance due to their importance during times of economic distress, joblessness, and increasing living standards. Consequently, remittances have emerged as an important source of external financing that could affect macroeconomic performances through expenditure, savings, and investments (World Bank, 2020).

There have been several studies that have provided proof of a positive relationship between remittances and economic growth. Remittances are seen to create income for families, which helps them boost their purchasing power and thereby demands for products and services. This will, in turn, lead to an increase in demand and eventually production, thus creating employment and higher growth. Remittances are seen to play a part in poverty reduction as they help provide access to education, healthcare, and improved living conditions (Kifle, 2007).

Moreover, empirical findings indicate that remittances play an important role in developing the financial sector in Ethiopia. By depositing their remittances in formal financial intermediaries, households boost the level of saving in the banking sector, which in turn makes banks more liquid and enables them to extend loans to companies and entrepreneurs. The availability of credits to enterprises and businesses promotes their growth, productivity, and ultimately economic development in the country. In other words, the effects of remittances can be viewed as promoting financial deepening and investments in the Ethiopian economy (Getinet & Hirut, 2018).

On the other hand, empirical investigations have found that the effect of remittances on economic growth in Ethiopia is insignificant and limited either to a short period or nonexistent. This result can be attributed to the consumption-oriented approach to using the remittances received. Indeed, households allocate most of their income obtained from remittances to immediate needs, including food and clothing purchases, payment of bills, housing maintenance, etc. Although this improves welfare, remittances do not lead to capital formation

and economic growth in the long term. Moreover, such structural constraints as low financial inclusion, poor institutional capability, and macroeconomic instability can lower the contribution of remittances towards growth promotion (Berhane & Hailu, 2016).

Another critical aspect that has been discussed in numerous studies lately is the role of macroeconomic shocks and structural transformations in defining the remittances-growth connection in Ethiopia. For example, exchange rate changes, political instability, global economic recession, and the coronavirus pandemic were some of the events that impacted the country's economy, including the inflow of remittances and their effects on the country's domestic economic situation. Such shocks and shifts can cause not only instability but also transformation of the process itself, thereby affecting its influence on growth in the region. This is evidenced by such an event as the COVID-19 pandemic when the disruption in the global labor market and decline in earnings caused changes in the amount and nature of the inflow of remittances (World Bank, 2020; IMF, 2020).

In addition, the nature of the financial infrastructure that has been developed also plays an important role in determining the effectiveness with which remittances are translated into economic growth benefits. Constraints, such as limited access to financial institutions, particularly in rural areas, costly transactions, and reliance on informal flow of remittances, among others, might render some of the remittances ineffective in contributing towards economic development. Consequently, their ability to stimulate economic growth within the country is limited. Hence, these institutional characteristics may account for inconsistencies in empirical findings (Getinet & Hirut, 2018; Berhane & Hailu, 2016).

On the whole, it can be said that there is no clear link between the receipt of remittances and economic growth in the case of Ethiopia according to empirical studies. Remittances may prove useful in promoting economic growth within the country in different ways, such as through consumption smoothing, saving, and investments. Nevertheless, this benefit is subject to household behavior and the interplay of remittances with other macroeconomic conditions. Therefore, it becomes apparent that there is the need for more robust methods of assessing remittances' effect on the economy. It WASbetter to use econometric modeling techniques which are capable of capturing both the short-run and long-run dynamics in addition to

incorporating any existing structural breaks in the data for improving the validity of any findings concerning the influence of remittances on economic growth. Accordingly, it seems more suitable to use ARDL models with the consideration of structural breaks as shown by Kifle (2007), Berhane & Hailu (2016), Getinet & Hirut (2018), and World Bank (2020).

Table 2.1: Summary of Empirical Literature on Remittances and Economic Growth

Author(s) & Year	Country/Area	Methodology	Variables Included	Major Findings
Adams and Page	Developing Countries	Panel Data Analysis	Remittances, Poverty, Growth	Remittances significantly reduce poverty and contribute positively to economic development.
Chami et al.	Cross-country	Panel Regression	Remittances, GDP Growth	Remittances have a negative or insignificant impact on economic growth because they are mainly used for consumption.
Giuliano and Ruiz-Arranz	Developing Countries	Panel Data Analysis	Remittances, Financial Development, Growth	Remittances promote growth, particularly in countries with less developed financial systems.
Aggarwal et al.	Developing Countries	Panel Regression	Remittances, Financial Development	Remittances improve financial sector development and indirectly support economic growth.
Pradhan et al.	Developing Countries	Panel Analysis	Remittances, Consumption, Growth	Remittances stimulate economic growth through increased household consumption and investment.
Kifle	Ethiopia	Time Series Analysis	Remittances, GDP	Remittances positively contribute to household welfare and economic growth.
Berhane and Hailu	Ethiopia	Econometric Analysis	Remittances, GDP Growth	Remittances have limited effects on long-run economic growth due to their consumption-oriented use.
Getinet and Hirut	Ethiopia	Time Series Analysis	Remittances, Financial Development, Growth	Remittances promote financial deepening and contribute positively to economic growth through investment channels.
World Bank	Ethiopia	Descriptive and Empirical Review	Remittances, COVID-19, Growth	COVID-19 affected remittance inflows and altered their contribution to economic performance.

The Literature Gap

Despite much academic research into remittances and economic growth, there are a number of unresolved aspects of the issue, particularly as far as the case of Ethiopia is concerned. First of all, one of the aspects that remain underexplored in the existing academic literature is that no consensus has been achieved on whether remittances promote growth and, if yes, to what degree

do they impact it. Some authors are convinced that remittances contribute to the growth because of the smoothness of consumption, savings, and investment they provide for. At the same time, other researchers claim that the consumption-based nature of remittances can slow down economic growth.

Second, the majority of prior studies focused on Ethiopia used rather simplistic econometric approaches such as OLS, VECM, or traditional ARDL model without considering structural breaks that occurred within the period analysed. However, there were numerous structural changes that took place in the economy of Ethiopia during the selected timeframe, such as the change in the exchange rate system, financial sector reforms, political turmoil, and the coronavirus pandemic. Consequently, neglecting these factors might be associated with biased results.

Third, the majority of previous Ethiopian studies employed older data sets that have failed to effectively explain the recent economic dynamics, especially the large amount of remittance flows noted after 2020. Thus, the results of previous studies might not reflect how important the role of remittances is to current economic performance in Ethiopia.

Fourth, some previous studies failed to include important macroeconomic controls like financial development, inflation, trade openness, and foreign direct investment. In such a case, it is likely to encounter omitted variable bias.

In order to solve these limitations, the current study employs the Auto-Regressive Distributive Lag (ARDL) model supported by the use of a structural break test in which the data set to be used consists of an annual time series data set from 2000 to 2024. In addition to this, some macroeconomic variables are also included in the analysis. The main purpose for including the ARDL model in the current study is the estimation of the relationship between remittances and economic growth both in the short run and in the long run.

Conceptual Framework

This research seeks to analyse the impact of remittances on economic growth in Ethiopia in the context of both direct and indirect connections between these variables. The dependent variable is RGDP, or economic growth, while REM (remittances) acts as an independent variable in this case. Besides, several key macroeconomic factors are taken into account, including FDI (foreign

direct investments), GCF (gross capital formation), FD (financial development), and TOP (trade openness). In addition, the structural break variable, which reflects the impact of such an external economic shock like the COVID-19 pandemic, is also introduced.

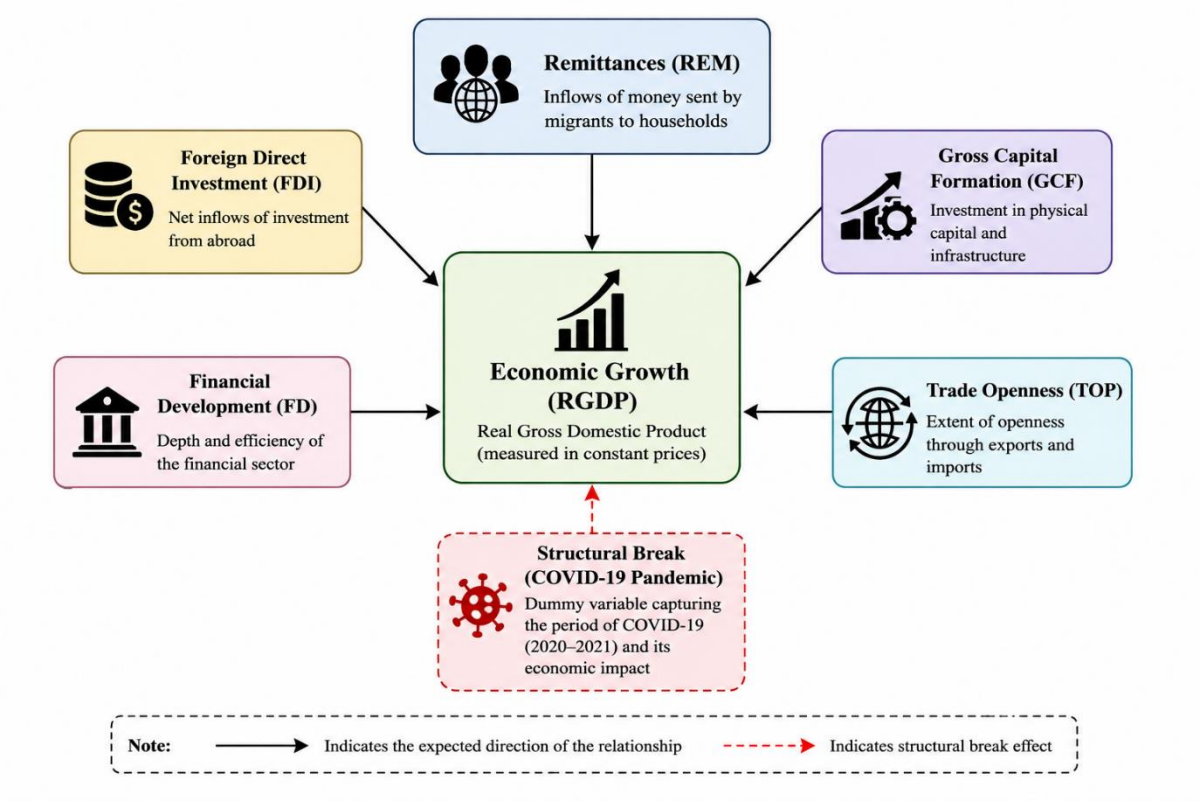


Figure 2.1: Conceptual Framework of the Remittances and Economic Growth in Ethiopia

Source: Author Computation

Chapter three

Methodology

3.1 Introduction

In this chapter, we present the methodological approach that has been adopted to analyse the impact of the influence of remittances on the economic growth in Ethiopia during 2000-2024. This chapter not only highlights the research methodology, data sources and data collection, but also explains variable measurements, model specification, estimation techniques, and result diagnosis. Further, reasons are provided for the adoption of the ARDL model with structural breaks approach.

3.2 Research Design

This study employs a quantitative research approach using annual time series data for Ethiopia covering the period 2000–2024. The quantitative approach is appropriate because it enables the study to examine the relationship between remittances and economic growth using numerical data and statistical analysis.

The study adopts an explanatory research design since it seeks to explain the causal relationship between remittances and economic growth while controlling for other macroeconomic variables such as gross capital formation, foreign direct investment, trade openness, financial development, and inflation. In addition, the study follows a time-series research design to analyse the dynamic behaviour of the variables over time, including the effects of structural changes and economic shocks during the study period.

3.3 Data Sources and Type

The data employed in this research shall be secondary time-series data for Ethiopia for the period between 2000 and 2024. The use of time series data in this context is important because it shall make it possible for the researcher to capture short-run and long-run changes with respect to the growth rate of the economy, remittances, and other macroeconomic variables.

Data were collected from reliable sources including international as well as local sources such as the WDI database from World Bank (GDP, investment, trade and inflation), IMF (financial sector and FDI) and the National Bank of Ethiopia (remittances).

3.4 Model Specification

3.4.1 Theoretical background of the model

The conceptual underpinning of this study involves both neoclassical and endogenous growth theories. According to the neoclassical growth theory, as explained by Solow (1956), capital accumulation, labor, and technology are identified as the principal sources of economic growth. Under the neoclassical framework, increases in investments and capital accumulation results in an increase in the quantity of outputs produced. With regard to remittances, they can spur growth through increased savings and more investments and capital accumulation.

Moreover, the study incorporated the ideas behind the endogenous growth theory, as explained by Romer (1986). Endogenous growth theory suggests that economic growth originates from within the economy through investments in human capital, innovation, financial systems, and productivity in production activities. From this point of view, remittances can spur growth through education, health, entrepreneurship, and investments in other productive activities. In addition, an efficient financial system can enhance the productive use of remittances by mobilizing savings and allocating resources efficiently.

In addition, the study takes into consideration factors which have a theoretical connection with economic growth. The gross capital formation is introduced because of the investment-growth connection, which is highlighted in the neoclassical theory. Foreign direct investment is included in the analysis because it stimulates economic growth by means of investments, transfers of technology, and employment (Borensztein et al., 1998). The trade openness is taken into account because foreign trade enhances market efficiency and resource allocation (Grossman & Helpman, 1991). Financial development is supposed to promote economic growth through improved financial intermediation and access to credit (McKinnon, 1973; Shaw, 1973). Inflation is introduced as an indicator of macroeconomic instability because constant inflation may harm investment and therefore adversely impact economic growth (Fischer, 1993).

Thus, on the basis of these theoretical considerations, the study attempts to find the connection between remittances and economic growth in Ethiopia.

3.4.2 Empirical Model

The model to be used for this analysis, the Autoregressive Distributed Lag (ARDL) model, will be an ideal choice since the model can be used even if the variables under consideration are integrated of order zero (I(0)), one (I(1)) or both but not integrated of order two (I(2)). It should be noted that this makes the use of the ARDL approach advantageous, especially in empirical research, as sometimes the variables may not share the same order of integration. Moreover, ARDL can be employed when working with rather limited sample sizes as well (Pesaran et al., 2001).

As the study covers a period of 25 years, structural breaks may appear. Therefore, a Zivot–Andrews test will be conducted in order to find out if there are any endogenous break points in the series considered. In case there is such evidence, the ARDL model will be estimated by adding corresponding dummy variables into the equation to take into account major shocks to the economy and economic policy shifts during the analysis (Zivot & Andrews, 1992).

For empirical examination of the relationship between remittance and economic growth in Ethiopia, a ARDL model is estimated that considers short-run dynamics and the long-run equilibrium relationships among all variables included in the analysis. In accordance with theoretical and empirical findings, economic growth, which will be estimated using real GDP, will be taken as a function of REM, GCF, FDI, TOP, FD, and INF.

The general functional relationship is expressed as:

$$RGDP_t = f(REM_t, GCF_t, FDI_t, TOP_t, FD_t, INF_t D(COVID)_t)$$

To improve estimation efficiency and ensure comparability of variables, all variables except inflation are transformed into natural logarithms. This transformation stabilizes variance and allows the estimated coefficients to be interpreted as elasticities. The log-linear model is specified as:

$$ln\, RGDP_t = \beta_0 + \beta_1\, ln\, REM_t + \beta_2\, ln\, GCF_t + \beta_3\, ln\, FDI_t + \beta_4\, ln\, TOP_t + \beta_5\, ln\, FD_t + \beta_6 INF_t + \beta_7 D(COVID)_t + \varepsilon_t$$

Where:

β_0 is the intercept term,

- $\beta_O - \beta_7$ are Coefficients of the explanatory variables.
- ε_t is Error term capturing other omitted factors affecting economic growth.
- $ln\ RGDP_t\ is$ Natural logarithm of real gross domestic product at time t, used as a proxy for economic growth.
- $ln\ REM_t\ is$ Natural logarithm of remittance inflows at time t.
- $ln\ GCF_t\ is$ Natural logarithm of gross capital formation at time t, used as a proxy for domestic investment.
- $ln\ FDI_t\ is$ Natural logarithm of foreign direct investment inflows at time t.
- $ln\ TOP_t\ is$ Natural logarithm of trade openness at time t.
- $ln\ FD_t\ is$ Natural logarithm of financial development at time t.
- $INF_t\ is$ Inflation rate at time t.
- $D(COVID\ )_t$ is a dummy variable representing the COVID-19 pandemic period, taking the value of 1 for observations during the COVID-19 period and 0 otherwise.
- $t\quad is$ Time period under consideration.

The ARDL in the case of structural breaks will take the form as follows:

$$\Delta\, ln\, RGDP_t = \alpha_0 + \sum_{\{i=1\}}^{\{p\}} \alpha_1\, \Delta\, ln\, RGDP_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_1\}} \alpha_2\, \Delta\, ln\, REM_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_2\}} \alpha_3\, \Delta\, ln\, GCF_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_3\}} \alpha_4\, \Delta\, ln\, FDI_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_4\}} \alpha_5\, \Delta\, ln\, TOP_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_5\}} \alpha_6\, \Delta\, ln\, FD_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_6\}} \alpha_7\, \Delta\, INF_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_6\}} \alpha_8\, \Delta\, DCOVID_{(t-1)} + \lambda_1 ln\, RGDP_{\{t-1\}} + \lambda_2 ln\, REM_{\{t-1\}} + \lambda_3\, ln\, GCF_{\{t-1\}} + \lambda_4\, ln\, FDI_{\{t-1\}} + \lambda_5\, ln\, TOP_{\{t-1\}} + \lambda_6\, ln\, FD_{\{t-1\}} + \lambda_7\, INF_{\{t-1\}} + \lambda_8\, ln\, DCOVID_{t-1} + e_t$$

In the current specification, Δ is the first difference operator. It reflects the short-term changes in the variables. D(COVID) represents the structural break dummy variable. The parameters associated with the lagged difference variables indicate short-run dynamics, whereas the parameters of the lagged level variables reflect long-run dynamics.

After establishing the cointegration between the variables, estimation of the Error Correction Model (ECM) is done to determine the speed of adjustment to the long-run equilibrium in response to short-run disturbances. The Error Correction Model (ECM) specification for the ARDL model with structural break dummy variable is given as:

$$\Delta\, ln\, RGDP_t = \alpha_0 + \sum_{\{i=1\}}^{\{p\}} \alpha_1\, \Delta\, ln\, RGDP_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_1\}} \alpha_2\, \Delta\, ln\, REM_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_2\}} \alpha_3\, \Delta\, ln\, GCF_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_3\}} \alpha_4\, \Delta\, ln\, FDI_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_4\}} \alpha_5\, \Delta\, ln\, TOP_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_5\}} \alpha_6\, \Delta\, ln\, FD_{\{t-i\}} + \sum_{\{i=0\}}^{\{q_6\}} \alpha_7\, \Delta\, INF_{\{t-i\}} + \lambda_8 D(COVID)_{t-1} + \phi ECM_{t-1} + e_t$$

where:

- Δ denotes the first-difference operator,
- D_t represents the structural break dummy variable,

- ECM_{t-1} is the lagged error correction term derived from the estimated long-run relationship,
- ϕ is the speed of adjustment coefficient,
- e_t is the white-noise error term.

Short-term dynamic effects can be observed through the coefficients of the differenced variables, while the speed at which the system returns to its long-run equilibrium can be observed from the error correction term. The estimated value of the coefficient of ECM_{t-1} should be negative and statistically significant, showing that the series converge back to their long-run equilibrium after short-term shocks.

3.5 Description and Measurement of Variables

Dependent Variable

Real Gross Domestic Product (RGDP):

Real Gross Domestic Product (RGDP) is used as a proxy for economic growth in Ethiopia. It measures the aggregate value of goods and services produced within the economy at constant Ethiopian Birr prices, thereby reflecting changes in real economic output after removing the effects of inflation. The data were obtained from the National Bank of Ethiopia (NBE). Since RGDP is the dependent variable used to measure economic growth, no expected sign is assigned.

Independent Variables

Remittances (REM):

Remittances (REM) refer to personal remittances received from Ethiopians residing abroad and are measured as a percentage of Gross Domestic Product (GDP). This measure captures the contribution of remittance inflows relative to the size of the Ethiopian economy. Data were obtained from the World Development Indicators (WDI) database. Remittances are expected to positively influence economic growth by increasing household income, consumption, savings, investment, and foreign exchange earnings. Therefore, the expected sign of the variable is positive (+).

Gross Capital Formation (GCF):

Gross Capital Formation is a measure of the fixed asset investments made on infrastructural developments, machinery, etc., relative to the percentage of GDP (World Bank, 2025). Gross Capital Formation is a measure of the capital formation that takes place within the economy. Higher Gross Capital Formation will be able to increase production levels; hence there will be positive impacts on economic growth (+).

Foreign Direct Investment (FDI):

Foreign Direct Investment represents the amount of investment as a percent of GDP, which is made by foreign countries into the domestic economy (World Bank, 2025). This kind of investment includes not only financial resources but also management practices, transfer of technology, and efficient production processes. Thus, foreign direct investments can help in improving capital formation and economic growth (+).

Trade Openness (TOP):

Trade openness is calculated as the percentage of exports and imports to GDP (%). Trade openness facilitates market access, efficiency, and technological transfer, hence boosting economic growth. Therefore, the sign for this variable will be positive.

Financial Development (FD):

Development in the financial sector is indicated by domestic credit to the private sector (% of GDP). This indicator measures how well resources from financial intermediaries are allocated to the private sector activities. Development in the financial sector helps improve resource allocation, hence investments become easy. Economic production activities are promoted as a result of financial development. This means that financial development positively affects economic growth (+).

Inflation (INF):

The level of inflation is calculated through the yearly change in consumer price index (World Bank, 2025). Inflation has a direct impact on the purchasing power and creates macroeconomic instability, thereby hindering economic development. Hence, the anticipated sign will be negative (−).

Structural Break Dummy D (COVID 19)

The structural dummy of the Covid-19 break is added in order to account for economic disturbance due to the pandemic in relation to economic growth and remittances received in Ethiopia. The dummy is equal to zero before the Covid-19 period (2000-2019) and one during and after the Covid-19 period (2020-2024). The incorporation of this dummy is useful in ensuring structural breaks in order to guarantee stability in the estimated ARDL model. The sign is expected to be negative (-).

3.6. Estimation Techniques

In this research, the model of Autoregressive Distributed Lag (ARDL) is applied by using Pesaran, Shin, and Smith's (2001) approach to examine the connection between remittances and economic growth in Ethiopia. This research design is applicable because it is possible to estimate both the dynamic relationship in the short run and the long-run relationships in a single empirical equation.

Firstly, the ARDL model can be used in cases where the variables under investigation are either integrated of order zero (I(0)), order one (I(1)) or are a mixture of the above but not any higher than order two (I(2)) (Pesaran et al., 2001). This characteristic of the model is particularly important in the case of macroeconomic time series studies where variables may have varying orders of integration. Secondly, the application of ARDL is appropriate where observations are limited, and consistent long-term parameter estimations can be obtained (Pesaran & Shin, 1999; Narayan, 2005). In the case at hand, observations are limited since data is annually collected between the years 2000 and 2024.

Moreover, ARDL models permit the inclusion of structural break variables that allow for changes that have taken place during a particular period. Hence, by including structural break variables, economic reform policies, economic changes caused by the COVID-19 pandemic, and other such variables will be considered in relation to their impact on economic growth in Ethiopia.

ARDL models offer significant advantages when compared to alternative time series models. The MA, ARMA, and ARIMA models are basically intended to forecast and are interested mostly in studying the behavior of a particular variable with time rather than considering its

long-run relationship with other economic variables (Box & Jenkins, 1976). Likewise, VAR and SVAR models are based on large sample sizes and consider all variables as endogenous, thus complicating interpretation in cases where particular dependent variables such as economic growth are under study (Sims, 1980).

Furthermore, ARCH and GARCH models are mainly appropriate for analysing volatility clustering and conditional heteroskedasticity in financial time series data such as stock prices, exchange rates, and inflation volatility (Engle, 1982; Bollerslev, 1986). Since the primary objective of this study is to estimate the long-run and short-run relationship between remittances and economic growth rather than volatility behavior, these models are not suitable.

The Johansen cointegration technique also requires all variables to be integrated of order one I(1) and generally performs better in large sample settings (Johansen, 1988). Likewise, the Engle–Granger two-step approach is limited to a single cointegrating relationship and is sensitive to the choice of dependent variable (Engle & Granger, 1987). Ordinary Least Squares (OLS) estimation is also inappropriate for non-stationary time series variables because it may generate spurious regression results when long-run relationships exist among variables (Granger & Newbold, 1974).

Therefore, considering the mixed order of integration of the variables, relatively small sample size, need for cointegration analysis, and the objective of estimating both short-run and long-run dynamics, the ARDL approach is considered the most appropriate estimation technique for this study.

3.6.1 Unit root tests

Before estimating the long-run and short-run relationships between remittances, macroeconomic determinants, and economic growth, it is necessary to examine the stationarity properties of the variables. The use of non-stationary time series may result in spurious regression, whereby statistically significant relationships are obtained despite the absence of any meaningful economic relationship (Granger & Newbold, 1974). Therefore, the order of integration of each variable must be determined before conducting cointegration analysis.

The Autoregressive Distributed Lag (ARDL) approach requires that the variables be integrated of order zero, I(0), order one, I(1), or a combination of both, provided that none of the variables

is integrated of order two, I(2) (Pesaran, Shin, & Smith, 2001). Consequently, unit root tests are conducted to verify the integration properties of the variables.

This study employs the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. The ADF test addresses serial correlation by incorporating lagged differences of the dependent variable into the regression equation (Dickey & Fuller, 1981). The PP test corrects for serial correlation and heteroskedasticity through non-parametric adjustments without including lagged difference terms (Phillips & Perron, 1988).

The hypotheses for both tests are:

H_0: The series contains a unit root (non-stationary).

H_1: The series is stationary.

The use of both ADF and PP tests makes for strong evidence about the stationary nature of the variables and guarantees that all of them are not integrated above first-order before conducting the ARDL bounds test.

3.6.2 Structural Break Analysis

Structural changes are commonly found in economic time series as a result of policies implemented by policymakers, institutional reforms, economic shocks, etc. The presence of structural breaks may cause estimation bias and false statistical inference (Perron, 1989). In the case of Ethiopia, the period under analysis saw various significant economic events like exchange rate changes, economic reforms, trade liberalization, and the coronavirus outbreak, all of which are likely to have had impacts on the association between foreign transfers and GDP growth rates. This paper uses the Zivot-Andrews (1992) unit root test to determine whether there exists an endogenous structural break in any of the time series examined. Contrary to common unit root tests, the Zivot-Andrews unit root test is able to test for the presence of one endogenous structural break in the mean and/or the trend.

The following models are therefore specified:

Model A (Break in Intercept)

$$\Delta y_t = \alpha + \beta y_{\{t-1\}} + \gamma t + \theta DU_t + \sum_{\{i=1\}}^{\{k\}} c_i \Delta y_{\{t-i\}} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots 1$$

Model B (Break in Trend)

$$\Delta y_t = \alpha + \beta y_{\{t-1\}} + \gamma t + \theta DT_t + \sum_{\{i=1\}}^{\{k\}} c_i \Delta y_{\{t-i\}} + \varepsilon_t \quad \text{.....2}$$

Model C (Break in Both Intercept and Trend)

$$\Delta y_t = \alpha + \beta y_{\{t-1\}} + \gamma t + \theta DU_t + \delta DT_t + \sum_{\{i=1\}}^{\{k\}} c_i \Delta y_{\{t-i\}} + \varepsilon_t \quad \text{.....3}$$

DU_t=1 if t > TB, otherwise 0

DT_t = (t − TB) if t > TB, otherwise 0

TB denotes the endogenous structural break date.

ε_t is the error term.

These findings of the structural break test contribute to assessing if any changes have happened within the set of variables within the sample period. These also serve to further justify the need to include the coronavirus dummy variable in the ARDL model. The inclusion of structural breaks will increase the accuracy of the relationship estimates.

3.6.3 ARDL Bounds Test for Cointegration

After establishing the order of integration of the variables via unit root tests, the researcher applies the Autoregressive Distributed Lag (ARDL) bounds testing procedure proposed by Pesaran, Shin, & Smith (2001). This procedure is applied to test the existence of long run relationships among the variables involved. An ARDL bounds test is appropriate if the variables are I(0) integrated, I(1) integrated, or have some combination of orders zero and one but not two.

The basis of the ARDL bounds test is the estimation of an Unrestricted Error Correction Model (UECM). In the UECM, the joint significance of the level variables is tested using the F-test. In essence, the ARDL bounds test is conducted to determine if a long run relationship exists between economic growth and the variables.

The hypotheses for the bounds test are formulated as follows:

$$H_0 : \beta_1 = \beta_2 = \beta_3 = \cdots = \beta_n = 0$$

$$H_1 : \text{At least one } \beta_1 \neq 0$$

Where:

- H_0 is represents the null hypothesis of no long-run relationship (no cointegration) among the variables.
- H_1 is represents the alternative hypothesis that a long-run relationship (cointegration) exists among the variables; that is, at least one of the level coefficients is different from zero..

The rule for decision-making involves comparison between the calculated F statistic and critical bound values (lower and upper bound), which are available from Pesaran et al. (2001). When the calculated F statistic is larger than the upper bound critical value, then the null hypothesis of no cointegration cannot be accepted and there exists a long-run relationship between the variables. When the F statistic is less than the lower bound critical value, the null hypothesis of no cointegration holds. However, when the F statistic is between the lower and upper bounds, then the results are inconclusive. When cointegration is established, the estimation of long-run coefficients and Error Correction Model is undertaken.

3.7. Method of Data Analysis

This research applies both the descriptive and econometric methods of analyzing data on the relationship between remittances and economic growth in Ethiopia. All analysis of the data will be done using the Stata version 17 software.

Descriptive analysis helps to provide description about the characteristics and behavior of the study variables within the study period. This can involve the application of tables, graphs, summarization of the data using various measures and trend analysis of the data on remittances, economic growth and other macroeconomic variables.

Furthermore, econometrics analysis has been utilized by the research in estimating the relationship between remittances and economic growth in short run and long run respectively. Econometrics analysis in this research involves application of unit root test, structural breaks,

ARDL cointegration bounds test, long-run estimates of coefficients and the Error Correction Model (ECM).

3.8 Post-Estimation Tests

Following the estimation of the ARDL model and the related error correction mechanism, it becomes necessary to undertake the post-estimation stability test to validate the appropriateness and correctness of the model. This test will ensure that the estimated regression fulfils the classical assumptions of linear regression and that the model is statistically significant for interpretation purposes. In particular, the present study undertakes tests for serial correlation, heteroscedasticity, normality, functional form, and parameter stability.

3.8.1 Serial Correlation Test

Autocorrelation is said to occur in a regression equation when the error terms are correlated in time periods. When it comes to time-series data, this issue may arise due to any omission of variables, mis specified lags, or dynamic misspecifications. The consequences of autocorrelation are inefficiency in parameter estimators and biased standard errors.

In order to test for autocorrelation, the Breusch-Godfrey Serial Correlation LM test will be used. This test was introduced by Trevor S. Breusch and Leslie G. Godfrey. The main advantage of this test is that it is capable of identifying higher-order autocorrelation and works well with models that involve lagged dependent variables, including the ARDL model.

The hypotheses of the test are:

- H_0: There is no serial correlation in the residuals.
- H_1: Serial correlation exists in the residuals.

When the p-value of the LM statistic exceeds the significance level of 5%, then the null hypothesis cannot be rejected because of the lack of serial correlation among the residuals. It is important to have no serial correlation to show that the dynamic specification of the ARDL model is correct.

3.8.2 Heteroscedasticity Test

Heteroskedasticity arises whenever there is an uneven variance in the error terms. With regard to econometrics, heteroskedasticity can make estimation of parameters inefficient and can make

the standard errors be incorrectly estimated leading to incorrect conclusions concerning significance of variables under test.

For testing heteroskedasticity, the Breusch–Pagan–Godfrey test was used by the author. This test is based on Trevor S. Breusch and Adrian R. Pagan. It involves checking for existence of any dependence between the variance of regression residuals and independent variables.

The hypotheses are as follows:

- H_0: The residuals are homoscedastic (constant variance).
- H_1: The residuals are heteroscedastic (non-constant variance).

In case where the calculated p-value of the test statistic exceeds the chosen significance level (like 0.05), then the null hypothesis is said to hold; thus, there is no heteroskedasticity problem in the model, and the regression results are valid for use.

3.8.3 Normality Test

Checking the normality of residuals is critical in confirming the validity of the statistical analysis, especially when there is a smaller sample size. Normally distributed residuals are a verification of the right use of the t-tests and F-test in the process of hypothesis testing.

The Jarque-Bera test was formulated by Carlos M. Jarque and Anil K. Bera. This test checks the normally distributed character of residuals by comparing their skewness and kurtosis with those of a normally distributed one.

Hypotheses of the test are:

- H_0: Residuals are normally distributed.
- H_1: Residuals are not normally distributed.

When the p-value of the Jarque-Bera test statistic is greater than the level of significance, then the null hypothesis cannot be rejected, implying that the residual distribution is normally distributed.

3.8.4 Parameter Stability Tests

Parameter stability plays an important role in time-series econometrics because of potential changes in structure, including policy change, economic shocks, and crises, which can affect stability in estimated parameters. This paper uses the CUSUM test and CUSUM square test for checking the stability of estimated parameters of the ARDL model. These two tests were proposed by Brown et al. (1975). Both tests depend on recursive residuals and help find systematic changes in the regression coefficients in the sample. Parameter stability will be assessed through graphs based on cumulative sum values and their relation to the critical boundaries at the level of 5%. If the line in the graph does not cross the confidence bands, then we accept the hypothesis about the stability of parameters. If it crosses them, then there is structural instability in the model parameters.

Chapter four

Results presentation and analysis

4.1. Descriptive Statistics

Remittance inflow trend analysis reveals that there was a remarkable variation in remittance inflow to Ethiopia throughout the study period between 2000 and 2024. Although there were times when remittances decreased in quantity, it is evident that there has been an upward trend in terms of remittances as a share of GDP. Consequently, remittances have proved to be a source of foreign exchange incomes for the Ethiopian economy.

Initially, there was little contribution made by remittance inflow, which was a result of fewer migration opportunities and less engagement of the diaspora community in financial transactions. Over the course of time, remittance inflow started increasing, probably owing to greater international migration opportunities and improvement in channels through which the diaspora community makes transfers to their homeland. It could also be attributed to increased interaction between migrants and their relatives at home times of economic hardship.

Table 4.1: Summary of descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
RGDP	25	1,179,320	712,715.1	364,984.3	2,603,953
REM	25	5.948141	5.849796	0.404993	27.38656
GCF	25	37.35592	31.70212	5.059957	116.6301
FDI	25	3.866922	4.171932	0.0026513	18.38097
FD	25	17.79427	18.75716	3.584169	67.8445
TOP	25	37.20117	40.81879	4.892976	187.037
INF	25	15.16301	11.54316	-10.78445	36.37902

Source: Author's computation using Stata output.

Table 4.1 presents the descriptive statistics of the variables employed in the study over the period 2000–2024. The statistics provide important preliminary insights into the nature, distribution, and behavior of the variables before conducting econometric estimation. In time-

series analysis, descriptive statistics help explain the extent of variability, stability, and trends within the data, which may reflect macroeconomic conditions, policy changes, and structural transformations in the economy.

Real Gross Domestic Product (RGDP) recorded a mean value of 1,179,320 with a standard deviation of 712,715.1, implying approximately 60.4 % variation relative to its mean value. The minimum value and maximum value of 364,984.3 and 2,603,953 respectively imply a broad spread of economic production in this period. This large variation implies that the economy of Ethiopia experienced substantial growth cycles and transformations. Neoclassical and endogenous growth models theorize that economic growth results from factors such as accumulation of capital, investments, technological advancements, and productivity levels (Solow, 1956; Romer, 1990). The rising trend in RGDP can be attributed to the development in economic operations and investments in the economy.

The average and standard deviation for REM were 5.95 and 5.85 respectively implying that there was approximately 98.3% variation around the average. The minimum and maximum values of 0.40 and 27.39 respectively suggest that there was a substantial increase in remittances during this period. Given the level of variability observed, remittances were relatively responsive to changes in macroeconomic environment factors such as global economic trends, migration and exchange rates. NELM theory indicates that remittances act as a way of income diversification and managing risk at household level, smoothing out family's consumption and easing financial constraint (Stark & Bloom, 1985). Similarly, Keynesian theory postulates that higher remittance income could help increase aggregate demand by boosting household consumption levels (Adams & Page, 2005).

Gross Capital Formation (GCF) has an average value of 37.36, with a standard deviation of 31.70, translating into about 84.8% of variability relative to its mean. The lowest and highest values of 5.06 and 116.63 show the range of variations in investment activities. This level of variability indicates that there were significant changes in investment and capital formation processes in the country. Neoclassical growth theory indicates that capital accumulation is one of the essential variables for economic growth (Solow, 1956).

Foreign Direct Investment (FDI) has a mean of 3.87, with a standard deviation of 4.17, translating to about 107.8% of variability from the mean. There exists a large gap between the

minimum and maximum FDI values, namely 0.003 and 18.38, respectively. It follows that FDI responded positively to fluctuations in investment policies, political stability, infrastructure development, and performance of the global economy. In line with the endogenous theory of growth, foreign direct investments aid economic growth through technology diffusion, management capabilities, and capital flows which improve efficiency and productivity (Romer, 1990).

Financial Development (FD) registered an average of 17.79 and a standard deviation of 18.76, translating into about 105.4% variance compared to its mean. The minimum figure of 3.58 and maximum figure of 67.84 show a wide spread within the financial industry. The high level of variability reflects substantial structural change in the financial industry over the study period such as financial deepening and banking activities. The intermediary theory of finance maintains that a developed financial system collects savings, allocates credit effectively, and fosters economic growth through investment (McKinnon, 1973; Shaw, 1973).

The Trade Openness (TOP) indicator had an average value of 37.20 and a maximum standard deviation of 40.82, showing that there was a variation of about 109.7 % around the mean value. The low value of 4.89 and high value of 187.04 show that trade activities have undergone significant fluctuations because of varying factors such as the performances of exports, demands for imports, changes in exchange rates, and external market forces. According to international trade theory, trade openness leads to specialization, market enlargement, technology transfer, and efficient allocation of resources (Krueger, 1978).

The Inflation (INF) indicator had an average value of 15.16 and a standard deviation of 11.54, meaning that the indicator varied significantly from its mean value by about 76.1 %. The low value of -10.78 and high value of 36.38 depict that the country's economy faced times of deflation and inflation within the period under consideration. The fluctuation in inflation indicates an instability in price changes caused by demand and supply shocks, expansion of money supply, and external forces. Keynesian and monetarist theories posit that constant inflation might create distortions in investment and reduce purchasing power (Friedman, 1968).

On the whole, the descriptive statistics indicate high variability as well as broad distributions for all variables under study. Such high variabilities can be attributed to macroeconomic instability and structural changes as well as external shocks that may occur in the Ethiopian economy. This

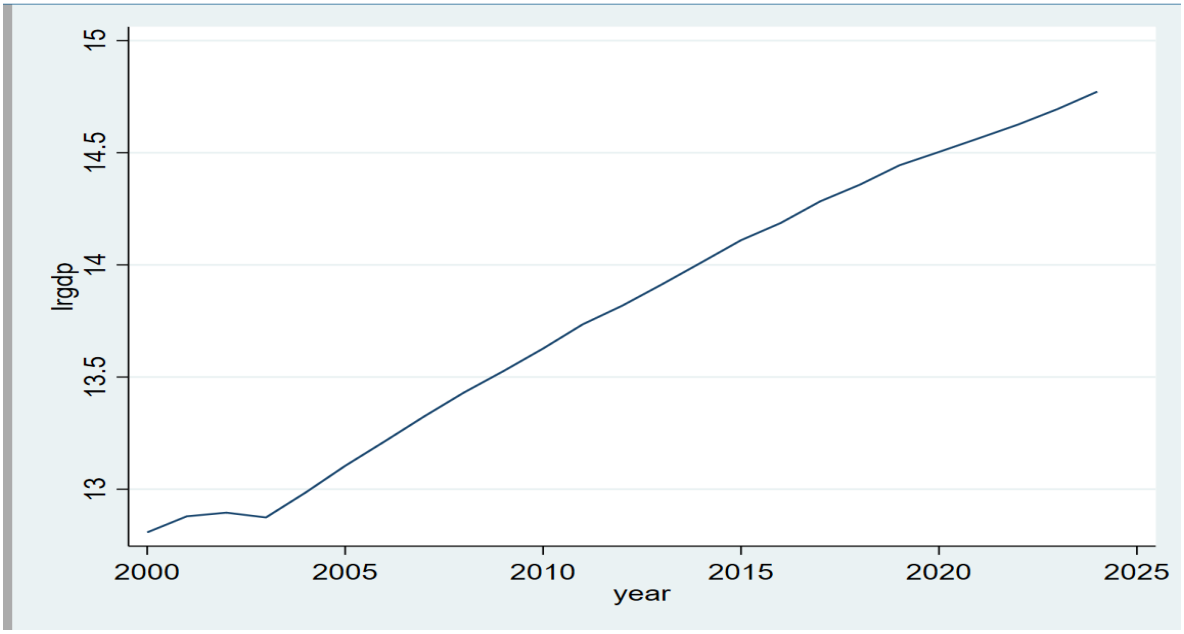
variability calls for further econometric analysis to understand the relationship between remittances and growth.

4.2 Trend Analysis of Variables

The technique of trend analysis can be used to study the behavior of the variables over time. It will help to get a graphical insight into how economic growth, remittances, investments, financial development, open economies, and inflation changed through time. Knowledge about the behavior of the above variables in the study period washelpful in determining the economic phases that occurred in Ethiopia.

4.2.1 Trend of Economic Growth in Ethiopian

Figure 4.1 Trend of Economic Growth in Ethiopia (2000–2024)



Source: Stata Result from NBE data.

The pattern of economic growth in Ethiopia depicted by LRGDP has exhibited an increasing trend during the analysis period from 2000 to 2024, as shown above. Even though the pattern of economic growth has undergone some changes in its growth process during the initial years, overall there has been economic growth within the period under consideration.

In the early years of the analysis period, economic growth increased moderately from 2000 to 2002. However, economic growth declined marginally during 2003 when the LRGDP pattern

declined briefly before starting an increase again. This decline in economic growth can be attributed to several factors such as economic difficulties, low productivity, climatic shocks, and poor industrialization.

From 2004, the trend of economic growth was continuously increasing. There is an indication that the increase in LRGDP started accelerating after 2005, which might be attributed to improvement in economic performance and expansion in productive activities of the economy. This continuous increase in economic growth could be caused by increased public investments, infrastructure development, agriculture transformation, and growth oriented economic policies (World Bank, 2018).

The other trend indicated in the above graph is that there was rapid economic growth after 2010. There were remarkable performances in economic growth in Ethiopia due to increase in domestic investments, increase in the expansion of construction and service sectors, enhancement in the trade performance, and inflows of capital. Government development interventions and huge infrastructural investments in road network, railway, energy, and industrial parks might be contributing factors for the continuous growth trend (African Development Bank, 2020).

During the period from 2000 to 2024, LRGDP increased from approximately 12.8 to 14.8, meaning that the total percentage increase was 15.6 %. Moreover, the economy grew from 364,984.3 million birr to 2,603,953 million birr, meaning that there was a percentage increase of 613 %.

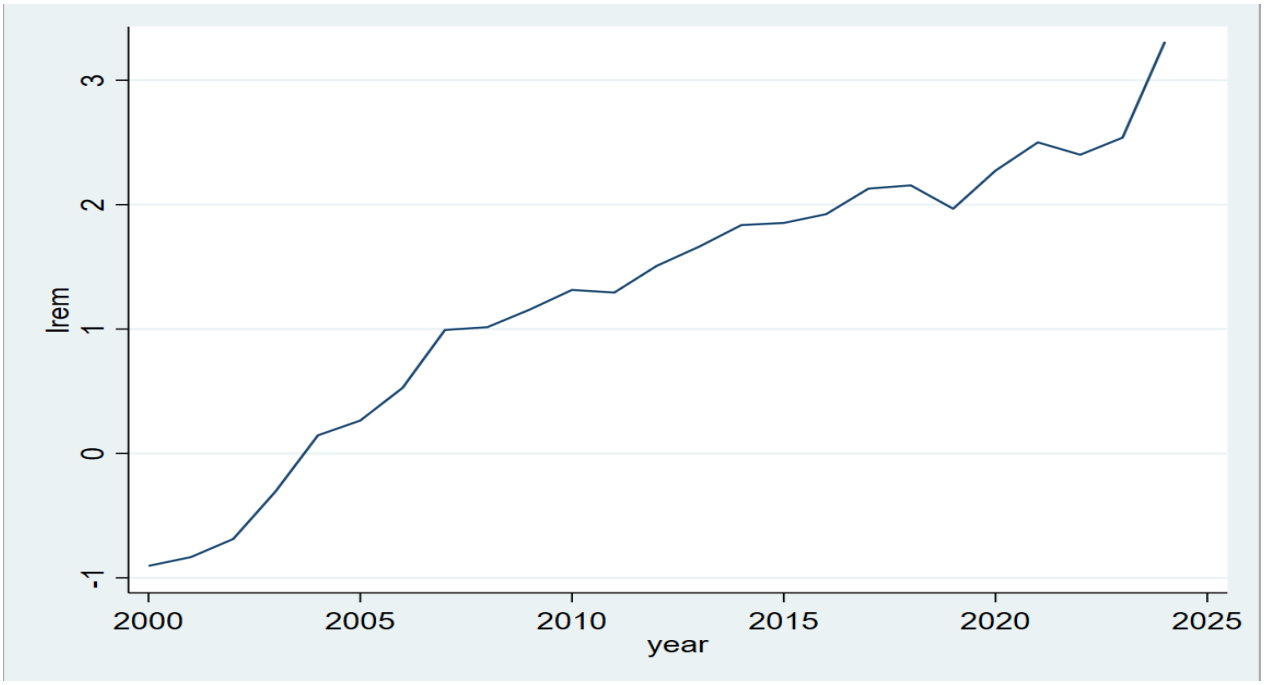
Notwithstanding the steady upward trend of the country, there are periods in which growth is relatively slowed, especially in those periods related to global economic uncertainties and macroeconomic challenges within the country. Issues like inflation, lack of foreign exchange, political instability, and economic shocks could have been among the major determinants behind growth during those particular periods (IMF, 2021).

In general, from the trend analysis, it can be revealed that there has been consistent long-term economic growth in the country during the research period. Consistent growth indicated by the steady rise in LRGDP shows an improvement in productive capacity, capital formation, and structural changes in the economy. Hence, the increasing trend in economic growth forms the

background upon which the effects of other macroeconomic variables including remittances on economic growth can be examined.

4.2.2 Trend of Remittance Inflows (LREM) in Ethiopian

Figure 4.2 Trend of Remittance Inflows in Ethiopia (2000–2024).



Source: Stata Result from NBE data.

The trend analysis of remittance flows in Ethiopia using the logarithm of remittances (LREM) shows that remittances in the country have been rising over time, as depicted in the graph above. Even though there were some fluctuations in some years, the trend reveals a considerable rise in the flow of remittances over time.

At the start of the study period, remittance inflows were still low since the logarithm of remittances was below zero in 2000 to 2003. This suggests that remittance inflows in the initial stages of the study period were few since the logarithm was below zero. The reasons for the few remittances could be the limited opportunity for migration, little diaspora contribution, and limited money transfer system.

Starting from about 2004, there began to be an increase in the volume of remittances flowing into the country. The increase became sharper starting from 2006, showing that the growth of remittance flows is very high in Ethiopia. The increase in the inflow of remittances may be due to increased international migration, enhanced financial transfer methods, utilization of formal bank channels, and improved linkages between migrants and their relatives.

Further, it can be seen that the volume of remittance inflows increased steadily after 2010 despite the presence of short-term variations in some periods, specifically 2011, 2019, and 2022. The cause of such temporary variation may be economic shocks, fluctuations in exchange rates, conditions of employment in host countries, and changes in the global economy affecting migrant workers.

However, in spite of such variations, remittance inflows rebounded and remained on an upward trend. A notable increase has been observed in the period between 2023 and 2024 when the highest level of LREM is recorded. Such an increase may be due to the utilization of formal methods of remittances, favourable policies for diaspora financing, exchange rates' changes, and increased foreign finances of Ethiopians abroad.

In all, the logarithm of remittance grew from -0.9 around the year 2000 to 3.3 in the year 2024, suggesting that there has been a growth rate of more than 460% in logarithm terms during the research period. Likewise, based on the raw value of remittances, there has been an increase in remittance from 0.405% to 27.39%, which suggests that there has been a growth rate of around 6,660% within the research period. The massive growth shows how significant remittance inflows have become as a source of foreign currency earning, household income support, and financing for consumption and investment.

The growth of remittance flows into the economy is consistent with the findings in other studies, where the significance of remittances in developing countries is well-established for purposes of consumption, poverty alleviation, foreign currency earnings, and investment finance (Adams & Page, 2005; World Bank, 2023).

4.3. Regression Results

In this section, the econometric findings of the study are presented. Unit root test and structural breaks tests like Augmented Dickey Fuller (ADF), Phillips–Perron (PP) and Zivot–Andrew's test is conducted to test the stationarity properties of the variables.

4.3.1. Unit Root Test

Table 4.2 presents the results of the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests used to examine the stationarity properties of the variables included in the study.

Table 4.2 Test results for Stationarity

Variable	ADF (Level)		ADF (1st Diff.)		PP (Level)		PP (1st Diff.)	
	t - Stat.	p-value	t - Stat.	p-value	t - Stat.	p-value	t - Stat.	p-value
RGDP	-0.299	0.9256	-3.296	0.0151	-0.111	0.9483	-2.782	0.0609
REM	-1.077	0.7240	-3.864	0.0023	-0.756	0.8317	-3.241	0.0178
GCF	-0.625	0.8652	-3.772	0.0032	-0.279	0.9284	-6.204	0.0000
FDI	-1.345	0.6084	-4.403	0.0003	-1.226	0.6623	-5.721	0.0000
FD	1.860	0.9985	-2.798	0.0585	3.315	1.0000	-3.733	0.0037
TOP	-0.147	0.9446	-3.257	0.0169	0.174	0.9708	-3.787	0.0030
INF	-3.283	0.0157	-5.485	0.0000	-2.979	0.0369	-6.848	0.0000

Source: Author's computation using Stata.

From the Table 4.2, the unit root tests show that RGDP, REM, GCF, FDI, FD, and TOP are I(1) whereas INF is an I(0). The tests show that most of the macroeconomic variables in the economy of Ethiopia are not stationary and have stochastic trends, indicating that disturbances in these variables have the potential to persist and exert their influence for long periods of time. Stationarity after first difference is observed from the tests, suggesting that the variables are becoming stable over time and hence can be used for further analysis using econometrics. Stationarity tests are performed due to the likelihood that regression with non-stationary variables leads to wrong inferences being drawn from the data (Gujarati & Porter, 2009). These findings corroborate with the results obtained in other studies carried out in Ethiopia, such as

those by Mikias Tilahun (2014), Temesgen Yaekoba (2014), and Melkamu Wondimu (2020), where the variables on economic growth, remittances, investment, and trade were seen to be I(1) and stationary after first difference. It is crucial to note that the variables do not have an order of integration of two, I(2), hence meeting the prerequisite for the ARDL method. Given that the variables have a combination of integration of I(0) and I(1), it will be suitable to conduct the analysis using the ARDL bounds testing technique by Pesaran et al. (2001).

4.3.2 Zivot–Andrews Structural Break Test

The structural break test developed by Zivot and Andrews was used to analyse the stationarity characteristics of the variables, taking into account possible endogenous structural breaks (Zivot & Andrews, 1992).

Table 4.3: Structural Break Analysis Using the Zivot–Andrews Test

Variable	Intercept Break	Break Year	Trend Break	Break Year	Intercept & Trend Break	Break Year	Order of Integration
lrgdp	-4.948**	2020	-7.022***	2018	-6.775***	2017	I(0)
lrem	-2.959	2006	-3.699	2008	-3.501	2006	I(1)
lgcf	-3.784	2017	-3.677	2014	-4.472	2011	I(1)
lfdi	-6.247***	2004	-4.477**	2008	-16.346***	2004	I(0)
lfd	-4.036	2020	-3.820	2016	-3.758	2015	I(1)
ltop	-2.202	2014	-1.668	2020	-1.625	2020	I(1)
inf	-4.612	2012	-3.760	2007	-4.713	2012	I(1)

Source: Author's computation using Stata output.

Note: *** and ** represent significance at 1% and 5%, respectively. The null hypothesis of the Zivot & Andrews test is the existence of a unit root with a structural break. Rejecting the null hypothesis means the series is stationary with a structural break.

The Zivot-Andrews structural breaks test outcome shows that the level of GDP (lrgdp) and foreign direct investments (lfdi) are stationary variables (I(0)), whereas remittances (lrem), gross capital formation (lgcf), financial development (lfd), trade openness (ltop), and inflation (inf) are I(1) series. It can be seen that structural breaks occurred at a certain point in time during the data period, implying some economic and political shifts during this period. In conclusion, the

outcomes show that a mixture of I(0) and I(1) variables are observed, with no I(2) variables observed. Hence, it is suitable to proceed with the ARDL bounds testing procedure.

- ✓ **What the Three Tests Show**

A Zivot and Andrews unit root test was conducted using the following three assumptions: (i) a break in the intercept, (ii) a break in the trend, and (iii) breaks in both the intercept and the trend. This was necessary to be certain of the stationarity of the variables. The rationale behind this is that macroeconomic time series can be influenced by structural breaks due to economic policy changes, political uncertainty, financial upheavals, and other global disturbances. In each of the three specifications, the empirical evidence clearly demonstrates that lrgdp and lfdi are stationary at level, or I(0); conversely, the variables lrem, lgcf, lfd, ltop, and inf are non-stationary at level, or I(1), but become stationary when first differenced, or I(1).

When it comes to the results from the intercept-break specification, the evidence of stationarity is strong for lrgdp and lfdi, with structural breaks primarily occurring in 2004 for FDI and in 2017-2020 for GDP dynamics. As for the trend-break specification, lrgdp once again displays strong evidence of stationarity, indicating that the process of economic growth in Ethiopia has undergone significant shifts in its long-term behavior, specifically around 2018. In turn, when analysing the results based on the combined intercept-and-trend break specification, the findings further strengthen their consistency and are even more pronounced, especially for FDI, where a highly pronounced structural break occurs in 2004.

- ✓ **Meaning of Structural Breaks in the Ethiopian Economy**

It should be noted that the detected break periods (2004, 2006-2008, 2011-2012, 2014-2017, and 2020) are economically significant and coincide with key changes in the Ethiopian macroeconomic situation.

- 2004-2008 (FDI and remittances breaks): This period was characterized by economic liberalization, promotion of incentives, and integration into international capital movements. The works by Alemu (2008) indicate gradual policy changes towards foreign investment in Ethiopia.

- 2007-2012 (inflation and macro instability): This period witnessed periods of high inflation and macroeconomic imbalances due to expansionary fiscal policy and global fluctuations in commodity prices. According to the World Bank (2013), there have been notable inflation fluctuations during shocks to global commodity prices.
- 2014-2017 (GDP and growth & structural transformation phase): During this time, the country implemented substantial public investments projects as part of the Growth and Transformation Plans (GTP I and II). As a result, GDP and capital formation were fundamentally changed.
- 2018-2020 (transition and coronavirus break): The GDP breaks around 2018 may be explained by political instability after changing the leadership, whereas 2020 break represents the effects of the coronavirus crisis. This result is similar to findings of IMF (2021) who reported notable output shocks in Ethiopia during the COVID-19 outbreak.

✓ **The Importance of Stationarity (Econometric Perspective)**

In econometric analysis involving time series variables, stationarity becomes important because non-stationary variables will produce erroneous results of regression with statistical significance despite the absence of any economic relation. When a time series variable is stationary, then its mean, variance, and covariance do not change overtime.

While testing for unit roots, the Zivot and Andrews' test is more powerful compared to other techniques since it takes into consideration the existence of structural breaks in the dataset. This is especially important when dealing with a developing country such as Ethiopia, which experiences frequent structural changes.

Zivot and Andrews (1992) argue that failure to consider structural breaks in the test for unit roots will bias unit root tests in favor of rejecting the null hypothesis.

✓ **Comparison with Previous Research**

The mixture of integration order (I(0), I(1)) discovered in this research aligns with other empirical investigations on emerging countries. For example, Narayan and Smyth (2005) report that macroeconomic variables in emerging markets have structural breaks because of policy and other external factors.

On the same note, empirical research by Asteriou & Hall (2021) reveals that taking into account structural break makes most of the variables I(0) instead of I(1). This is especially true for variables like GDP and investment.

In the case of Ethiopia, past empirical investigations also reveal that GDP and FDI in the country are very sensitive to structural breaks (World Bank Report, Alemu, 2008).

- ✓ **Overall Implications for ARDL Model**

All these results indicate that none of the variables is integrated to order two, I(2). Instead, the variables have both I(0) and I(1) integration orders. The importance of this finding cannot be ignored since it meets one of the primary requirements for using the Autoregressive Distributed Lag (ARDL) bounds test approach pioneered by Pesaran et al. (2001).

Consequently, the use of ARDL model for this study is appropriate since it can estimate both the long-term equilibrium and short-term dynamic relationship between remittances, gross capital formation, foreign direct investment, financial development, trade openness, inflation, and economic growth of Ethiopia.

In summary, the results indicate that there are several structural breaks and different integration orders in this study, indicating the dynamic nature of the Ethiopian economy.

4.3.3 Lag Length Selection

In order to estimate the ARDL model, the selection of the optimal lag length was conducted through vector autoregression criteria such as Log Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQIC), and Schwarz Bayesian Information Criterion (SBIC).

Table 4.4: Lag Order Selection Criteria

Lag	**Log Likelihood (LL)**	**LR**	**FPE**	**AIC**	**HQIC**	**SBIC**
0	-66.1162	–	0.000602	6.7730	6.8270	7.0217
1	51.8239	235.88	9.3e-08	-2.0785	-1.7546	-0.5863

2	90.1783	76.709	4.3e-08	-3.3503	-2.7566	-0.6147
3	171.3540	162.35	1.2e-09*	-8.7004	-7.8368	-4.7213
4	2935.2700	5527.80*	.	-269.5490*	-268.4160*	-264.3270*

Source: Author's computation using Stata 17

Note: * indicates the optimal lag selected by the respective criterion.

The above Table 4.3 shows, most of the information criteria indicate lag four as the best lag order because of having the highest log-likelihood value of 2935.270 and lowest AIC (-269.549), HQIC (-268.416), and SBIC (-264.327) values. In general terms, the result suggests that a larger number of lag orders will be more statistically consistent with the data set (Lütkepohl, 2005).

On the other hand, this research utilizes a small sample size (25 annual data sets between the periods of 2000-2024). For this reason, taking a high number of lag orders will greatly decrease the sample size, increase the number of estimated parameters, and lead to problems such as over-parameterization, multicollinearity, and reduction in degrees of freedom. According to Pesaran, Shin, and Smith (2001), the ARDL modelling approach works effectively with small samples if the lag order structure is parsimonious. Therefore, the maximum number of lags was limited while applying the AIC criterion.

4.3.3 ARDL Bounds Test for Cointegration

The ARDL Bounds Test was employed to test whether there is a long-run relationship between economic growth, remittances, gross capital formation, foreign direct investment, financial development, trade openness, inflation, and the dummy variable of the COVID-19 pandemic.

Table 4.5: Interpretation of the ARDL Bounds Test Results

Test Statistic	**Value**	**Significance Level**	**I(0) Lower Bound**	**I(1) Upper Bound**
F-statistic	34.582	10%	2.560	3.991
t-statistic	-4.712	5%	3.166	4.855
k = 7		1%	4.747	7.098

Source: Author's computation using Stata output.

As shown in Table 4.4. The computed F-statistic (34.582) is found to be higher than the upper bound critical values at the 10%, 5%, and 1% level of significance, even the upper bound critical value at the 1% significance level (7.098). As per Pesaran et al. (2001), in case the computed F-statistic is larger than the upper-bound critical value, then the null hypothesis of the non-existence of a long run relationship or cointegration cannot be accepted. In addition, the computed t-statistic (-4.712) is lower than the 5% critical value (-4.643). Thus, based on the joint decision rule in the bounds test procedure, the null hypothesis of the non-existence of a long-run relationship among the variables is rejected in favour of cointegration among economic growth, remittances, gross capital formation, foreign direct investment, financial development, trade openness, inflation, and the dummy variable for the COVID-19 pandemic.

Note: k = 7 represents the number of explanatory variables included in the ARDL model.

4.3.4 Long-Run ARDL Estimation

After establishing cointegration through the bounds test, the long-run ARDL equation was estimated. Coefficients from the estimation reflect the long-term effect of remittance and other factors on economic growth. Where the data series are logarithmically transformed, then the coefficients have to be interpreted as elasticities (Pesaran et al., 2001).

Table 4.6: Long-Run ARDL Estimation Results

Dependent Variable: Real GDP (lrgdp)

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**P-value**
Lrem	0.0023	0.0739	0.03	0.975
Lgcf	0.1386	0.0968	1.43	0.173
Lfdi	0.1582	0.0359	4.40	0.001***
Lfd	0.3353	0.0787	4.26	0.001***
Ltop	-0.0189	0.0586	-0.32	0.752
Inf	0.0009	0.0012	0.73	0.477
Covid	-0.2481	0.0855	-2.90	0.011**

Source: Author's computation using Stata output.

Note: *** and ** indicate significance at the 1% and 5% levels, respectively.

Table 4.6 presents the estimated long-run coefficients obtained from the ardl model. The results indicate that foreign direct investment, financial development, and the covid-19 pandemic are significant determinants of economic growth in the long run.

Remittance coefficients (LREM) are positive (0.0023) and not significant (p = 0.975). Remittances have no significant impact on economic growth in the long run in Ethiopia. Even though the positive coefficient of remittances implies that an increase in remittance inflow contributes to economic growth, the effect is extremely small since a one percentage point increase in remittances increases real GDP by 0.0023%. Therefore, the use of remittances in Ethiopia is mainly aimed at consumption expenditure, schooling, health costs, housing, and other welfare expenses and does not include production activities that enhance economic growth. This result conforms to the assertion put forward by Chami et al. (2005) that remittances are mainly compensatory transfers that do not support economic growth. Similarly, Kemiso (2021) found a negative and significant relationship between remittances and economic growth in Ethiopia and concluded that remittances in the country were mainly meant for consumption. This conclusion runs contrary to the findings of Mikias Tilahun (2014), Melkamu Wondimu (2020), Temesgen Yaekoba (2014), and Gidey (2023) who found a positive and significant contribution of remittances to economic growth in Ethiopia. This variation may be attributed to different sample periods, econometric frameworks, and economic circumstances. In recent times, the economy of Ethiopia has suffered from a lack of foreign exchange, political unrest, inflation, and the COVID-19 pandemic. As a result, it is plausible to state that these factors have motivated individuals to utilize money transfers in consumption-smoothing purposes rather than investments in productive activities.

The gross capital formation (LGCF) variable has a positive but statistically insignificant coefficient value of 0.1386 (P-value = 0.173). This indicates that for every 1% increase in the gross capital formation variable, there will be an increase of approximately 0.139% in the country's real GDP in the long run, but it is insignificant. The positive coefficient is in line with the neo-classical growth theory of Solow (1956) and Harrod Domar Growth Theory (Harrod, 1939 and Domar, 1946), where capital accumulation has been identified as the most fundamental cause of economic growth. However, the lack of statistical significance of the

coefficient value indicates inefficiency in translating the investment expenditure in the country into productive output. This could be due to inefficiency in implementation of the investment project, inefficiencies in resource allocation, inefficiencies in productivity of investment projects, and poor institutions and governance. In contrast, Mikias Tilahun (2014) found gross capital formation to have a significant positive impact on economic growth in Ethiopia while Barro (1991) identifies investment as an important determinant of economic growth. However, it is supported by the findings of Easterly and Levine (2001) and Collier and Gunning (1999), who suggested that the impact of investments on economic growth is influenced more by the quality of investments rather than the quantity. Consequently, the finding suggests that simply raising investments will not be enough to facilitate economic growth.

The foreign direct investment (LFDI) variable has a positive and statistically significant coefficient of 0.1582 (p-value=0.001) showing that an increase of 1% in FDI results in 0.158% increase in real GDP in the long run. Therefore, FDI contributes greatly to economic growth through capital formation, technological transfers, improved managerial know-how, employment generation, and increasing productivity levels. Such results confirm the theory of endogenous growth, which suggests that innovations and technologies have played an important role in economic growth in the long run through knowledge and technological spillover effects (Romer, 1986; Lucas, 1988). Similar to the conclusions made by Borensztein, De Gregorio, & Lee (1998), FDI contributes greatly to economic growth through its technology spillover effect. Also, the results support the views made by Alfaro et al. (2004) who posit that FDI helps boost economic growth only where financial systems are developed and efficient. In case of Ethiopia, the results concur with the findings of Tesfaye (2014), Assefa & Mollick (2017) and Teka (2022), which found a positive and significant effect of FDI on economic growth via industrialization, exports, infrastructure, and employment generation. The significant positive effect of FDI in the present analysis means that there have been gains from foreign investments by the country in terms of increased productivity and technological development. This makes it necessary for the country to pursue policies that promote good business environment, institution-building, infrastructural development, and export-technology oriented foreign investments.

The financial development index variable (LFD) has a positive and significant coefficient of 0.3353 (p = 0.001). A 1% increase in LFD results in an approximate 0.335% rise in real GDP. Thus, LFD has the highest positive coefficient among all the explanatory variables. As a result, it can be assumed that financial development is among the most significant determinants of economic growth in Ethiopia. The above-mentioned result means that an advanced financial sector contributes to economic growth through such factors as mobilization of savings, effective allocation of funds, easy availability of credit, lower transaction costs, and investments. The finding agrees with the supply-leading approach proposed by Ronald McKinnon (1973) and Edward Shaw (1973). The approach states that the development of the financial sector leads to higher economic growth rates due to increased capital accumulation and higher investment efficiency. In turn, this finding is supported by the empirical evidence of Ross Levine (1997), who proved that there exists a strong positive correlation between financial development and economic growth, and King & Levine (1993), who demonstrated that financial intermediation contributed to faster economic growth due to better resource allocation. Regarding the current study, its findings are consistent with those of Ayalew (2013), Abdu Mohammod (2019), and Habtamu (2022), the financial sector's development is essential for stimulating economic growth through the expansion of the private sector's credit, savings mobilization, and better financial intermediation. Thus, the substantial positive impact identified from this research highlights the importance of financial sector development in the form of the development of the country's banking industry, increase in financial inclusion, improved credit availability, and financial market deepening, leading to economic growth in the country. Consequently, this indicates that financial sector development could yield more growth results compared to remittances or external financing.

The trade openness indicator has a negative and statistically insignificant coefficient (-0.0189; p = 0.752) which means that trade openness does not play any significant role for the long-term economic growth in Ethiopia. It can be inferred that a 1% change in trade openness leads to a 0.019% change in real GDP but this effect is insignificant. In theory, trade should lead to economic growth because of enhanced access to markets, increased competition, transfer of technologies, effective resource allocation and exploitation of comparative advantages according to classical and neoclassical theories of trade (Smith, 1776; Ricardo, 1817). In addition, the export-led growth theory suggests that deeper integration into the world economy

results in growth driven by exports and production efficiency as well as economies of scale (Balassa, 1978). Nevertheless, the insignificant and negative coefficients indicate that trade liberalization has not had a strong impact on growth in Ethiopia. Perhaps, the reason for that could be the consistent trade deficit position, heavy dependence on commodity exports, the lack of export diversity, poor competitiveness of domestic industries and reliance on imports of capital and consumer goods in Ethiopia. This finding is in line with the claims made by Dani Rodrik (1998), in his assertions that trade openness is not enough for economic growth without having solid institutions, productive capacities, and favourable policies. The finding is also in line with the findings of the research done by Francisco Rodriguez and Dani Rodrik (2000), in their analysis of the strength of the positive link between trade openness and economic growth. In terms of the case of Ethiopia, the finding is in agreement with Teshome (2018) and Getachew (2021), in their finding of insignificance of the positive effect of trade openness on economic growth because of underdeveloped exports of the economy. But the finding is contrary to the research findings of Sachs & Warner (1995) and Yanikkaya (2003), who reported that there was positive contribution of trade openness towards economic growth. Hence, the implication from this finding is that trade openness by itself does not help the acceleration of economic growth in Ethiopia without export diversification and productive capacity of the country.

Inflation (INF) has a positive but statistically insignificant coefficient value (0.0009; $p = 0.477$) showing that there was no significant relationship between the rate of inflation and economic growth within Ethiopia. Though the positive coefficient value shows that for one unit increase in the inflation rate, there will be an increase in real GDP growth by 0.0009%, the value is statistically insignificant, suggesting that there was not enough fluctuation in inflation rates in the period under investigation to have influenced investment and consumption decisions, thereby influencing production processes. According to Michael Bruno and William Easterly (1998), moderate levels of inflation do not necessarily cause harm to economic growth. In line with this theory, the current study reveals findings similar to those of Teshome (2013) and Birhanu (2018) in which it is stated that structural factors like investment, financial development, and productivity determine the insignificance of inflation on economic growth. From this perspective, it could be said that factors such as foreign direct investment and financial development played a critical role in long-term economic growth rather than the inflation factor in Ethiopia.

The COVID-19 dummy has a negative and significant coefficient (-0.2481; p= 0.011), which means that the COVID-19 pandemic decreased the real GDP by 24.8% compared to the situation before the pandemic. This outcome means that there was a huge impact of the pandemic on the economic growth of Ethiopia by hampering production, trade, investment, employment, and supply chains. The results agree with other sources such as the World Bank (2021) and the International Monetary Fund (2021). Both reported that there were significant slowdowns in economic growth among developing countries during the pandemic. Concerning the Ethiopian case, the findings agree with other sources such as the Ethiopian Economics Association (2021) and Abebe and Beshir (2022), which indicated that the outbreak of the pandemic has adversely impacted economic activities, employment, trade, and investments in Ethiopia. Thus, this finding means that shocks to the economy through pandemics could seriously hamper economic growth.

In general, from a long-term perspective, it becomes clear that there is a positive yet statistically insignificant contribution of remittances to economic growth, while foreign direct investments and financial development become the key determinants of long-term economic growth in Ethiopia. In other words, it can be concluded that the role of remittances in the development of the country can be enhanced via proper policies aimed at fostering investment opportunities for the diaspora population and channelling the remittance flows into productive sectors.

4.3.5 Error Correction Model

Table 4.7: Error Correction Model (ECM) Results

Dependent Variable: Δlrgdp

Variable	Coefficient	Std. Error	t-Statistic	P-value
ECT (-1)	-0.1650	0.0350	-4.71	0.000***

Source: Author's computation using Stata output.

Note: *** denotes significance at the 1% level.

The coefficient of the error correction term (ECT (-1)) is negative (-0.1650) and statistically significant at the 1% level ($p < 0.01$), confirming the existence of a long-run equilibrium relationship among the variables. The coefficient implies that approximately 16.5% of any

short-run disequilibrium is corrected each year, indicating a relatively slow but stable adjustment process toward long-run equilibrium.

4.4 Diagnostic Tests

The validity of the regression model was assessed using several post-estimation diagnostic tests, including tests for serial correlation, heteroskedasticity, and normality of residuals.

Table 4.8: Diagnostic Tests for the Estimated Regression Model

Diagnostic Test	Test Statistic	Probability Value	Decision
Breusch–Godfrey LM Test (Serial Correlation)	χ^2 (1) = 0.990	0.3197	Fail to reject H_0
Breusch–Pagan/Cook–Weisberg Test (Heteroskedasticity)	χ^2 (1) = 0.65	0.4219	Fail to Reject H_0
Skewness/Kurtosis Normality Test	Adj χ^2 (2) = 5.62	0.0602	Fail to Reject H_0 at 5%

Source: Author's computation using Stata output.

Interpretation

Serial Correlation Test

The Breusch–Godfrey Lagrange Multiplier (LM) test was employed to examine the presence of autocorrelation in the residuals of the estimated model. The test results yielded a chi-square statistic of χ^2 (1) = 0.990 with a corresponding p-value of 0.3197. Since the p-value exceeds the conventional significance level of 5% (0.05), the null hypothesis of no autocorrelation cannot be rejected. This indicates that there is no evidence of serial correlation in the residuals. Therefore, the error terms are independently distributed over time, satisfying one of the key classical linear regression assumptions and supporting the reliability of the estimated model results (Breusch, 1978; Godfrey, 1978; Wooldridge, 2020).

Heteroskedasticity Test

The Breusch-Pagan/Cook-Weisberg test was conducted for assessing whether there is any constant variance of the error terms through all observations. The outcome of the test resulted in a value of χ^2 (1) = 0.65 with a probability of 0.4219. Given that the probability value is higher than 0.05, we fail to reject the hypothesis of homoscedasticity. Therefore, this conclusion indicates that there is constant variance in the errors of the regression and thus no problem of heteroscedasticity (Breusch & Pagan, 1979; Greene, 2018).

Normality Test

The skewness/kurtosis test of normality was carried out to determine the normality of the residuals. The test gave an adjusted statistic value of χ^2 (2) = 5.62 and a p-value of 0.0602. Given that the p-value is just above 5% significance level, it means that the null hypothesis of normality cannot be rejected. Therefore, it can be concluded that the residuals are normally distributed within a 5% significance level. Even though the result is marginal, it supports the normality of the residuals, which in turn ensures valid hypotheses tests and confidence intervals (Jarque & Bera, 1987; Gujarati & Porter, 2009).

In summary, the diagnostic tests indicate that the model is free from serial correlation, heteroskedasticity, and non-normality problems. Therefore, the estimated ARDL model satisfies the major diagnostic requirements and is appropriate for inference.

Stability Test

Stability analysis of the estimated ARDL model was conducted with the help of the CUSUM test suggested by Brown, Durbin, and Evans (1975), which is one of the most popular procedures that allows testing for the stability of coefficients in an econometric model. Parameter stability is an indispensable requirement for receiving unbiased estimates in both the short run and long run because instability of coefficients may reflect structural breaks in the economy, which might affect the results and produce erroneous conclusions about appropriate policy measures (Gujarati & Porter, 2009; Pesaran et al., 2001).

Figure 4.3: CUSUM Stability Test for the ARDL Model

The Recursive CUSUM plot begins in 2015 rather than 2000 because the CUSUM test is based on recursive residuals, which require an initial estimation period before the recursive process can start. In the ARDL framework, a sufficient number of observations are first used to estimate

the model parameters, taking into account the lag structure and the number of explanatory variables. Consequently, the recursive residuals and the CUSUM statistic can only be computed after this initial estimation window, causing the plot to start in 2015 rather than at the beginning of the sample period (2000). This does not imply that observations prior to 2015 were excluded from the analysis; rather, they were used to estimate the initial model required for the recursive stability test.

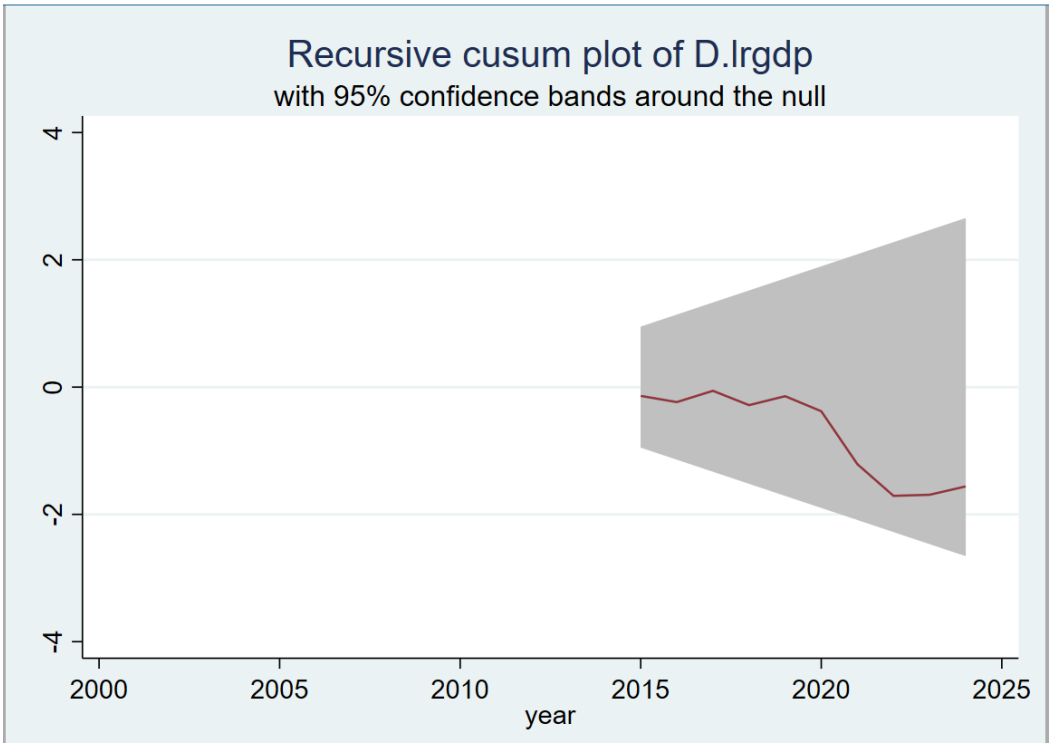


Figure 4.3 : that provides the outcomes of the CUSUM test of stability of the estimated ARDL model. The CUSUM plot falls within the limits of the 5 percent critical region over the sample period (2000-2024), which implies that the null hypothesis of stability cannot be rejected. Thus, the model parameters are stable and the model does not suffer from structural instability (Brown et al., 1975).

While there is a small downward trend in the value of the CUSUM statistics towards 2020 due to the pandemic, this statistic is well within the critical region. This shows that the pandemic had no major effect on the structural stability of the relationship. Including the dummy variable related to COVID-19 appears to have handled the shock brought by the pandemic adequately.

Consequently, the long-run and short-run parameters of remittances, gross capital formation, foreign direct investment, financial development, openness to trade, inflation, and the COVID-19 dummy variable are all found to be stable over the period covered in this paper. The CUSUM stability test has confirmed that the ARDL model is structurally stable.

Chapter five

Summary, conclusion and recommendation

5.1 Summary

This study examined the effect of remittances on economic growth in Ethiopia using annual time-series data covering the period 2000–2024. The study employed the Autoregressive Distributed Lag (ARDL) approach to investigate both the short-run and long-run relationships between remittances and economic growth while incorporating a structural-break consideration through a COVID-19 dummy variable. Real Gross Domestic Product (RGDP) was used as a proxy for economic growth, while remittances, gross capital formation, foreign direct investment, financial development, trade openness, inflation, and the COVID-19 dummy were included as explanatory variables.

Prior to estimation, stationarity tests were conducted using the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Zivot-Andrews structural-break unit root tests. The results indicated that the variables were integrated of order zero, I(0), and order one, I(1), with no variable integrated of order two, I(2), thereby justifying the use of the ARDL methodology.

The ARDL bounds test confirmed the existence of a long-run relationship among the variables. The estimated long-run coefficients revealed that foreign direct investment and financial development had a positive and statistically significant association with economic growth in Ethiopia. The COVID-19 dummy variable exhibited a negative and statistically significant relationship with economic growth, indicating that the pandemic period was associated with lower economic performance. Although remittances showed a positive coefficient, the relationship was statistically insignificant, suggesting that remittance inflows did not have a significant long-run association with economic growth during the study period.

The error correction model (ECM) results confirmed the existence of a stable long-run equilibrium relationship among the variables. The error correction term was negative and statistically significant, indicating that short-run deviations from long-run equilibrium were corrected over time. Diagnostic tests further indicated that the final estimated model was free

from serial correlation, heteroscedasticity, and non-normality problems, while the CUSUM and CUSUMSQ tests confirmed parameter stability throughout the study period.

5.2 Conclusion

Based on the empirical findings, the study concludes that remittances did not have a statistically significant long-run association with economic growth in Ethiopia during the period under investigation. Although remittance inflows increased substantially over time, their contribution to aggregate economic growth appears limited. This finding may suggest that a considerable proportion of remittance inflows is directed toward household consumption and other non-productive activities rather than investment in productive sectors capable of generating sustained economic growth.

The study also concludes that foreign direct investment plays an important role in promoting economic growth in Ethiopia. The positive and significant coefficient of FDI suggests that foreign investment contributes to capital accumulation, technology transfer, productivity enhancement, and employment creation.

Similarly, financial development was found to be positively associated with economic growth. This finding indicates that improvements in the financial sector enhance resource mobilization, facilitate investment activities, and support economic expansion.

The negative and statistically significant coefficient of the COVID-19 dummy indicates that major economic disruptions can adversely affect economic performance. The result highlights the vulnerability of economic growth to large-scale external shocks and underscores the importance of building economic resilience.

Overall, the findings suggest that while remittances remain an important source of foreign exchange and household income support, their direct contribution to economic growth is less evident than that of foreign direct investment and financial sector development

5.3 Recommendations

Based on the findings of the study, the following recommendations are proposed:

5.3.1 Promote the Productive Utilization of Remittances

Although remittances were not found to have a statistically significant association with economic growth, they remain an important source of financial inflows. The government should design policies that encourage remittance recipients to channel funds toward productive investment activities such as small and medium enterprises, agriculture, manufacturing, and entrepreneurship rather than concentrating primarily on consumption expenditures.

5.3.2 Strengthen Foreign Direct Investment Promotion

Since foreign direct investment was found to contribute positively to economic growth, policymakers should continue efforts to attract and retain foreign investors through improvements in the business environment, regulatory efficiency, infrastructure development, and investment incentives. Enhancing investor confidence can increase capital inflows and support long-term economic growth.

5.3.3 Enhance Financial Sector Development

The positive contribution of financial development suggests the need for continued financial sector reforms. Expanding access to financial services, promoting financial inclusion, strengthening banking institutions, and improving the efficiency of financial intermediation can support investment and economic growth.

5.3.4 Improve Economic Resilience Against External Shocks

Given the negative impact associated with the COVID-19 period, policymakers should strengthen mechanisms that enhance economic resilience during future crises. This may include diversifying sources of economic growth, improving social protection systems, strengthening public health preparedness, and developing contingency measures to mitigate adverse economic shocks.

5.4 Limitations of the Study and Areas for Future Research

Despite providing useful insights, the study has several limitations. First, the analysis relies on annual data covering only twenty-five observations, which may limit the degrees of freedom available for estimation. Second, the study incorporates a single structural-break proxy through the COVID-19 dummy despite evidence of other structural changes during the study period. Third, remittance data may not fully capture informal remittance channels that are common in

Ethiopia. Finally, the study employs a single ARDL specification and does not conduct alternative robustness estimations.

Future studies may utilize longer datasets, consider multiple structural-break frameworks, employ alternative estimation techniques such as FMOLS, DOLS, or VECM, and explore the sectoral effects of remittances on economic performance in Ethiopia.

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Annex I – Stata Output

Variable	Obs	Mean	Std. dev.	Min	Max
rgdp	25	1179320	712715.1	364984.3	2603953
rem_gdp	25	5.948141	5.849796	.404993	27.38656
gcf_gdp	25	37.35592	31.70212	5.059957	116.6301
fdi_gdp	25	3.866922	4.171932	.0026513	18.38097
fd_gdp	25	17.79427	18.75716	3.584169	67.8445
top_gdp	25	37.20117	40.81879	4.892976	187.037
inf	25	15.16301	11.54316	-10.78445	36.37902

ARDL Bounds Test for Cointegration

Pesaran, Shin, and Smith (2001) bounds test

H0: no level relationship F = 34.582

Case 3 t = -4.712

Finite sample (7 variables, 24 observations, 0 short-run coefficients)

Kripfganz and Schneider (2020) critical values and approximate p-values

	10%		5%		1%		p-value	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F	2.560	3.991	3.166	4.855	4.747	7.098	0.000	0.000

t | -2.521 -4.103 | -2.933 -4.643 | -3.814 -5.811 | 0.002 0.046

do not reject H0 if

either F or t are closer to zero than critical values for I(0) variables

(if either p-value > desired level for I(0) variables)

reject H0 if

both F and t are more extreme than critical values for I(1) variables

(if both p-values < desired level for I(1) variables)

decision: no rejection (.a), inconclusive (.), or rejection (.r) at levels:

| 10% 5% 1%

---+---

decision | .r .r .

Error Correction Representation (ECM) of the ARDL model, and it already contains the Long-Run (LR) coefficients and the Adjustment (ADJ) coefficient.

. ardl lrgdp lrem lgcf lfdi lfd ltop inf covid, maxlags(1) ec

ARDL(1,0,0,0,0,0,0,0) regression

Sample: 2001 to 2024 Number of obs = 24

R-squared = 0.9486

Adj R-squared = 0.9211

Log likelihood = 84.81787 Root MSE = 0.0089

D.lrgdp | Coefficient Std. err. t P>|t| [95% conf. interval]

---+---

ADJ |

lrgdp |

L1. | -.1650288 .0350217 -4.71 0.000 -.2396759 -.0903817

---+---

```
LR          |
       lrem |   .0023375    .073877     0.03   0.975    -.1551276    .1598027
       lgcf |   .1386292   .0968115     1.43   0.173    -.0677197    .3449781
       lfdi |    .158189   .0359227     4.40   0.001     .0816217    .2347564
        lfd |   .3352886   .0787415     4.26   0.001     .1674551    .5031221
       ltop |  -.0188892   .0585688    -0.32   0.752    -.1437257    .1059473
        inf |   .0009009    .001235     0.73   0.477    -.0017314    .0035332
      covid |  -.2481406   .0855252    -2.90   0.011    -.4304332    -.065848
-------------+----------------------------------------------------------------
SR          |
      _cons |   2.142819   .4227263     5.07   0.000     1.241799    3.043839
------------------------------------------------------------------------------
Lag-order selection criteria
  Sample: 2004 to 2024                            Number of obs = 21
 +---------------------------------------------------------------------------+
 | Lag |    LL      LR      df    p      FPE       AIC      HQIC      SBIC    |
 |-----+---------------------------------------------------------------------|
 |   0 | -66.1162                    .000602   6.77298   6.82695   7.02167  |
 |   1 |  51.8239  235.88    25  0.000 9.3e-08  -2.07847  -1.75463  -.586291  |
 |   2 |  90.1783  76.709    25  0.000 4.3e-08  -3.35032  -2.75661  -.614664  |
 |   3 |  171.354  162.35    25  0.000 1.2e-09*  -8.7004  -7.83683  -4.72127  |
 |   4 |  2935.27  5527.8*   25  0.000       .  -269.549* -268.416* -264.327* |
 +---------------------------------------------------------------------------+
  * optimal lag
  Endogenous: lrgdp lrem lgcf lfdi inf
  Exogenous: _cons
```

DATA

Year	RGDP	GCF	FDI	TOP	FD	REM	INF
2,000	364,984.33	18,468.05	432.20	9,535,903.74	34,035.10	1,478,161.04	-0.2
2,001	392,058.84	20,242.75	256.00	10,615,952.87	28,098.96	1,703,689.14	-10.8
2,002	398,464.76	20,561.43	122.30	12,170,882.03	28,689.43	2,003,570.61	10.9
2,003	390,102.91	28,978.01	10.34	16,326,309.61	31,652.96	2,874,367.11	7.3
2,004	435,859.45	31,895.72	1,297.77	23,048,344.56	40,873.53	5,041,586.28	6.1
2,005	490,970.44	41,836.64	3,169.43	27,712,152.85	49,298.60	6,395,957.23	10.6
2,006	547,625.36	47,975.67	4,583.59	33,020,809.15	61,846.88	9,282,505.72	15.8
2,007	612,217.20	70,003.46	7,530.24	45,217,386.84	78,475.08	16,525,384.03	25.3
2,008	680,706.93	96,074.57	9,312.80	55,233,988.00	89,205.89	18,780,016.32	36.4
2,009	749,058.85	119,166.57	12,379.13	79,453,047.95	104,416.17	23,801,350.28	2.8
2,010	828,212.74	164,525.71	20,026.37	111,345,188.77	135,558.56	30,839,180.52	18.1
2,011	922,512.81	275,811.34	18,497.58	149,990,442.74	189,122.06	33,631,549.17	34.1
2,012	1,002,766.88	293,930.70	22,409.01	160,368,831.39	233,406.35	45,300,633.26	13.5
2,013	1,102,467.82	400,841.24	27,982.08	193,166,788.90	299,729.65	58,099,432.03	8.1
2,014	1,216,015.26	508,975.86	44,254.01	225,329,836.04	393,439.76	76,267,292.41	7.7

2,015	1,342,555.90	585,665.00	68,988.55	236,446,876.41	490,230.38	85,633,955.00	9.7
2,016	1,449,397.45	704,596.00	93,483.06	240,821,311.54	631,092.76	99,216,060.32	7.4
2,017	1,596,481.63	751,626.21	97,212.26	272,769,216.62	784,621.75	134,218,896.49	14.6
2,018	1,719,491.33	948,866.00	84,594.97	286,629,498.34	963,699.94	148,391,089.35	12.6
2,019	1,874,689.30	1,031,962.81	75,823.13	310,459,814.30	1,302,948.27	134,068,339.16	19.9
2,020	1,989,587.75	1,216,585.00	154,325.71	421,371,982.19	1,659,218.41	193,246,919.24	20.2
2,021	2,114,238.31	1,560,324.77	160,655.77	642,004,783.75	2,195,732.48	257,812,419.53	33.8
2,022	2,248,662.83	1,933,863.00	182,655.52	649,664,516.39	2,711,304.05	248,135,857.71	32.5
2,023	2,409,921.42	2,424,729.18	218,577.18	729,493,560.30	3,133,736.30	305,211,723.61	26.6
2,024	2,603,952.86	3,036,992.91	478,631.82	2,154,773,056.49	4,837,114.91	713,133,100.89	16.0