DETERMINANTS OF BANK AGRICULTURE CREDIT AND ITS EFFECT ON POVERTY, INCOME INEQUALITY, UNEMPLOYMENT AND ECONOMIC GROWTH IN ETHIOPIA

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The author was born on September 02, 1991 in Gelemso Town of West Hararghe in Oromia Regional State, Ethiopia. He attended his primary education at Gelemso Number Two Primary School and his secondary education at Gelemso Secondary and Preparatory School. He enrolled at Adama Science and Technology University in 2011 and graduated with a Bachelor of Arts in Economics in 2013. Soon after his graduation from Adama Science and Technology University, he has joined Commercial Bank of Ethiopia as a Junior Officer at Jigjiga City in 2013. Furthermore, the author graduated with Masters of Business Administration from Jigjiga University in 2017. The author joined Bank of Abyssinia in April 27 as Banking Business Manager at Gelemso and Haramaya City. Further, the author joined Oromia Bank as Branch Manager in May 10, 2022. Apart from banking industry the author also works as part time instructor at University and Colleges found at Dire Dawa city. He started his doctoral study in Agricultural Economics at Haramaya University's School of Agricultural Economics and Agribusiness in November 2021. Development economics, international trade, environment and finance are some of the author's areas of research interest.

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ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dicky Fuller
AMG	Augmented Mean Group
ARDL	Autoregressive Distributed Lag
ESS	Ethiopian Statistical Service
GDP	Gross Domestic Product
MDGs	Millennium Development Goals
NBE	National Bank of Ethiopia
OLS	Ordinary Least Square
PCSE	Panel Corrected Standard Error
SSA	Sub Saharan Africa
UNDP	United Nations Development Program
VAR	Vector Autoregressive
WB	World Bank

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ABSTRACT

Harshly, the problem of poverty and income inequality overwhelmed a tremendous portion of populations across developing countries like Ethiopia and remains one of the economic curses posing catastrophic consequences on society's economic as well as social wellbeing. Hence, this study investigated the effects of extending bank agriculture credit on poverty level and income inequality in Ethiopia. The study used unbalanced panel data from 2000 to 2021 collected from 11 regional states in Ethiopia. Additionally, the study determined the effects of bank agriculture credit on unemployment and GDP per capita in Ethiopia using time series data from 1990 to 2021. Moreover, the study identified the main determinants of bank agriculture credit volume injected by commercial banks in Ethiopia using panel data from 2010 to 2021. While figuring out the relationship between bank agriculture credit and poverty level and income inequality; the study adopted Panel Corrected Standard Error (PCSE) basing its robust feature on effectively controlling spatial correlation, heteroscedasticity, and cross-sectional dependence in panel data setting. The time series analysis is conducted using the Auto-Regressive Distributed Lag model (ARDL). Additionally, the Augmented mean group (AMG) model is adopted based on the panel data setting to figure out determinants of bank agriculture volume of commercial banks in Ethiopia. The result from mean difference test reveals that, from the total banks outstanding loan only 14% goes to agriculture while 61% and 25% is granted to service and industry sectors respectively. The regression result also reveals that bank agriculture credit has a significant and negative effect on poverty level, income inequality, and unemployment and has a positive and significant effect on GDP per capita in Ethiopia. Finally, bank-specific and macroeconomic factors such as deposit volume, return on assets, branch network, and economic growth positively and significantly determine the volume of bank agriculture credit provided by commercial banks while interest rate spread, climate change and inflation negatively and significantly determine the credit volume. Therefore, renovating the credit distribution aimed at directing the magnitude towards the agriculture sector is vital to flourishing the society's economic well-being.

Key Words: Bank Agriculture Credit; Ethiopia; Income Inequality; Panel Corrected Standard Error; Poverty Level.

1. INTRODUCTION

1.1. Background of the Study

Poverty and income inequality remain a hot macroeconomic issue for government and non-governmental organizations both at the national and international levels. Despite plenty of measures to reduce poverty, it continues to affect a significant portion of people at the world level. A tremendous portion of population or nearly 1.1 Billion people at world level lives with acute poverty in 2024, where around 40% of them suffers from war, prevalence of political turmoil and absence of peace (UNDP, 2024). In the past decades, the move towards reducing poverty has a good progress. However, this progress was halted between 2020 to 2022 due to significant crises and shocks. In this specific period, poverty shows an increasing trend in low-income countries and they are unable to recover from poverty. This condition puts a big doubt on the achievement of the Sustainable Development Goals (SDGs) of ending extreme poverty by 2030. In sub-Sahara Africa (SSA) which is characterized by political turmoil where majority population lives in poverty are found in the rural part of Africa (World Bank, 2022). Similarly, World Inequality Database (2022), indicates income inequality remains high across African regions. In the Ethiopian context, the past two decades show good progress in poverty reduction and a slight increase in income inequality (World Bank, 2016). However, contrary to this progress recently, the United Nation Development Program (2022) report shows that the poverty level indicates an increasing trend after 2020. According to the report due to shocks and the prevalence of war, the poverty headcount ratio shows a high figure compared to 2016.

Correspondingly, SSA region is characterized by rampant unemployment despite its population is dominated by young labors which has the capability to foster economic development in the region. The prevalence of unemployment even encompasses those regions that recorded substantial economic growth for decades (Akeju and Olanipekun, 2014). According to Nicola *et al.* (2020) the recent soar in unemployment rate in region is triggered by economic shocks, COVID-19, persistence of war and oil price volatility which ignites the problem through recession. The spike of unemployment poses negative implications in the

region by escalating poverty, high crime rate and endless migration through illegal mechanism hoping to improve their living conditions (Agbor, 2024). Hence, the issue of unemployment remains a global macroeconomic problem and it predominantly persists in sub-Sahara Africa. Aimed at halting the welfare eroding consequences of unemployment, policy makers and government organs has coined different policy instruments. Correspondingly, ensuring of sustainable growth in the region also remains a major policy concern. Ensuring improved economic progress is essential to strengthen the living standard and wellbeing of the society. In line with this, the region recorded 2.4% growth in economy in 2023. However, the surge in economic growth was significantly affected by the increasing conflict, violence and climate shocks through interrupting economic activities in the region. Despite a growth figure the conventional economic performance in the region is at its early stage which lags far behind the average of developed countries (World Bank, 2024).

It was apparent that the agriculture sector plays a prominent role in SSA countries' economies, where most of their population lives in rural areas. The majority of least-developed countries rely on this sector and it provides livelihoods for most of the population in the region. The sector contributes labor and resources for the development of the remaining sectors; namely industry and the service sector (FAO, 2015). The role of this sector is huge, especially in developing countries where it covers the lion share of gross domestic product and employment creation. Food self-sufficiency and rural development are realized in the region through the improvement of the sector since it plays a significant role in the economy (Pawlak and Kołodziejczak, 2020). In Ethiopia, the agriculture sector plays a significant role and it contains the majority of the population which comprises 79% of the total population in 2019. In line with this, the government aimed to apply growth and transformation plan to support and increase national income and make Ethiopia to be a middle-income country by 2025 (World Bank, 2018). The agriculture sector in Ethiopia was an engine for economic growth. Undeniably, the sector contributes 32.4% of GDP; it accounts for 80% of exports and tremendous labor employment (National Bank of Ethiopia, 2022). Plenty of literature argues that, agricultural productivity has the potential to curb poverty and food insecurity. However, in Ethiopia, the agriculture sector shows a dwindling trend due to multiple factors like limited access to fertilizer, very few agricultural lands getting access to irrigation, and fragmented land cultivation practices by many farmers which restrain them even feeding their families. In

addition to low productivity, post-harvest LOSS on crops due to many factors such as fungi, pests, and physical harm on farm products affect the sector (Asfaw *et al*., 2021). Furthermore, the sector also suffers from marginalized concerns or doesn't get the necessary concern from the government, inadequate mechanization and supply of agricultural inputs, inadequate credit facilities, and access to technology (Diriba, 2020). The inadequate income generated from the sector forced the labor force to be employed in other non-farm sectors at low cost to cover their basic needs (Adem *et al.,* 2018).

Despite the agriculture sector being the backbone of the Ethiopian economy, the country failed to curb poverty and income inequality. Still, poverty in Ethiopia gradually decreased, dropping from 39 % in 2004 to 24 % in 2016. Despite this poverty level shows an increasing figure in recent times and it rose to 27% in 2021 (UNDP, 2022). However, there exists a disparity in poverty reduction levels in rural and urban areas, where the rate of poverty reduction in urban areas was better than in rural areas (WB, 2016). The real consumption growth in the rural part of the country shows unsatisfactory growth, where the real consumption growth shows a dwindling trend between 2004 and 2015 which leads to the worsening of poverty in these periods (WB, 2016). Further, income inequality is also another issue in recent times which emanates due to the difference in welfare delivery between the urban and rural populations (WB, 2021). Income inequality in the Ethiopian context showed relatively stable status until 2011 and showed a slight increase in 2016 with a 0.33 Gini Coefficient (World Bank, 2016). At the national level, the trend of inequality (Gini coefficient) shows almost a constant trend which is between 28 and 29% for the period 1996 to 2011. However, the little or dwarfed consumption growth by the poor between 2011 to 2016 indicated that the total consumption at the bottom 10% of the population decreased and the consumption for the 10% at the top increased. Due to this, the total consumption by the top 10% of the population was seven times greater than the 10% poor at the bottom in 2011 and this figure increased to 9 times in 2016. This condition leads to widening income distribution gap at the national level. The consumption by the richest increased between 2011 and 2016 while the consumption level by the poor remained stagnant between the aforementioned periods. The main triggering factor for the modest increase in inequality was due to the disparity between the urban and rural areas in which the urban receives better welfare leading

to increasing consumption between 2011 and 2016 and the rural experienced infant growth in consumption (World Bank, 2020).

Apart from poverty and income inequality, high unemployment becomes a common phenomenon in Ethiopia. The rural and urban unemployment in Ethiopia is characterized by an up surging trend coupled with high underemployment where the unemployment in rural area increased 2.69 times in 2021 than the year 2013. This reveals that the figure changed from 1.33% in 2013 to 3.58% in 2021. Similarly unemployment rate shows a 1.54 times increase between 2013 and 2021 in urban areas (Central Statistics Agency, 2021). According to (Yami *et al.* (2020) multiple problems like access to education, financial problem and lack of basic infrastructure aggravated the problem of youth unemployment in rural Ethiopia. Further, high population growth in the country coupled with insufficient job creation which able to absorb the growing labor force has aggravated the problem. This reveals that high population growth put a significant stress on agricultural land and absence of other employment opportunity seriously affects the increasing labor force (Geda, 2022). Additionally, despite Ethiopia shows a good progress in economic growth in the past two decades, the growth performance shows a staggering performance between 2015 and 2016 due to drought and adverse weather condition at global level (Yegnanew, 2023). Further, the prevalence of COVID-19 pandemic, persistent war in the north and drought also forced the coutry to experience a sharp decline in real output growth onward from 2019. Further, this condition forced the country to experience deteriorated living standard for the first time after the last two ecades (World Bank, 2024).

Agriculture finance has a significant role in the strengthening agricultural sector and rural development by enabling the sector to get access to technology, better soil fertility practices, better pest management, and high-yielding seeds which enables farmers to utilize their full potential (Poulton *et al*., 2010). Promoting the private sector and non-governmental actors to increase mechanization, commercialization, irrigation, and better access to fertilizer, high-yielding varieties, and pesticides can be achieved through facilitating finance and increasing allocation of foreign currency to generate optimum production and revolution in the agriculture sector (Nin-Pratt and McBride, 2014). The provision of credit helps to reduce poverty in developing countries by adopting green revolution technologies which bring better

productivity to the sector (Evans, 2009). However, the pervasive poverty especially in Sub-Sahara African countries coupled with erratic financial inclusion in the region hampered small holders' accession to financial services. This problem remains a bottleneck for smallholders from utilizing the aforementioned inputs which leads to weak development of the sector and increased poverty (Ayanlade and Radeny, 2020). Apart from this abundance of agriculture finance also plays a supporting role in improving the level of income and agriculture development at the national level (Assunção *et al*., 2020). Increasing the supply of agriculture credit remains the most effective technique in developing countries to realize improved per capita GDP and poverty reduction. According to Joao and De Castro (2023), extending agriculture credit in the economy drove up the agriculture GDP. Raymond (2020) and Azolibe *et al.* (2022) also revealed the unemployment rate reduction role of extending bank agriculture financing. The increased supply of credit in the agriculture sector remains an effective technique to realize increases in the real income of the masses through increased productivity which triggers people's engagement in agricultural activities and facilitates employment creation.

Finally, to realize agricultural transformation and to increase productivity in the sector, farmers' access to credit enhances farmers' access to mechanization, commercialization of irrigation, and better access to fertilizer, high-yielding varieties, and pesticides (Mausch *et al*., 2018). In the same fashion, this study investigated how bank agriculture credit affects poverty level and income inequality in Ethiopia at the macro level. The study also determined the role of agricultural credit in reducing the level of unemployment and per capita GDP of Ethiopia.

1.2. Statement of the Problem

Although Ethiopia has shown progress in well-being in the past decade, millions of its citizens live below the poverty line, increasing income inequality, and with Per capita Gross National Income of 1,020 USD in 2022, the country remains one of the poorest countries in the world and classified as a low-income country despite its endeavor to reach lower middle income by 2025 (World Bank, 2023). Additionally, according to Niken *et al.* (2023) the recent the spiking of unemployment rate in the country seriously erodes the society's welfare amid excessive demand for employment. Currently, close to 2 to 3 million young people join the

labor market where the majority of the labor force in rural areas get underemployed coupled with a high unemployment rate in urban areas (UNDP, 2022). Being the biggest threat to the world economy, the welfare dwarfing effect of unemployment remains one of the world's macroeconomic curses. Despite, Ethiopia experiencing remarkable achievement in economic growth recently and being recognized as fast-growing economy in Africa, there was also a simultaneous surge in the unemployment rate. This condition is further intensified by the staggering real output growth which shows a sharp decline after the advance of 2019 (Niken *et al.*, 2023). The trend of unemployment in Ethiopia witnessed a spiking status starting from 2019 to 2022 due to persistent political instability and the threatening impact of COVID-19 on economic sectors (Shuker and Sadik, 2024). Several policy measures were suggested by many works of literature to pursue sustained economic growth on one hand and to tackle society's welfare-threatening factors like unemployment, Poverty, and income inequality on the other. Among others, well-organized and efficient financial services namely credit supply and their effects on economic well-being through different transmission mechanisms have reached its peak recently.

Financial inclusion or community accession to financial services helps society to easily build their capital through saving, getting access to credit, and insurance, and reducing transaction costs. Access to financial services plays a significant role in alleviating poverty and income inequality through enhancing the low-income society to startup a business. Financial access enables the poor to get credit access (Abor *et al.*, 2018). According to Demirgüç-Kunt *et al.* (2018) access to finance remains the main solution to alleviate poverty and income inequality through enabling the rural unbanked and poor society, vulnerable groups like women and low-income families to benefit from borrowing, and payment. However, the mass of the agricultural sector population was disregarded from financial access which restrains them from saving, investment funds, and wealth building in the sector. Access to a better credit system supports the poor by protecting them from being exploited by informal creditors, to cope with sudden shocks and reduce the cost of capital.

Despite the fact that agricultural credit plays a marvelous role in increasing agricultural productivity and breaking the cycle of poverty, the status of agricultural finance in Ethiopia shows a dwindling trend even after the 1991 economic reform. The worst characteristic of the

credit provided by financial institutions was that the majority of smallholders in agricultural sectors were the most affected when compared to other sectors in Ethiopia. The erratic provision of credit services to the sector was shown in credit–to–aggregate value of total agriculture production which was 6% for the last two decades (Abate *et al.,* 2016). Unequal financial services to economic sectors characterize the current credit provision system by banks in Ethiopia. For instance, of the total outstanding loans provided to economic sectors by commercial banks, only 9.3% went to agriculture, and the remaining huge amount was granted to sectors like domestic trade and services, exports, manufacturing, and construction (NBE, 2021). Despite the big role of the agriculture sector, the credit provision was inclined to other sectors.

The majority of previous studies like Teklewold (2003), Negussie and Ndinda (2017), Amanuel and Degye (2018), and Adamu (2022) focus on the credit provided to the agriculture sector by microfinance cooperatives and its implication on farmers living improvement on one hand and agriculture sector improvement on the other. They also disregarded the role of banks' agriculture credit service for the sector. However, the role of commercial banks in Ethiopia should get attention since the total credit outstanding in the country was huge as compared to microfinance, and almost more than 90% of the total assets of the financial sector were owned by commercial banks (World Bank, 2015). This indicates that there is no comprehensive study conducted in Ethiopia that considers the role of channeling of huge financial capital to agriculture sector circulated by banks in the economy on poverty and income inequality. Hence this study filled this gap by thoroughly examining how sector specific credit access that encompasses the neglected portion of the society enables the mass to get rid of poverty and ensures equitable income distribution in the society.

Additionally, the inclusive provision of credit like bank agriculture credit by banks and its implication on economic well-being improvement as well as labor market efficiency is highly disregarded by literature conducted so far in Ethiopia. Carefully examining the role of increasing credit access to economic sector like agriculture that provides a livelihood for majority of the society is decisive to determine its effect on the spiking unemployment. Simultaneously, existing literatures merely focuses on how total credit supply magnify the overall growth figure without considering the inclusiveness of the credit provision and

disregarded whether the mass harness the economic benefit from it. Even though, total credit supply contributes significantly to economic growth through initiating investment, disbursing of concentrated and huge credit amounts to limited customers in economic sectors like service and industry might support the overall output in the economy but still the economic wellbeing of the mass that depend on agriculture and agribusiness get constrained from utilizing the resource. According to Feghali *et al*. (2021) granting of financial services in the economy must be inclusive and must consider the mass portion of the society, especially economically vulnerable and disadvantaged groups. Therefore this study rigorously unveiled the role of bank agriculture credit on employment creation for tremendous labor forces who participates in agriculture and agribusiness activities through its labor intensive attributes. Moreover, the study determined effects of bank agriculture credit on economic improvement using GDP per capita as a proxy variable considering its feature of accompanying the living standards of the society rather than using a single growth proxy like GDP.

Even though agriculture credit has a big role in strengthening the sector, the aforementioned evidence shows that the current status of agricultural credit disbursement shows the little attention paid to the sector. However, studies show that the rural poverty level as compared to the urban poverty shows little improvement which drags the poverty reduction objective of the government. Furthermore, keeping the relatively stable income inequality in Ethiopia until 2011, the recent increase in income distribution gap in the country emanated from the difference in welfare provision between urban and rural residents in favor of the urban population. The outstanding credit by commercial banks was mainly focused on other sectors rather than the agriculture sector. Even, more than 80% of bank agriculture credit provided in Ethiopia is provided by Development Bank (NBE, 2021). This indicates the contribution of commercial banks in granting agriculture loans is very low as compared to the other sectors. Ironically, few studies like Gebisa (2014), Nebiat (2017), and Zerihun *et al.* (2022) were undertaken to investigate the determinants of bank agriculture credit performance. For instance, Zerihun *et al.* (2022) investigated determinants of bank agriculture credit performance in Ethiopia. However, this study used time series data of all commercial banks and development banks to figure out the issue. But, as discussed earlier the volume of agriculture credit was very limited in commercial banks, and investigating or figuring out bank-specific and macroeconomic determinants of commercial banks' agriculture credit alone

is essential to identify those factors that determine little credit volume in commercial banks. Despite commercial banks having a big role in providing finance to the economic sector their provision to the agriculture sector is limited. This study fills this gap by taking panel data of commercial banks in Ethiopia. The rationale behind using panel data lies in its advantage of accommodating the good identities of both the cross-sectional and time-series data, and due to the dynamic nature of the variables of interest. This type of data set is widely used for its advantage in estimating dynamic econometric models. The study used panel data for the last objective because that offers greater scope to investigate heterogeneity in adjustment dynamics between different types of individuals/countries (Hsiao, 2003). Although, plenty of existing literatures (See: Amano, 2014; Berhanu, 2016; Zelalem, 2017; Taye, 2020; among others) were undertaken to determine the lending decision of commercial banks in Ethiopia, the study fails to examine determinants of specific economic sectors credit supply. Additionally, these studies utilized conventional panel data analytical techniques like ordinary least squares (OLS), fixed effects, and random effects which are not robust when problems like endogeneity, cross sectional dependence, and heterogeneity persists in the data set. Aimed at overcoming such analytical shortcomings; the recently introduced Augmented Mean Group (AMG) model is used. So, this study is intended to empirically delve into determinants of bank agriculture credit and its effect on poverty, income inequality, unemployment and economic growth in Ethiopia.

1.3. Research Questions

This study tries to answer:

1. Does bank agriculture credit reduce the level of poverty and income inequality?
2. What is the effect of bank agriculture credit on unemployment and per capita income in Ethiopia?
3. What are the determinants of bank agriculture credit volume in commercial banks in Ethiopia?

1.4. Research Objectives

The general objective of the study is to analyze determinants of bank agriculture credit and its effect on poverty, income inequality, unemployment and economic growth in Ethiopia.

The specific objectives of the study are:

1. To determine the effect of bank agriculture credit on poverty level and income inequality in Ethiopia;
2. To analyze the effects of bank agriculture credit on unemployment and per capita GDP in Ethiopia; and
3. To identify the determinants of bank agriculture credit volume of commercial banks in Ethiopia.

1.5. Significance of the Study

Ensuring income self-sufficiency and fair distribution of income among the society gets a major concern by government organs and policymakers. Financing agriculture contributes significantly to bridge the financial needs of farmers and fulfills their need to build capital and to smoothly undertake their farm production. In developing countries, like Ethiopia where agriculture is the source of employment and livelihood for the majority of the society, better agriculture production and return from it plays a major role in lifting the society from poverty and ensuring fair income distribution. This study helps the government and concerned organs on the role of credit provision for the agriculture sector in alleviating poverty and income inequality and how to harness the benefits of it to overcome those problems.

In similar fashion this study significantly contributes to existing knowledge and policy makers who are striving to handle the rampant macroeconomic curses like unemployment by uncovering the role of agriculture credit create employment opportunity for the marginalized mass in the labor market through its inclusive role. Correspondingly, the study provides important insight for government organs on improving economic growth through channeling the immense financial capital to agriculture sector which circulate in the economy. Finally, the study helps commercial banks in Ethiopia in dealing with those significant factors that promote as well as hamper agriculture loan provision. These reveal that commercial banks

able to identify and handle those significant factors to improve their credit concentration risk level and to provide equitable credit provision to different economic sectors in Ethiopia.

1.6. Scope and Limitations of the Study

This study focused on bank agriculture credit and its implication on poverty level and income inequality in Ethiopia at the macro level by using panel data from 2000 to 2021. The study also investigated how bank agriculture credit affects GDP per capita and unemployment at the national level by taking time series data from 1990 to 2021. Moreover, the study identified bank-specific and macroeconomic factors that determine agriculture credit volume provided by commercial banks in Ethiopia by taking panel data. The study determined the role of bank agriculture credit on the aforementioned economic wellbeing components at macro level by incorporating other macroeconomic variables which are integrated from in-depth review of theoretical and empirical literatures. While uncovering effects of agriculture credit on poverty and income inequality; the study used poverty headcount ratio and Gini coefficient respectively. On the other hand, to represents unemployment and economic growth; proxy variables like number of unemployed as a percentage of total labor force and GDP per capita respectively was used. The study also discussed different theoretical reviews that associate credit provision and its implication on poverty, income inequality, unemployment and economic growth to build comprehensive understanding of their inter-linkage.

Despite the aforementioned economic wellbeing problems persists in SSA; this study was geographically limited to Ethiopia only. The other limitation of the study was stemmed from the problem of data availability which constrained the scope in terms of time and cross-sectional units. The challenges of data availability problem are alleviated by using unbalanced panel data rather than time series analysis for the first objective of the study. The other limitation of the study is that empirical determination is made from the supply side but still, micro-level consideration also strengthens the study. Despite this, the study deeply reviewed the literature and integrated the main macroeconomic determinants that affect the economic wellbeing of society.

1.7. Organization of the Study

This study has five chapters. The first chapter explains the background, and statement of the problem, the outlines research questions and objectives, scope and limitations of the study. The second chapter starts with discussing definitions and concepts of basic terms and is followed by reviewing the theoretical foundations of the study. Moreover, the second chapter describes the methodological framework, and analytical framework, reviews empirical literature and formulates conceptual framework of the study. The third chapter deals with research methodology and specifically describes the study area, research design, data type and source, population, sample size and sampling technique, method of data analysis and description of variables. Chapter four demonstrates descriptive analysis and presents econometric results in accordance with studies specific objectives. Finally, the fifth chapter concludes and summarizes the main findings of the study and recommends policy implications based on the findings.

2. LITERATURE REVIEW

This chapter defines basic terms and concepts, and discusses different theoretical foundations and empirical findings. The section also presents methodological and analytical methods were discussed in detail. Based on the reviewed literature the study finally develops and presents the conceptual framework of the study.

2.1. Definition of Basic Terms and Concepts

Agriculture Credit: Agriculture credit is a financial service provided by financial institutions for farmers to help them reconcile their financial needs which is created by the imbalance between income and their expenditure. Financing the agricultural sector was considered a driving force to facilitate agricultural growth. Apart from utilizing agriculture loans, the sector also uses the credit for processing as well as facilitating the sales of agricultural products. Provision of agriculture credit especially for small and poor farmers who comprise the majority of the farming population helps to reduce the level of poverty. However, many problems like the inability to repay, risks in investing in the agriculture sector, lack of collateral, and seasonality of agricultural production hindered financial institutions from providing loans to the sector (Khan *et al.*, 2011).

Poverty: Literature forwards various definitions and indicators of poverty depending on its multidimensional nature and this gave rise to divergent definitions of poverty. The multi-dimensional and varied concepts of poverty forced researchers and government organs to follow different understandings of the problem and measurement. Those who investigate the problem of poverty tend to understand the concept under three categories namely: absolute poverty minimum or having less to fulfill basic needs, relative poverty or having less when compared to what others have and the third category that contains the first two categories states that poverty is when an individual feels that he does not possess enough to manage to live or survive (Panday, 2008). The consideration of poverty from those three components urges to give varied understanding and quantifying of poor people under the specific population of a nation.

The absolute poverty definition of poverty is based on the concept of minimum subsistence or the availability of necessary goods and services necessary for one's existence. Equivalently those individuals in the population who lack financial assets to fulfill these needs are considered poor, whereas most literatures at current time apply this method while investigating poverty. Despite this relative poverty approach starts by considering the mean or median income of a society as representative of the lifestyle in a given population and those who earn less than that average are considered poor and fail to meet the requirements to live that lifestyle (Eskelinen, 2011). However, this approach is criticized in that it fails to base data that show the quality of life in poor lives and while measuring poverty certain population's income fall below the average indicating the persistence of poverty in a population.

Income Inequality: According to the Society for International Development (2004), poverty is the level of disparity or difference in the distribution of economic welfare generated in the economy from equal share between populations. In the same fashion, income equality is the fair or equal distribution of economic welfare in a society. A nation that experiences equal income distribution for each individual in the economy has an equal share of income but when the income generated in the economy is owned in the hands of one individual it leads to perfect income inequality (Gehring and Kulkarni, 2006).

Unemployment: It refers to the circumstance used to represent labor forces that are found in working age group and actively seeking for employment but failed to get employment opportunity. According to International Labor Organization, unemployment is defined as a person who is found in working age, able to and looking for paid employment in specified period of time but unable to get work (World Bank Indicators, 2021). Prevalence of unemployment often associated with labor market inefficiency which poses a negative implication on socio-economic wellbeing of the society. The rise in unemployment level erodes the living standard of the society and retards the economic performance by cutting consumption level as well as motives for investment. Furthermore, the accumulation of unutilized labor escalates the human capital inefficiency level resulting in macroeconomic instability (Hjazeen *et al.,* 2021).

GDP Per capita: It is the widely applied technique to indicate the extent of living standard achieved by the populations of a given country. Unlike economic measures like gross domestic product; this measure has is capable of better reflecting the economic wellbeing of a society since it further divides the total output to the total residents of the country. High level of GDP per capita indicates the improvement in living standard of the society and at the same time it helps to halt the prevalence of poverty through improved earnings (Thorbecke, 2023).

2.2. Overview of Financial Sector Development in Ethiopia

History of modern financial sector development in Ethiopia is not a recent phenomenon and it traced back to 1905 when Bank of Abyssinia was established. Despite this, a well-organized financial system starts to operate onward from 1940 after Italians are expelled from Ethiopia. In 1942 the State Bank of Ethiopia was established under the ownership of a government and during that time various foreign banks as well as private banks provide a banking service in Ethiopia by competing the state owned commercial bank. However, the competitive financial system in Ethiopia comes to an end when the Dergue regime comes to power in 1976. During this time three commercial banks, all privately owned financial institutions and 13 insurance companies were merged into one to form a single bank owned by the government where financial institutions implements the economic plans coined by the government (Befekadu, 1995).

Following the downfall of Dergue regime in 1991, call for policy revision that deregulate and liberalize the financial sector in Ethiopia under a proclamation number of proclamation number 84/94. This policy revision necessitates for the establishment of many private banks and insurance companies in Ethiopia. In the year 2023 there were two state owned banks namely Commercial Bank of Ethiopia and Development Bank of Ethiopia and thirty privately owned commercial banks were found in Ethiopia. Although, the Ethiopian banking industry is characterized by the dominance of state owned banks in the past decades; currently, private banks are recording a remarkable progress in terms of market share. Furthermore, the financial system of Ethiopia which works under the operation of domestic banks is now relaxed and Ethiopian government has approved the operation of foreign banks in Ethiopia by considering

advancement in technology, current and future development, best practices and experiences of partner central banks (NBE, 2024).

2.3. Theoretical Perspectives

This section reviews different theoretical literature to optimize comprehensive thinking and guidance for the study. This section starts with discussing causes of poverty and income inequality followed by exploring and discussing theories that associate access to finance, poverty level, and income inequality. The study also reviews the association between access to credit or financial development and their inter-linkage with unemployment and economic growth. Finally, theories developed on determinants of bank lending decision are discussed in detail.

The triggering factors of poverty are so vast they can be categorized under cultural, individual, political, economic, social, geographical factors, etc. However, the causes of poverty can be categorized under theories of poverty. After briefly reviewing these theories, the review integrates determinants of poverty and how access to credit in the agricultural sector affects the poverty level.

The individual deficiency theory argues that the way an individual behaves is the main reason for the cause of poverty. Individual factors that trigger poverty are attitude, human capital, and welfare participation and one of the mechanisms to get rid of poverty is hard work and increasing choices (Sameti *et al.,* 2012). According to this theory, the mechanism of overcoming poverty is in the hands of the individual and she/he is expected to use her/his talent and virtue and has to work hard. The choice of an individual like shelter, food, and health service tends to increase when he can work hard (Rank, 2004). The emergences of the inherited intelligence concept in the nineteenth century backed by the Eugene movement undermined individuals with a lack of ability and argued that they tend to suffer due to failing morals and are born to suffer. Despite this, the work of Schwartz (2000) disproved the wrong perception of society that individuals are the main cause of poverty rather they argued that the poor have to focus on hard work, and personal responsibility with the application of their skills and hard work to succeed.

The other theory of poverty is the cultural belief system theory which argues the transfer of cultural beliefs and values in society are the main causes of poverty. The society as a whole builds beliefs, values, and skills to be practiced individually which poses a dysfunctional culture in the society. Deeply rooted in the culture of poverty, this theory sets a framework for how poverty prevails and is maintained in a society. The society's achievement or becoming being poor was influenced and shaped by their cultural as well as environmental residence (Bradshaw, 2006). According to Lewis (1966) who coined cultural poverty, the difference between rich and poor emanates from their divergence in terms of their values, beliefs, and norms. The prevailing psychological patterns in the cultures and environment that surround the poor make them poor. Success factors like planned spending, family planning, studying hard, and future plans are weakly practiced by the poor. According to Samati *et al.* (2012), the transfer of these beliefs, values, and norms to society's children through social interactions and they tend to be overwhelmed by poverty. This theory was criticized for its excessive focus and blaming of the victims rather than the causes of poverty by disregarding societal forces that trigger or cause poverty. It is the prevalence of human capital that determines the success or the failure of a society. The prevalence of human capital highly influences the earnings of a society (Rank, 2004).

The structural theories of poverty argue the structure of economic, political, and social distortion or discrimination are factors that cause poverty (Abdulai and Shirmshiry, 2014). The imbalance of social, economic, and political factors is the sources of poverty that restrains the society from utilizing the resources and opportunities to optimize their wellbeing and improve income. The structure of an economy and the economic as well as social structure disregard the hardworking habits, capabilities, and skills of individuals causing poverty. Individuals are often endowed with varied skills, capabilities, and resources and these lead them to varied productivity levels and this condition creates poverty in a competitive market system (Davis and Sanchez-Martinez, 2014). According to Sameti *et al.* (2012), societies possess unique talent; skill and capabilities have to get training and sacrifice their time, money and resources together with motivation and must earn better wages and privileges to overcome poverty. In the labor-market theory of neo-classical, as the market is free, individuals get free spaces to compete and as long as they exert maximum contribution on training, effort, and ability they tend to earn more as per their contribution to society (Grusky, 2001). However,

this argument was criticized by dual-labor market theorists for its mere dependence on capability, training, and effort as a source of increased earnings rather than factors like discriminating against minorities in the labor market violates the free market concepts.

The labor price determination in the labor market is also determined by social factors like gender and race influence individual earnings in society. The disparity in earnings in society was not only influenced by the abundance of human capital but also due to social factors like race and gender. Further, income inequalities and the difference in earnings in a society have influenced labor wages which is constructed intentionally and maintained deliberately by policies and social institutions (Figart and Power, 2002). Further, demographic factors like race, gender, family size, and age highly influence the level of poverty in a society. This means families with large numbers of children, minority groups, and women have a high risk of poverty (Rank, 2004). According to Richardson and London (2007), the problems of rural poverty and inequality are caused by structural problems which create barriers for rural communities. This structural poverty problem in the rural economy can be solved by creating favorable conditions for them to focus on their livelihoods and to improve their income.

The theory of geographical disparity that suggests geographical disparities across the world gave rise to poverty like rural poverty, ghetto poverty, urban disinvestment, and third-world poverty which emanates due to uneven distribution of resources and looting by Western powers. Due to a lack of necessary resources, societies and institutions across different areas fail to meet their goals and well-being. According to this theory, the differences in levels of poverty across different areas, communities, and regions are due to the differences in access to natural resources, disinvestment, innovation, and population density (Abdulai and Shamshiry, 2014).

The above theories are reviewed to strengthen and complement the selection of other macroeconomic determinants of poverty and income distribution gap which helps to getting insights on those variables integrated with agriculture finance to determine its effect on poverty and income inequality. Further, these theories are strengthened by reviewing of empirical works undertaken so far on macroeconomic determinants of poverty and income inequality.

2.3.1. Poverty Reduction and Narrowing Income Inequality

2.3.1.1. Theory of credit constraint

This theory postulates that the demand as well as supply constraint creates barriers for those who want loans and pull them away from obtaining the funds. The constraint exposed majority of debtors especially economically vulnerable groups from obtaining the credit which affect their productivity and expose them to reduced income. The criteria developed by formal financial institutions for credit provision like increased transaction cost is considered as a demand side constraint due to its negative implication on debtors interest for loan application (Baydas and Meyer, 1994). The supply side constraint that is considered as barriers for debtors is credit rationing created due to information asymmetry which leads to adverse selection and moral hazard. Aiming to avoid this risk under fixed interest rate, banks often introduce loan criteria's like processing fee, time and transportation fee (Yin and Zhang, 2018). According to Boucher *et al.* (2008), credit constraint aggravate poverty and income distribution gap especially in rural economy through retarding allocation efficiency and their entrepreneur capability. In addition elements like technology adoption, production efficiency and investment motive get hurt with the prevalence of credit constraints which reduces income earned by families. Galor and Zeira (1993) suggest that income inequality can be reduced and economic growth can be realized by solving the problem of credit constraint. The availability of capital through even distribution of credit supply to farmers promotes rural development and farmer's income. Alleviating credit constraints helps mass farmers solves their capital shortage problem and ensures rural economic development.

2.3.1.2. Theory of financial inclusion

Better access to finance and its linkage with poverty level and income inequality is best explained by financial inclusion theory. Providing financial access to marginalized or economically vulnerable and disadvantaged groups of societies ensures balanced and inclusive growth (Feghali *et al.*, 2021). This theory suggests that the financial service provided to the society must consider the majority of unbanked and disadvantaged portions of the society to ensure financial stability and equitable income distribution. Formal financial institutions like banks significantly contribute to the supply of credit in the economy; however the contribution to the mass is questionable. According to Isukul and Tantua (2021), the prevalence of poverty

and income inequality across the world is due to the segregation of many people from formal financial services. Developing countries like Africa are a continent where tremendous societies live with poverty and are characterized by unequal income distribution. One of the best strategies to halt poverty level and narrow income distribution gap in this region is through adhering to financial inclusion (World Bank, 2016). According to Bhandari (2018), forging financial inclusion in the economy significantly helps the poor and women. Access to credit for the majority of the population who own a small business benefited from the service by fulfilling their short-term capital requirement which solve the problem of income distribution gap and financial stability (Demirguç-Kunt and Klapper, 2018). The role of better access to finance on poverty reduction and ensuring equitable income distribution by easily coup-up the short term capital need and as more population are included in this service their entrepreneurial activity and investment improve their stream of income and capital accumulation (Demirguç -Kunt and Levine, 2009). In general, financial inclusion fosters economic growth and financial literacy which help to reduce the poverty level and income inequality in the society. Better financial development in the economy increases the majority of the population to participation in financial activities and the accumulated surplus cash gets channeled to the people who reduce the divergence of the income distribution (Demirguç -Kunt and Levine, 2009). The central aim of this theory is to provide financial services for majority of the society enabling them to get out of poverty and this study bases the theory of financial inclusion to investigate the role of bank agriculture credit in reducing poverty level and income inequality.

2.3.1.3. Social capital theory

This theory got rampant four decades ago when authors like Bourdieu's (1986) and Putnam's (1993) propagate the importance of social capital. It encompasses components like social norms, social networks, trust, and institutions that guide how actors in the society and individuals behave; well-being in society is built. It is considered an asset accumulated for individuals and groups whether that is accumulated as a result of having a strong network of mutually recognized and acquainted relationships (Bourdieu, 1986). According to Woolcock (1998), blurred social capital poses a negative implication on social and economic development or with the presence of strong social capital individuals or groups tend to have

better bondage and social networking which enables them to easily possess resources used to improve their living conditions. Hence in developing countries, social capital plays a key role in economic improvement. The presence of bonded social capital enables the poor to minimize risk, get protected and create unity in the society. In line with this strong social capital is perceived as a method of poverty reduction. Poor people with limited finance and human capital can benefit from strong social networks to minimize their reliance on wealthy people and substitute private capital (Collier, 1998). Policy measures directed toward social and human capital affect the level of poverty in the long run by influencing individuals enduring earning capability (Attanasio and Szekely, 1999). However, this theory is criticized for its incapability to incorporate the relationship between social capital and gender inequality, government, and organizations at the baseline.

Moreover, theories that associate the magnitude of credit supply and its implication on income distribution are recent phenomena and the issue gets attention and empirical evidence start to evolve after the 2000s (Demirguc-Kunt and Levine, 2009). The existing theories that argue between these two aspects were categorized under four groups are the financial narrowing hypothesis, financial widening hypothesis, inverted U-shaped hypothesis, and U-shaped hypothesis. The financial narrowing hypothesis argues that the existence of an efficient financial market was a key to narrowing down income inequality. The existence of an imperfect credit market in the economy at the initial stage hampers the fair income distribution in a society and gives rise to widening income inequality. The accession of low-income households to financial access is a key to reducing income inequality and contrary to this those countries that experience credit market constraint has a high tendency to income inequality (Banerjee and Newman, 1993). The second hypothesis or financial narrowing hypothesis states that increased access to finance only benefits to those who have access to credit market and this condition aggravates income inequality. Rich households are the primary beneficiaries of financial services since they can fulfill credit requirements like collateral. According to this hypothesis, financial access to all can only be realized in situations where better institutions were built like better legal enforcement, strong trust, and better adherence to property rights, and in the presence of a developed market system (Rajan and Zingales, 2003).

The inverted U-shaped hypothesis suggests the existence of high-income inequality at the initial stage where access to financial services is increasing together with saving rate. However, as access to financial services advances and starts to work efficiently, income inequality tends to dwindle and the difference in income distribution starts to narrow and high level of economic growth is realized (Greenwood and Jovanovic, 1990). Unlike this theory, the simple U-shaped theory of income inequality finance nexus suggests that the effects of access to finance on income inequality depend on the level of financial access development. According to this theory, increased access to finance only helps to reduce income inequality up to the certain limit. Increasing financial access beyond this limit will exacerbate the level of income inequality (Law and Tan, 2012; Park and Shin, 2015; Brei *et al.*, 2018; Cihak and Sahay *et al.*, 2015).

Therefore, this study is based on and guided by the theory of financial inclusion as it posits that the majority of the population that were deprived of access to basic financial services like credit supply must be provided with credit access to reduce poverty and income distribution gap.

2.3.2. Credit Supply and Unemployment

The relationship between the credit market and unemployment is well explained by two theoretical perspectives which reveal how financial development affects labor market efficiency. The first category of theories that emerged from the frictionless financial market argument conveys that, there was a limited credit constraint in the credit market and the financial development plays a significant role in containing the prevalence of unemployment in the economy. This theory believes that in the credit market there is the perfect flow of information where the creditors like banks and borrowers has full access to information regarding the availability as well as costs associated with credit provision. Thus, financial development is a means to increase customer's access to credit services and consequently, the improvement in financial service reduce costs associated with credit service in credit market. The increase in access to credit and reduced credit processing cost ignites investment and productivity which creates a smooth environment for employment creation (Chen *et al*., 2021).

The smooth supply of credit through a well-developed financial system increases the level of production and reduces unemployment through increased demand for labor. According to (Raifu 2019), better access to credit drags costs associated with loan provision and helps investors to possess the opportunity for cost reduction which increases their motive to produce more. The improved in productivity and high motive for investment increases creates employment opportunity.

The other theory that posits the association between financial development and labor market efficiency demonstrated how credit market imperfection affects unemployment level. Unlike the previous theory, this theory believes that there was information asymmetry between creditors and borrowers due to financial market imperfection. Credit constraint in the credit market prevails due to information asymmetry. The presence of credit constraints negatively affects the investment motives and decisions of borrowers. The credit constraint coupled with less motives for investment seriously affects the production level hence the demand for labor.

According to Dromel *et al.* (2010), unemployment becomes rampant due to a contraction in credit supply in the credit market due to borrowers' incapability access to credit to undertake the intended investment and even the increase in financial development with the presence of credit constraint reduces labor market efficiency. In another context, few investors tend to benefit from this financial market imperfection through rent-seeking interest by hindering reforms and other mechanisms that jeopardize financial development in the credit market. This condition dwarfs the credit market and job creation opportunities get hurt (Acemoglu *et al.*, 2005). On the other hand, other studies like Pagano and Pica (2012), argued that the unemployment reduction role of credit supply depends heavily on the magnitude of loan provision. Consequently, they argued that credit provision to labor-intensive technology plays a significant role in reducing unemployment level than capital-intensive technology. Indeed, providing credit to capital-intensive technology increases the total production level in the economy but it fails to reduce the level of unemployment in the economy.

This study adopted the theory of frictionless financial market which entails well developed financial market increases demand for labor and creates employment opportunity. However, the adoption of this theory is backed by the argument of Pagano and Pica (2012), that solicited

whether the provided credit is labor intensive or not. Since the mere injection of credit without its consideration of labors might not bring the intended employment creation purpose and since the intention of this study is how the increased credit access for marginalized economic sector reduce unemployment.

2.3.3. Credit Supply and Economic Growth

The other most important theories explored in this study are the finance growth nexus theories which serve as a base to address the second objective. The growth effect of credit or financial development argument is traced back to 1911 when Schumpeter (1911) posited the necessity of financial sector development in driving economic improvement. According to Schumpeter (1911), financial development leads to surge in total output through technological innovation where the provision of ample credit for firms increases productivity in the economy. In this study theories that investigate the inter-linkage between finance and economic growth are reviewed as follows:

The first theory on the finance growth nexus is the theory of the Quantitative ease theory which is introduced by Werner, (1995). This theory considers the banking credit provision as a means of quantitative easing which revealed the important role played by banks in economic development. The supply of credit in the economy fosters economic growth, especially for private sectors that engage in investment. Investment-oriented credit allocation increases the production of goods and services in the economy, increasing the return of factors of production and suppressing the inflationary pressure. Exceptionally, the quantity theory of credit postulated that bank credits provided to non-GDP transactions lead to inflationary pressure and don't contribute to economic growth. Nonproductive credit provision like consumer credit increases aggregate demand which surpasses aggregate supply in the economy. Banks' provision of credit for consumers only increases the transaction of property and financial assets than the production of goods and services. This condition aggravates the scenario of financial crises in the future due to asset price bubbles created by higher non-GDP transactions than GDP transactions (Lyonnet and Werner, 2012).

Secondly, the Financial Liberalization thesis that explores finance growth nexus theory is introduced by McKinnon and Shaw (1973). This theory argues that the expansion and

development of the financial sector is a precondition for economic growth. It posits that the intervention of the government to manipulate interest rates and other legislation seriously hamper economic efficiency by constraining the mobilization of savings by financial institutions. Financial liberalization is the opposite of financial repression where the government policy is design to deregulate the financial system avoiding credit control, adhering to free entry and exist, allowing the participation of foreign financial institutions, avoiding control over interest rates and allowing the ownership of private sectors. The aim of financial liberalization is to ascertain competition in the market through launching of policy measures that transform the market structure into market oriented financial system (Niels and Robert, 2005). According to Niels and Roberts (2005), financial liberalization with deregulation of the market enables the market to determine the real interest rate through competitive market equilibrium which promotes economic growth. The removal of restrictions in the financial market increases the saving rate through a high real interest rate and the accumulated fund is channeled to investment and improves economic growth (McKinnon and Shaw, 1973). Despite this fully withdrawing from financial institutions in the context of developing countries where the financial system is not fully developed might pose a big question on the inclusiveness of the service.

Finally, the theory of Supply–Leading Hypothesis introduced by Patrick (1966), considers financial sector as cause of economic growth. In the business world, the need for controlling and keeping information, monitoring costs, and transaction costs low necessitates the operation of financial institutions and calls for the development of financial sectors. Extreme transaction and monitoring cost restricts economic agents from making transactions and exchanges. Financial development is a key to reducing those problems and smoothing the free mobility of funds in the economy. Financial resource efficiency takes place with well-developed financial sectors which facilitates by mobilizing savings, allocating it to the right place, and minimizing the associated risks with diversification. The allocation of these funds fosters economic growth through human capital development and well accumulation of physical capital in the long run. Financial sector development triggers economic development by bridging the mobility of funds from surplus areas to deficit areas. The smooth mobility of funds in the society through financial sector paves the way for entrepreneurs to realize their ideas, and it increases resource efficiency. Contrary to this hypothesis Robinson (1952)

introduced the Demand–Following Hypothesis which argues that it was economic growth which precedes financial development through improving real sector development which increases the demand for financial development. According to this theory, the increasing level of output in the economy initiates the introduction of new financial sectors to facilitate financial services. Despite this the supply leading hypothesis and Demand Following Hypothesis merely focuses financial development leads to growth and vice versa without figuring out the magnitude of the growth. Although financial development is important what really matters is whether that development plays a significant role pro poor growth.

This study bases the Quantitative ease theory which is introduced by (Werner, 1995), to investigate agriculture credit and its implication on economic growth. the selection of this theory is rationalized by considering the underpinning concept of the theory of credit provided to investment oriented loans only promote economic growth otherwise it leads to inflationary pressure in the economy. This theory, doesn't consider credit provision as an end by itself but still the magnitude of credit provision matters on the economic performance of the country.

2.3.4. Banks' Lending Decision

Several theories were developed at different time regarding the determinants of banks credit supply volume. In these study four major theories was reviewed as follows. The Loan Pricing theory developed by Stiglitz and Weiss (1981), elucidates that banks doesn't always charge high interest rate on their loan as means of increasing profitability by aiming minimization of behavioral risk and adverse selection. This means merely focusing on high interest rate to earn increased return might leads to lending to wrong borrowers those who are unable to get credit in the market and since they have no choice rather than taking the loan with existing interest rate. This in turn escalates the chance of loan default from the bank side. Further the theory postulates that, charging of high interest rate may force borrowers to shift to other options and providing the loan with high interest rate creates the possibility of customers to involve in risky investment. Hence, banks refrain from deliberately charging of higher interest rate to avoid adverse selection. On the other hand, the credit creation theory reveals the task of commercial banks is beyond accepting deposit and lending where they create deposit money. This means that when other banks lend money it increases the deposit of other banks where they are able to provide extra loan. According to this theory bank regulation

instruments like reserve requirement and capital adequacy are not as such valid to affect the volume of credit supplied by commercial banks (McLeay *et al*., 2014). However, banks are not free from constraints while supplying of credit. Factors like the degree of demand for credit, bank regulations, banks intention to optimize profit subjected to level of competition and risks (Botos, 2016).

The Multi-bank system approach (The post Keynesian approach) introduced by Wallace and Karmel (1962) conveys that the volume of credit supplied by the bank is not only determined by banks management decision but also determined by competitors move. This means before coining strategic move on credit provision, banks considers rivalry banks strategy (Dymski *et al.,* 2008). This theory invalidates the Keynesian argument that states ‘’bankers hang together rather than hang separately’’ revealing that banks implicitly follow each other’s strategy while granting of loan. But the multi-bank system approach invalidated this argument by stating that banks doesn’t imitate other banks strategy rather they will develop their own optimum strategy by carefully considering rivalries move. It also criticized the Keynesian thought of banks have constrained customer information and rather banks credit supply volume is determined by their risk taking appetite (Dymski *et al.,* 2008). The bank lending channel approach on the other hand argues that banks’ credit supply decision is mainly determined by monetary policy. Monetary policy determines the amount of credit supplied through transmission mechanism which means during contractionary monetary policy dwarfs banks credit supply thereby reduce loanable funds to customers. Conversely, expansionary monetary policy ignites the tendency of banks credit supply and avails loanable fun for borrowers (Sanfilippo-Azofra *et al.,* 2018). According to Altunbas *et al.* (2009) in developing countries, bank lending channel is so powerful since the economy highly relies on bank financing and in turn banks credit supply highly rely on the amount of deposit mobilized. Hence, the introductions of monetary policy that spike interest rate, leads to the decrease in supplied credit because of a simultaneous decrease in banks deposit volume. This indicates that monetary policy is a powerful instrument in developing countries in determining credit supply.

The credit rationing theory conveys that financial institutions like banks doesn’t extend loan to all eligible debtors in the market who are ready to pay the availed interest rate. Lenders

deliberately restrict the provision of credit supply due to information asymmetry where they may not have full information towards the associated risks (Stiglitz and Weiss, 1981). Despite the theory provides an important insight, it was criticized for overemphasizing information asymmetry and the role of economic cycle on credit delivery decision. On the other hand, the liquidity Risk constraint theory suggests that financial institutions must remain solvent to reduce liquidity risk stemmed from insufficient liquidity and able to provide enough credit. Banks face the problem of liquidity constraint by paying their depositor short term obligations and when the rate of withdrawal is sufficiently high, the bank fails to provide loan to all eligible investors while paying the depositors. In this condition banks are forced to ration loan for even high profile entrepreneurs. When the problem of liquidity persists in banks, it limits bank capital, and constrains their lending capability amide the growing demand for loan (Webb, 2000).

The Risk Based credit constraint introduced by Flavin (1981) on the other hand states, the volume of loan received by the household was highly sensitive to the amount of income he/she owns. This reveals that the tendency of financial institutions to extend loan highly depends on the capability of a customer to repay the loan. The repayment capability of debtors, basically determined by factors like: mortgage asset, credit history and ability to generate consistent income. Those debtors with limited asset and income have a low tendency to tolerate risk and at the same time they have limited access to possess credit service with high risks (Jappelli and Cox, 1990).

The above reviewed literatures deeply investigated factors that determine the lending decisions of financial institutions like banks. Despite this, many of them provide a single factor as determinants of lending decisions of financial institutions and fail to focus on the role of macroeconomic factors in determining the lending decision of financial institutions. Hence, this study tries to amalgamate determinants of credit volume raised by theories and backed them with empirical works to delve into determinants of credit volume of commercial banks in Ethiopia.

2.4. Methodological Framework

This section reviews different methodological frameworks or methods of measuring poverty level and income inequality. Different methodological frameworks have been developed so far and after reviewing different measurements of poverty and income inequality, the study indicates the methodological framework adopted in the study.

2.4.1. Measurement of Poverty

The identification and measurement of poverty were important tools to identify who the poor are and to understand the severity of the incidence to facilitate the welfare distributions by the government for those who are affected. Measuring poverty has the potential to give strategic insight for the government so it can deal with the revision of socio-economic policies that have implications on poverty (Foster *et al.,* 2013). The following measures of poverty are the most commonly applied measure of poverty.

Poverty Headcount Index: This measurement is widely and most commonly applied measure of poverty where the total share of the population that has income or consumption level below the poverty line or the share of the total population who are unable to fulfill or purchase goods and services (Todaro, 2015). Since this measure is widely applied, this study adopted Poverty head count ratio as a measure of poverty level in the study.

Poverty Gap: This measure indicates how households are far apart from the poverty line by considering the average total income or consumption is far from the poverty line of the total population. The poverty gap is calculated by summing up the level of the population that falls below the poverty line and dividing it by the total population. This measurement of poverty has also the potential to measure non-monetary variables since the distance measure has meaning here. For instance, non-monetary indicators like education can be measured by taking the distance or number of years taken to reach a certain threshold. However, there were some instances where the indicator failed to be quantified when indicators were binary. Despite this, this measurement can predict the necessary resources used to eradicate poverty through redistributing the resources to the poor (Todaro, 2015).

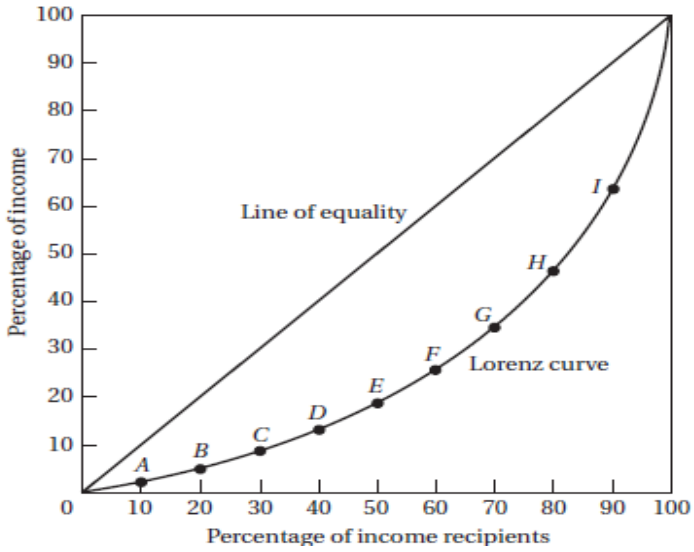
Squared Poverty Gap: This method of measuring poverty follows the footsteps of the poverty gap or the distance that exists between the poverty line and the poor but also it further shows the level of inequality between the poor. This means those portions of the population who are farthest from the poverty line. As explained above, the shortcoming of this measure was that it failed to work on non-monetary indicators.

Although various measures of poverty were introduced, this study has selected poverty headcount ratio as a proxy variable to measure poverty in Ethiopia. The measure was a widely used and straight forward measure applied by policy makers and development organizations due to its convenience to measure the extent of poverty. The selection of this method is due to its alignment with the objective of the study which focuses on the portion of the population who lives below poverty often set as below specific threshold. It shows the extent of poverty in a given society which helps to evaluate the progress of poverty reduction endeavor. However, unlike poverty gap and Squared Poverty Gap this measure is criticized for its shortcoming of showing the intensity as well as severity of poverty in a society.

2.4.2. Measurements of Income Inequality

Income distributions are often used to compare the distribution of income through incorporating methods like mathematical constructs that entail or assign value to income distribution. The following are commonly used income inequality measurements:

The Lorenz Curve: This measures income inequality analyzes income distribution in a given population and compares the actual income distribution of a society with equal distribution. It measures the distance between the vertical line of equality and the Lorenz curve to indicate the level of income inequality. When the difference between equality and the Lorenz curve is high, it indicates high-income inequality. Perfect inequality or a case when a society earns nothing and all income goes to one individual is represented by alienation or congruence of the Lorenz curve with right-hand vertical and bottom horizontal axis. However, perfect equality and perfect inequality do not exist in any society, the income distribution of countries lies below the equality line (Todaro, 2015).



Source: Todaro, 2015

Kuznets Ratio (K): It is a measure of income inequality that bases individuals' total income by placing the personal income from smaller income to higher income and dividing the total population into different groups by the income they earn. To determine the proportion of income received by the population group, this method works by dividing the population into quintile or decile groups to ascending income levels (Todaro, 2002).

GINI coefficient of inequality: This is the most widely used measurement of inequality where the coefficient ranges between 0 and 1. The value zero indicates perfect equality and value one shows perfect inequality or the whole resources were owned by a single household. The coefficient can be depicted between the Lorenz and the equality lines. The graph indicates that if the total population has an equal income, the income distribution curve becomes straight and indicates equality. However, if the income distribution were concentrated in the hands of one person, the Gini coefficient turns 1 and shows perfect inequality (Deaton, 2013). The measurement of income distribution gap in this study is measured by using the Gini Coefficient.

Gini Coefficient is a widely applied measure of income inequality due to its convenience in interpreting of Lorenz curve and fulfills the four axioms or desirable properties namely: the anonymity, scale independence, population independence, and transfer principles (Todaro,

2015). Basing this attributes, this study adopted Gini Coefficient as a proxy variable to measure the extent of income inequality in Ethiopia.

2.5. Analytical Framework

The empirical determination of bank agriculture credit and its effect on poverty level, income inequality, GDP Per capital as well as unemployment in Ethiopia and determinants of commercial banks agriculture credit volume is analyzed through the following econometric models. This section discusses analytical tools used to analyze the panel as well as time series data used in the study.

Various estimation techniques are frequently recommended for the panel as well as time series data. Some receive criticism for their subpar performances, while others are regarded as superior based on the extent of their strengths, robustness, and available corrective actions. For instance, panel estimation models differ in their strength of accounting for estimation problems like heteroscedasticity, autocorrelation, and cross-sectional dependence. The other most important dimension of selecting of econometric models depends on the structure of the panel cross-section and the length of time and even models incorporate these criteria's as an assumption while specifying the model. In the same fashion, selecting analytical tools for time series data needs to closely monitor the robustness of models in fulfilling basic econometric assumption and their capability to yield unbiased and reliable results.

2.5.1. Panel and Time Series Data Analytical Techniques

This section reviews different regression models used to analyze panel and time series data together with their strength and weakness. Plenty of panel data analysis techniques were applied by empirical literatures and at the same time application of panel data regression techniques often requires a careful selection of the technique to guarantee its robustness. Among others panel data analysis techniques like Generalized Method of Moment (GMM), Ordinary Least Square, Fixed and Random effect models are widely applied analysis technique in panel data setting. GMM has many advantages and suitable in obtaining consistent parameter estimates while explanatory variables have endogenous variable and measurement error. This method avoids individual effect in the model by taking first difference to obtain consistent instruments. GMM is the most appropriate model especially in

models related to growth analysis. The model estimates by using instruments the lagged value and two time period differences of endogenous independent variables and handles the problem of correlated error term and lagged dependent variable (Roodman, 2009).

However, the model has an assumption of number of groups must be higher than number of instruments in the analysis. Hence, undertaking of GMM for analyzing panel data set with relatively long time series is not ideal. Additionally, techniques like GMM ignore the issue of cross-sectional dependence which leads to biased and inefficient estimates. In the same fashion application of conventional models like OLS, Fixed and Random effect models assumes presence of cross-sectional independence across panel units and application of these models with the presence of cross-sectional dependence and heterogeneity issue is non-robust and often leads to inefficient results (Pesaran and Smith, 1995).

The other most issue to be considered in panel data analysis is the structure of panel data setting. For instance, Beck and Katz (1995) suggested that for panel data setting that has long time than number of cross-sections often expose most panel data models to the problem of contemporaneous correlation due to non-sphericity of the error covariance matrix. Aimed at solving the problem of contemporaneous correlation techniques; models like Feasible Generalized Least Squares were introduced by (Parks, 1967). However, this model is criticized for providing unacceptably small standard error estimates and alternative model of Panel Corrected Standard Error (PCSE) model is introduced by (Beck and Katz, 1995). Moreover, application of PCSE model has a suitable feature when applied to panel data setting containing problems like heteroscedasticity, and cross-sectional dependence. However, the only shortcoming of this model is when applied to panel data setting with higher cross-sections than the time period since it become non-robust due to violation of its assumption of T>N (Moundigbaye *et al*., 2018). Hence, by considering the panel setting of the first objective which has larger time period than number of cross-sectional units and basing other advantageous attributes; the study adopted PCSE model to analyze the first objective.

The other most important and popular panel analytical tool is the Augmented Mean Group Model (AMG) which is recently introduced by Eberhardt and Teal (2009). This model is widely applied for panel data setting with relatively equal time length and number of cross

sections. This model has advantages of generating unbiased and efficient estimates in the presence of cross-sectional dependence, slope heterogeneity, endogeniety and the model exhibits the best performance in Mote Carlo simulation for panel data setting (Stephen and Markus, 2013). Depending up on its advantageous role and since the panel setting of the last objective violates the assumption of PCSE; the AMG model is applied as analytical tool for the last objective of the study which uses a panel data from 2010 to 2021.

Correspondingly, while undertaking empirical studies using time series data it is imperative to select robust analytical tools by considering the attributes of the data like unit root, correlation, linearity and non-linearity properties must be considered (Little and Jones (2015). Hence, the selection of time series regression models is made by considering the aforementioned attributes of research variables. For instance, application of ordinary OLS technique using stationary data yields unbiased and consistent results which are genuine to draw inferences. Conversely, applying this technique for non-stationary variables leads to spurious regression and in this condition co-integration techniques were often introduced to determine long run association between variables which helps to determine the short run dynamics and long run coefficients. On the other hand, when variables are integrated at level and after first differencing regression models like ARDL models can be applied to get a simultaneous short run and long run results. Furthermore, if variables are integrated at level, first and second order analytical technique like Toda and Yamamoto (1995), is used to determine long run causality (Jalil and Rao 2019).

The other most important issue in time series analysis is to select long run analysis models which indicate the association of variable in the long run. Although plenty of techniques were found to determine co-integration, models like Johansen Test, Engle Granger Test and ARDL Tests are the prominent one. Careful consideration must be made while selecting of these techniques since they have their own pros and cons. For instance applying Engel Granger Test identifies the existence of common trends were found between variables meaning that both of variables are non-stationery by assuming the combination of these non-stationary variables might be stationary in the long run. However, this technique is criticized for its inappropriateness for small samples, and requires all variables to be integrated after first differencing. On the other hand Johansen Test is used to determine co-integration through

applying maximum likelihood principle for non-stationary variables. The requirement that is necessary for applying this test is that variables must be integrated at same order and the necessary lag length must be determined by AIC through running VAR model. However, this model has weakness in finite sample distribution by posing restriction using weak approximation which leads to committing of Type I error when applied in small sample size (Coombs and Algina, 1996). Finally, application of ARDL co-integration technique introduced by Pesaran *et al*. (2001) is often widely applied method of analyzing time series data and becomes popular since it overcomes the low power and other above mentioned problems associated with other techniques. Additionally, the model is capable of regressing time series data with mix of stationary variables. The only exception to this technique is that it only analyze variables with integration of I(0) and I(1) and fails to accommodate when the order of integration of variables are above I(1). Depending up on many advantageous role of ARDL model and presence of mix of stationary variables of I(0) and I(1) this study adopted ARDL model to analyze the time series data of the second objective.

Therefore by taking into consideration the aforementioned issues, the following section briefly explains panel and time series models and the rationale behind adopting them in the study.

2.5.2. Panel Corrected Standard Error (PCSE)

Apart from the usual heteroscedasticity problem across cross-sections and autocorrelation in time-series panel data set with cross-sections that are less than the time period (N<T) often leads empirical investigation exposed to contemporaneous correlation or residuals from panel cross-section to correlate. This condition often leads to inefficient estimates and inconsistent standard errors due to the non-sphericity of the error covariance matrix. The notable proposed mechanism for this problem is to estimate using Feasible Generalized Least Squares which is proposed by Parks (1967). However, this method is criticized by Beck and Katz (1995) for providing unacceptably small standard error estimates. Consequently, these authors suggested an alternative solution to this problem by introducing Panel Corrected Standard Error (PCSE) model that accurately accounts for the subject's contemporaneous correlation and better performs in small panels.

Considering that there are fewer cross-sections than time periods (T>N) in the first objective of the study, the PCSE model is used for the first two equations of this study. In addition, the model's ability to effectively control spatial correlation, heteroscedasticity, and cross-sectional dependence is the main reason for adoption in the study. The OLS methods yield inefficient estimates and inaccurate standard errors with the presence of heteroscedasticity and spatial correlation. The application of PCSE performs better due to its capability to withstand panel heteroscedasticity and spatial correlation in panel data sets. This model incorporates the assumption that the number of cross sections must be less than the time length in the panel setting otherwise PCSE is not robust in violation of this assumption (Moundigbaye *et al*., 2018).

The formulation of the PCSE model starts with the general model of panel data as follows:

$$y_{it} = X_{it}\beta_{it} + \varepsilon_{it} \qquad i = 1, \ldots..N \ \& \ t = 1\ldots..T \tag{1}$$

y_{it} and X_{it} stand for the ith unit observations at period t. β and ε_{it} represent coefficient and error term respectively

$$var(\widehat{\beta}) = (X'X)^{-1}\,(X'\Omega X)(X'X)^{-1} \tag{2}$$

The above equation (1) depicts OLS estimates variance and when the problem of panel heteroscedasticity and spatial correlation prevails the standard errors become inaccurate. The NT X NT error covariance with N X N matrix on equation (2) contains $'\Sigma'$ spatial covariance matrix. In the following equation, E stands for OLS residual matrix and Σ is calculated as follows:

$$\hat{\Sigma} = \frac{(E'E)}{T} = \frac{1}{T}\begin{bmatrix} \sigma_{e,11} & \sigma_{e,12} & \cdots & \sigma_{e,1N} \\ \sigma_{e,21} & \sigma_{e,22} & \cdots & \sigma_{e2N} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{e,N1} & \sigma_{e,N2} & . & \sigma_{e,NN} \end{bmatrix} \tag{3}$$

By using $\hat{\Sigma}$ estimates as a transformation, Ω is obtained

$$\hat{\Omega} = \frac{(E^{'}E)}{T} \otimes I_T = \frac{1}{T}\begin{bmatrix} \sigma_{e,11} & \sigma_{e,12} & \cdots & \sigma_{e,1N} \\ \sigma_{e,21} & \sigma_{e,22} & \cdots & \sigma_{e2N} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{e,N1} & \sigma_{e,N2} & . & \sigma_{e,NN} \end{bmatrix} \otimes \begin{bmatrix} 1 & \rho & \cdots & \rho^{T-1} \\ \rho & 1 & \cdots & \rho^{T-2} \\ \vdots & \vdots & \ddots & \vdots \\ \rho^{T-1} & \rho^{T-2} & \ldots & 1 \end{bmatrix} \quad (4)$$

Thus, Kronecker product is represented by $\otimes$ time-invariant cross-sectional dependence, panel heteroscedasticity, and common autocorrelation were all included in $\hat{\Omega}$.

Finally, the Panel corrected Standard Error (PCSE) was calculated by the square root of diagonal elements of the following equation

$$var(\widehat{\beta}) = (X'X)^{-1}X'(\frac{(E^{'}E)}{T} \otimes I_T)X(X'X)^{-1} \quad (5)$$

2.5.3. Auto-regressive distributed lag model (ARDL)

Empirical research often requires using of time series data to investigate the past and forecast the future. However, economists face challenges in selecting the best tools to analyze time series data since it has varied features and addressing these features is crucial. In other words while dealing with time series data it's imperative to be aware of the behavior of variables, level of integration and interaction and properly addressing these issues help to obtain clear relationships between variables. Hence selecting of robust and appropriate econometric model in time series analysis is decisive to get unbiased and reliable estimates. For instance one of a major condition in model selection is stationary of variables. Time series models like ordinary Least Square (OLS) and Vector autoregressive (VAR) can provide unbiased estimates if all variables are stationary at level. But, applying this model on variables with mix of stationary variables or integrated at different order might not be appropriate. On the other hand, models like Autoregressive Distributed Lag (ARDL) are capable in accommodating mix of variables which are integrated at level and at first difference. This study adopted ARDL model to analyze the second objective of the study which uses a time series data from 1990 to 2021. The rationale behind selecting the ARDL model is due to its advantageous role than other models like: Johansen co-integration and VAR methods allow variables to be integrated in different order. Also, the ARDL model allows or is suitable for estimating an equation with a mix of stationery and non-stationery variables of order 1 (Pesaran *et al.*, 2001). The other advantage of the ARDL model is that it is suitable to apply to small samples. Unlike ARDL,

approaches like Engle-Granger and Johansen co-integration require large data otherwise the result might be biased (Udoh *et al.*, 2012). ARDL model also allows the application of dummy variables in the co-integration test process which is not allowed in the Johansen method. Finally, the ARDL model has the advantage of giving valid and unbiased estimates in the presence of endogenous regressors (Rahimi *et al.*, 2011).

The application of the ARDL model after the unit root test requires to the undertaking of a co-integration test to identify the presence of long-run association between variables. The ARDL Bound test developed by Pesaran *et al*. (2001) is an appropriate method to check long-run relationship between variables based on the following equation:

$$\Delta y_t = \alpha_0 + \beta_1 y_{t-1} + \sum_{k=2}^{n} \beta_k \Delta X_{t-1} + \sum_{i=1}^{p} \gamma_1 \Delta y_{t-i} + \sum_{i=1}^{p} \gamma_k \Delta X_{t-i} + \lambda DUM + \varepsilon_t \quad (6)$$

Where α_0 stands for deterministic drift parameter, p is the maximum lag length, Δ is a difference operator of variables and ε_t is the error term. y_{t-i} and X_{t-1} show the correlation of lagged variables with the error term. The long-run association or co-integration of variables is determined by the joint significance of lagged variables where F-Statistics is compared with upper and lower critical values (Pesaran *et al*., 2001).

The null hypothesis (H_0) based on the joint test equation is specified as:

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_k = 0$

The alternative hypothesis (H_1) is specified as follows:

H_0: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_k \neq 0$

According to Pesaran *et al*. (2001), the criteria to confirm the presence of long run association is through comparing the calculated F-Statistics against the upper and lower bound of tabulated critical values. If the calculated F statistics is greater than the upper and lower bound critical values the null hypothesis ($H_{0)}$ that states no co-integration is rejected and vice versa.

Finally, the null hypothesis of no co-integration is accepted only if short-run model is estimated.

2.5.4. The Augmented Mean Group Model (AMG)

The Augmented Mean Group (AMG) is a recently introduced panel data analysis model by Eberhardt and Teal (2009). This model is capable of generating unbiased and efficient estimates in the presence of cross-sectional dependence and the model exhibits the best performance in Mote Carlo simulation for panel data setting (Stephen and Markus, 2013).

The previous panel data analysis technique, PCSE requires a relatively larger time than the number of cross-sections (N<T) and the result from this technique or estimates are inefficient if this criterion is violated (Moundigbaye *et al.*, 2018). On the other hand, AMG become popular for estimating panel settings with relatively equal size of time length and number of cross-sections. The last objective of the study is to identify the determinants of agriculture credit performance of commercial banks in Ethiopia which uses panel data from 2010 to 2021. Hence, the AMG model is used to analyze the third objective of the study.

The following equation shows the AMG model developed by Eberhardt and Bond (2009) as follows:

$$\Delta y_{it} = \alpha_i + \gamma_i \Delta x_{it} + \sum_{t=1}^{t} \varphi_t D_t + \omega_i f_t + u_{it} \quad (7)$$

Where y_{it} and x_{it} represent dependent and independent variables, f_t is the unobserved common factor with heterogeneous factor, Δ denotes the first-difference operator, $\gamma_i$denotes bank-specific coefficients and φ_t represents time specific coefficient. α_i Stands for interecept and u_{it} represents the error term.

Finally, the AMG model can be generated by utilizing the across-panel averaged group-specific parameters as follows:

$$AMG = \frac{1}{N}\sum_{i=1}^{N} \delta_i \quad (8)$$

2.5.5. Pre-Estimation and Diagnostic Test of the Study

Empirically unveiling the relationship between variables often requires basic preconditions to be fulfilled. Failing to address that basic requirement leads to unreliable and biased results. This study uses both panel and time series data and adopts different econometric models to analyze the data. However, before undertaking regression analysis basic pre-estimation and post-estimation diagnostic tests were undertaken as follows:

2.5.5.1. Cross-sectional dependence test

Plenty of studies were delved to figure out igniting factors of cross-sectional dependence and ways of withstanding this shortfall in panel data analysis. The problem of cross-sectional dependence arises due to factors like: economic distance, spatial correlation and unobserved shocks. To overcome its effect and assure yielding of consistent estimation during data analysis, it is recommended to test the presence of cross-section dependence (Kapoor *et al.*, 2007).

The first and the fourth objectives which use panel data adopted cross-sectional dependence test proposed by Pesaran (2003). Application of cross-sectional dependence test is a precondition to adopt suitable unit root and co-integration tests which can consider the problem. For instance, with the presence of cross-sectional dependence application of first-generation unit root test methods might lead to spurious regression and it was advised to apply second-generation unit root tests to avoid this risk (Pesaran, 2007). The following equation specifies the CD test developed by Pesaran (2004):

$$\text{CD} = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \frac{(T-K)\hat{\rho}_{1j}^2 - E[(T-K)\hat{\rho}_{1j}^2]}{Var[(T-K)\hat{\rho}_{1j}^2]} \qquad (9)$$

Hence, N stands for sample size, T represents time, K stands for identity matrix $\hat{\rho}_{1j}^2$ represents pairwise correlation coefficient of all cross-sections i where $j = i + 1$.

2.5.5.2. Panel Unit Root test

This study applied second-generation unit root test for panel data models to take into consideration of cross-sectional dependence. First-generation unit root tests like augmented Dickey-Fuller, Phillips-Perron and Pesaran, and Levin-Lin Chu don't account for cross-sectional dependence in panel data analysis and they assume the presence of cross-sectional independence across the panel. The second-generation unit root test incorporates the presence of cross-section dependence across section units (Pesaran, 2015).

In this study, the cross-sectional augmented Im, Pesaran, and Shin (CIPS) introduced by Pesaran (2007) is adopted since it considers cross-sectional dependence across units.

$$\mathrm{CIPS(N,T)} = \bar{T} = N^{-1}\sum_{i=1}^{N} t_i(N,T) \qquad (10)$$

Where, N represents number of cross section and T denotes time period. The left hand side of the equation denoted heterogeneous panel's unit root test and t_i on the right hand side denotes OLS t ratio cross-sectional averaged ADF regression.

2.5.5.3. Time series unit root test

The precondition in time series analysis is determining the presence of unit root in the variables. Forecasting and drawing inferences from non-stationary variables leads to misleading information due to spurious regression. A series becomes stationary when its mean and variance remain unchanged over time and at the same time the covariance between two time periods is solely dependent on the gap between two periods; the computation of the covariance is independent of the actual time. The stationary process in time series can be trend stationary and difference stationary. In trend stationary the mean trend is deterministic and by removing the trend and constant, the series becomes stationary. While in difference stationary the mean trend is stochastic and the series becomes stationary after differencing the series D times (Gujarati, 2004).

Since testing the presence of unit root in the series is mandatory many tools were used to uncover the presence of non-stationary. Dickey and Fuller (1979) introduced a tool to identify

the presence of unit root in the series. The following three equations were formulated in consideration of varied conditions:

Without drift and trend

$$\Delta Y_t = \gamma Y_{t-1} + \mu_t \quad (11)$$

With Drift

$$\Delta Y_t = \delta_0 + \gamma Y_{t-1} + \mu_t \quad (12)$$

With drift and trend

$$\Delta Y_t = \delta_0 + \delta_{1t} + \gamma Y_{t-1} + \mu_t \quad (13)$$

The null hypothesis in the above condition states:

$H_0 = \gamma = 0$: The time series has a unit root

$H_1 = \gamma < 0$: The time series is stationary

However, Dickey and Fuller had an exception and is not applicable if the error term μ_t is correlated and to consider the correlated error term Augmented Dickey–Fuller (ADF) test is introduced which adds dependent variables lagged value to detect the non-stationary problem in the series. The following equations are specified under three possibilities:

Without drift and trend

$$\Delta Y_t = \gamma Y_{t-1} + \lambda_t \sum_{t=1}^{m} \Delta Y_{t-1} + \varepsilon_t \quad (14)$$

With drift and no Trend

$$\Delta Y_t = \delta_0 + \gamma Y_{t-1} + \lambda_t \sum_{t=1}^{m} \Delta Y_{t-1} + \varepsilon_t \quad (15)$$

With drift and Trend

$$\Delta Y_t = \delta_0 + \delta_{1t} + \gamma Y_{t-1} + \lambda_t \sum_{t=1}^{m} \Delta Y_{t-1} + \varepsilon_t \quad (16)$$

Where δ_0 stands for constant and t denotes the time trend.

This study uses the ADF test to detect the problem of non-stationary for the second objective uses time series data from 1990 to 2021.

2.5.5.4. Panel co-integration test

The next pre-estimation test undertaken in the study is the panel co-integration test to determine the log run relationship between variables. By taking into consideration the presence of cross-sectional dependence across units, this study adopted the second generation panel co-integration test introduced by Westerlund (2007). This test is applicable to the presence of CSD across units. The following equation is formulated for the test:

$$\Delta y_{it} = \delta_i d_t + \lambda_i y_{it-1} + \beta_i' X_{i,t-1} + \sum_{j=1}^{pi} \lambda_{ij} \Delta y_{i,t-j} + \sum_{j=-qi}^{pi} y_{ij} \Delta X_{i,t-j} + \varepsilon_t \quad (17)$$

Where i represent a number of cross-sections, d represents model residuals and t denotes the time period. The presence of long run association can be determined by rejecting the null hypothesis of no co-integration at 1 percent, 5 percent, and 10 percent levels of significance.

2.6. Empirical Reviews

In this section, different empirical findings of how agricultural credits affect the level of poverty and income inequality together with other macro-economic determinants of poverty and income inequality are discussed. The study also reviewed empirical works on the relationship between credit access and its effect on unemployment and per capita income. Finally, the study reviews empirical works on factors that determine the credit supply of commercial banks.

2.6.1. Effects of Access to Finance on Poverty and Income Inequality

Beck *et al.* (2007) investigated the nexus between finance, inequality, and poverty using data from 1960 to 2005 in Peru. The study applies ordinary least square (OLS) and Generalized

Method of Moments (GMM) to analyze the data. The findings of the study reveal that increasing access to financial services significantly narrow income distribution gap and poverty through better bridging of finance to the poor which in turn helps the economy to grow.

The investigations made by Herms (2014) and Bangoura *et al*. (2016) on the role of microfinance on income inequality in developing countries indicate that high-level participation of microfinance institutions is a key to minimizing the disparity of income level in society. Demirguc and Levine (2008) collected cross-country data to investigate the effects of financial access on income distribution and economic growth. The results reveal that increasing financial accessibility for the poor is a mechanism used to increase the income level of the poor and to increase the economic growth rate. They further concluded that those people who earn less than a dollar per day tend to be reduced through increased access to credit. Similarly, the works of Rajan and Zingales (2003) who undertook a study at a cross-country level stated that increasing financial access to the poorest has the tendency to reduce income inequality and poverty. Honohan (2004) increased provision of credit services by commercial banks significantly reduces poverty in developing countries.

According to Croppenstedt *et al.* (2017) provision of better agriculture credit helps to reduce the level of poverty, and deprivation and helps to increase farmers' income by improving the level of productivity. The credit facilities provided for farmers can take place in different forms or credit products to improve agriculture crop production, fisheries, better access to market, livestock, etc. Osabohien *et al.* (2018) reported that curbing poverty incidence needs the adoption of credit policies to improve the return from agricultural outputs. However, according to the World Bank (2007), the rural sector get little concerned about access to credit services especially in developing countries although the sector employs the majority of the labor force in the economy. Iganiga and Unemhilin (2011) undertook a study to determine the impact of agriculture credit on agricultural production using a Cobb-Douglas production function. The results show that credits provided by commercial banks had positively affected agriculture production. This study was further supported by Osabohien *et al.* (2018) who investigated the effects of commercial banks credit on agriculture production and achieving food security in Nigeria.

The work of Khan (1996) assessed the effects of credit on Asian countries together with other development programs and its implications on the poor. The study recommended that credit provision is a strategic tool to reduce the poverty level. Similarly, the study made by Tenaw and Islam (2009) determined the effects of rural financial services, and microfinance on agricultural productivity and poverty. The study raised different jeopardizing factors in the rural part of the community that retard productivity like weak technological adaptation, lack of infrastructure, market imperfection or failure, and bad climate scenarios. The study suggests that better financial access to the rural community has the potential to overcome the challenges of the above problems and equally improve productivity and reduce poverty levels.

However, according to Khan *et al.* (2009) undertook a review in Pakistan to assess the impact of agriculture credit on the rural community, the success and failure factors in the sector, and the proper functioning and controlling of institutions in the sector. The study recommended that the provision of credit for the rural community must be accompanied by proper control and evaluation to bring the intended improvement. To determine the effects of agriculture credit on the productivity of wheat crops in Lahore and Punjab, Bashir *et al*. (2010) deployed Cobb Douglas production type regression and the finding reveals that agriculture credit has a significant effect on agriculture productivity by facilitating the acquisition of key inputs like land, seed, fertilizer, water, and plow. The study of Claudio and Guillermo (2023) investigated the contribution of banks in terms of narrowing income distribution gap in emerging and low-income countries using data from 2000 to 2018. The results of the study indicate that banking financial efficiency together with availability and relevance significantly reduces income inequality and poverty in emerging and low-income countries. In addition, the finding reflected that the financial service provided by banks must be up to a certain optimal limit, and exceeding that limit may aggravate income inequality.

Similarly, Brei *et al.* (2018) stated that at the early stage of economic development, the injection of credit helps to get rid of income inequality. As the financial system in the economy gets liquid relatively fair income distribution among the society takes place. Omar and Inaba (2020) also assessed the contribution of financial inclusion to halt poverty and income inequality. The study used 116 developing countries' panel data from 2004 to 2016. The result of the study indicates that well well-developed financial system has a significant

and positive effect on poverty and income inequality reduction in developing countries. The study also suggests that the accessibility of formal financial services in developing countries for marginalized parts of societies helps to improve welfare and attain fair income distribution. Turégano and Herrero (2018) also empirically determined the role of financial inclusion in reducing income inequality. The finding of the study indicates that it was inclusion that matters in reducing the gap of income distribution rather than the size of the financial system. They argued that expanding of the credit system to low-income households and small business enterprise is a key to reducing income inequality.

Although, plenty of empirical studies were undertaken at the world level on the role of credit supply and its role in reducing poverty level and ensuring income distribution gap, scanty literature tried to segregate and uncover the strength of sectorial credit supply and their implication to overcome those economic welfare curses. Obviously, plenty of literature argued that total credit supply in the economy brought economic growth. However, economic growth might be achieved with total credit supply despite the increasing figure of the economy, still a tremendous portion of the society lives below the poverty line, especially in developing countries. In the less developed majority of the population which depends on agriculture is overwhelmed by high poverty, increasing income inequality, and a high unemployment rate. Identifying sound credit delivery direction that can be inclusive in terms of reaching that mass portion of the population employed in the agriculture sector and its role in improving the aforementioned economic well-being of the society is important. In a similar fashion literature has disregarded the role of streaming huge financial capital in banks to the agriculture sector and its implication on improving the welfare of the majority through its inclusive nature. Obviously, many studies have been conducted to devise and suggest mechanisms for containing the rampant poverty in Ethiopia; however, the implication of diverting the huge financial capital circulated in the economy to the agriculture sector is not focused. So this study was intended to uncover the effects of bank agriculture credit in reducing the level of poverty, narrowing the income distribution gap, improving labor market efficiency, and in improving per capita GDP at the national level.

2.6.2. Macroeconomic Determinants of Poverty

Factors that determine or cause poverty are multi-faceted and attributed to structural causes, government structural adjustment reforms, economic policies and natural and man-made disasters like drought, environmental degradation, war, etc. The structural factors that cause poverty are related to factors like insufficient resources, location-related factors, lack of human capital, and socio-political factors. Transitional factors is mainly emanate from structural adjustment reform and policy change that affect unemployment and price levels leading to poverty (Narayan *et al.,* 2000). According to Cisse (2018), the causes of poverty in ECOWAS were attributed to inequality in distribution, poor governance, and prevalence of unemployment, constrained economic diversification, and inadequate per capita income. The limited or slow growth of per capita income was due to the population's reliance on one sector as a means of revenue generation. Society's well-being improving role of economic growth is argued by Nandori (2010) who revealed that the depth of poverty and its prevalence can be contained through better economic growth. In the same fashion, Garza-Rodriguez (2018) and Mndebele *et al.* (2023) stated that improved growth enables the nation to reduce the level of poverty in the long run while unemployment rate ignites poverty level in the long run. Meo *et al*. (2018) also stated that being unemployed especially in the mass of societies who receive little income with the absence of other benefits like medical insurance is easily vulnerable to poverty due to their incapability to accumulate capital. The positive relationship between poverty and unemployment is also confirmed by Ariski *et al.* (2022) and Alghina *et al.* (2019). Literature also considers human capital as a key determining factor of poverty which is acquired through education to equip a society with the necessary knowledge and skills. The improvement in human capital through education and health serves as an input for production in the economy and reduces the level of poverty (Matthew, 2011). Similarly, Hammer *et al.* (2000) point out that the poverty reduction objective is better realized through improvement in human capital since an increase in human capital development has the capability to grow and improve income level. This condition was observed in regions like South Asia and Sub-Saharan Africa where children remain under height due to malnutrition.

Studies like Fernández (2015), Hynes and Lammersen (2017), and Gnangnon (2019) associated trade liberalization as a determining factor of poverty level. They stated that

developing countries, especially those whose livelihoods is highly dependent on the agriculture sector benefited from trade openness. Nations can realize poverty reduction endeavors through trade liberalization. For instance, farmers get benefit from exploiting their relative advantage in the international market and it opens the room for employment and production efficiency. From developing countries' economic sectors, improvement in the agriculture sector better improves reduction in poverty than improvement in the industry since the agriculture sector dominates the majority population's livelihood. Despite the role of industrial development in enhancing economic growth, it has little room for mass poor and unskilled labor to create employment opportunities. But agriculture sector has the potential for employment creation for the unskilled and poor (Callistus and Mulugeta, 2014). According to Ahlburg (1996), poverty is also aggravated by the increase in population size through its negative effect on per capita income. Increased population growth puts substantial pressure on land use which leads to landlessness, child health, and education which further worsens poverty. In sub-Sahara Africa, factors that cause poverty are lack of employment opportunities, bottleneck in credit access by the poor, lack of resources, lack of human capital, less access to market, increased environmental degradation and lack of productivity, unsatisfactory development support, insufficient assistance for the rural poor and minimum capital (Obadan, 1997). Finally, studies like Tebaldi and Ramesh (2010) and Kaufmann *et al.* (2011) associate improved economic development and reduced poverty level with better institutional quality. They have revealed that the pro poor economic growth and fair income distribution take place when key components of institutional qualities are properly addressed.

2.6.3. Macroeconomic Determinants of Income Inequality

So far plenty of literature reviews have been undertaken on determinants of income inequality but the findings are complex, vague, and divergent (Breau, 2015). However, the majority of literature argues that volatile economic conditions gave rise to variations in income distributions (Sieron, 2017). Other studies like Castells-Quintana *et al*. (2015) also suggest that up to some extent or exaggerated income inequality has no big effect even if it triggers the society to work hard, increase their saving level, and invests in human capital to possess a better life. Contrary to this, Kakwani and Son (2015) indicate the devastating nature of income inequality on societal welfare through eroding one's choice of occupation and

education. Further, the increase in income inequality in states where high taxation is imposed forced individuals to restrain their involvement in investment and want to avoid risk which in turn leads to economic crises.

Among the determinants of income inequality, national-level development was a prominent one which is argued by Kuznets hypothesis that at the initial stages of development, societies experience high income inequality and the divergence in income inequality tends to converge when development reaches at optimum point. This hypothesis represents states per capita income has an inverted U-shaped pattern indicating the difference in income is high initially and income inequality tends to narrow when the economy matures (Kuznets, 1955). However, this argument was falsified by studies like Amos (1988) and Harrison and Bluestone (1988) who showed that nations often experience high income inequality at matured or high economic development which necessitates the introduction of augmented inverted U-hypothesis. This hypothesis argues that there is the dynamism of economic growth that leads the nation to experience increase-decrease-increase. This indicates societies face increased income inequality at high economic development. The other vastly raised determinant of income inequality was inflation through its effect on cost of living by incapacitating the purchasing power of the society, especially those who earn fixed income. Inflation also leads to income inequality through wealth effect by reducing the value of money which affects who earns fixed income and forced the society to store wealth in other alternative ways. It widens the income distribution gap by affecting taxation and exploits low-income earners (Palmer and Barth, 1977). The continuous increase in general price level affects those who earn low-income and fixed income through weakening their purchasing power. This condition further affects the poor who spend the highest proportion of their income on consumption rather than capital accumulation and leads to income inequality (Thalassinos *et al.,* 2012). Similarly, Erosa and Ventura (2002) finds a significant and positive effect of inflation on income inequality. Contrary to these findings, Maestri and Roventini (2012) conveyed that an increase in the inflation rate reduces income inequality through transferring income from nominal lenders to nominal borrowers and the tax system.

According to Erksoy (1994) increased unemployment due to volatile macro-economy conditions triggers income inequality. Undeniably, income inequality tends to increase when

the real output declines indicating that high unemployment cuts the income earned by the majority of the working class and their relative income falls significantly. The situation in the labor market condition also has pressure on income inequality through its structure. The increased participation of the labor force narrows the gap in income inequality (Levernier *et al.*, 1998). The prevailing macro-economic shocks are also considered as factors that influence income inequality depending on the income distribution patterns in the society. This means macroeconomic shocks like the business cycle have a high tendency to affect the bottom income distribution and their earning levels which aggravates income inequality (Geiger *et al.*, 2020). The effects of the recession on income inequality were viewed differently by different authors. For instance, Hoynes *et al.* (2012) argue that when the economy experiences a recession those portions of the population who were found at the bottom of the income distribution are highly affected and it aggravates income inequality. However, the findings of Bartik (1996) showed those portions of the population or low-skilled workers tend to benefited from economic down turn since their wage rate remains unaffected by reduced production unlike the skilled labors.

The other determinant of income inequality is human capital structure. The theory of human capital argues that human capital is a major determining factor of income inequality. However, the magnitude of effects that human capital poses on income inequality differs based up on the rate of return one can generate from education or from an average year of schooling indicating that the result may be negative or positive (Lee and Lee, 2018). The way education affects income inequality has no specific magnitude and it remains vague in the literature. For instance, there were two perspectives on how an increase in education affects income inequality. The first one was the composition effects which argue that the increase in education aggravates income inequality due to the increased proportion of more educated people. Contrary to this, the wage compression effects argues the continuous increase in education leads to the labor supply surpassing labor demand which forces the wage rate to dwindle (Knight and Sabot, 1983).

Countries' international relations through foreign direct investment (FDI) and trade liberalization also have implications on income inequality. The influences of FDI on income inequality are studied by different researchers with varying conclusions. The work of

Deardorff and Stern (1994) revealed that the increase in FDI reduces income inequality especially when the system is inclusive in employing low-income and less-skilled workers in the country where the investment takes place. But other studies like Saltz (1992), Tsai (1995), and Jensen and Rosas (2007) argued that FDI is a driving factor for income inequality through increasing the price of capital and reducing local investments through paying wage premiums for skilled labors which frustrates local firms to invest. According to Fujita *et al.* (1998), income inequality is affected when nations open their economy to the world market. However, the effects of trade openness on income distribution differ from developed nation's perspective and less developed regions. According to Leichenko and Silva (2004), in developing economies, the increase in trade openness aggravates income inequality through increasing comparative advantage in industries producing products by labor-intensive techniques and this increases the return. Further, there is a tendency to shift from unskilled labor to skilled sector due to technological advancement in developed economies. But, in less developed economies, the abundance of unskilled labor and the reliance of majority of labor on producing primary sector with relatively same income, trade openness benefits those societies by benefiting in fair income distribution and reduces income inequality (Anderson, 2005).

According to Feenstra (2004) and Li and Fu (2021), trade liberalization significantly contributes to reduction of income inequality in developing countries since the real return is high for relatively abundant factors like cheap labor. It also argues that the benefit of trade liberalization in terms of reducing income inequality hold when developing countries trade inclined towards exporting their abundant resources. Correspondingly, Jaumotte *et al*. (2013) and Bergh and Nilsson (2014) who asserted that trade globalization significantly reduce income inequality and poverty in developing countries. Dorn *et al.* (2022) empirically determined the effects of trade openness on income inequality in 139 sample countries using data from 1970 to 2014. The finding of the study revealed that trade liberalization disproportionately benefits the poor in developing countries by reducing income inequality, but not all of the poor. On the other hand, trade liberalization fuels income inequality in advanced economies with effects accompanied by outliers. The positive role of trade liberalization is also suggested by the findings of Bergh and Nilsson (2014), Jaumotte

et al. (2013) and Winters (2004) that demonstrates trade openness has a potential effect on reducing income inequality.

Contrary to literature that demonstrates the positive role of trade openness in narrowing income distribution, other studies invalidate this argument. According to Meschi and Vivarelli (2007), economies with abundant unskilled labor are affected while dealing in skill-based technological development. Hence, the greater gap between import and export in favor of import forces to utilize foreign products which put a lot of pressure on local workers. Local industries who are deprived of competitive advantage by foreign industries cannot withstand increased competition and this condition affects works employed domestically. Gourdon *et al*. (2008) argue that the effects of trade openness on income inequality are conditional or it depend on factor endowment. Further, the finding reveals that trade openness worsens income distribution in those countries that are well-endowed with labor accompanied by low educational level. According to Galiani and Sanguinatti (2003), high trade liberalization increase income distribution gap by creating wage inequality through creating high competition and affecting workers in industries. Similarly, Hanson and Harrison (1999) stated that low-skilled workers get hurt more proportionately due to high competition from imports.

The decisiveness of institutional quality in ensuring equitable distribution of income and important ingredients to drag rampant income inequality is propagated by Acemoglu and Johnson (2005). Asamoah (2021) undertook a study in developing countries to determine the role of institutional quality in reducing income inequality in developing countries. The study adopted a dynamic panel threshold model using data of developing and advanced economies from 1995 to 2017. The result of the study reveals that institutional quality and income inequality have an inverse relationship. Correspondingly, Bahamonde and Trasberg (2021) investigated the role of democratic governance inequitable income distribution using 126 industrialized and developing countries. The study used two-stage least squares and the GMM approach and the result shows that democratic government highly contributes to the reduction of income distribution gap. According to Adams and Akobeng (2021), institutional components like democracy, regulatory quality, rule of law, and political stability has a potential to reduce income inequality using data from 46 African countries from 1984 to 2018.

2.6.4. Implication of Access to Finance and Macroeconomic Determinants of Unemployment

The problem of unemployment remains the major macroeconomic curse at the world level and its consequences brought social and economic crises in the society. Policymakers strive to tackle the problem of unemployment by considering its main determinants. Empirical findings associate many economic and social variables as determinants of unemployment. For instance, Gatti (2012) determined how the financial and labor market determines unemployment by using 18 OECD countries data from 1980 to 2004. The study applied the Generalized Method of Moments (GMM) as a data analysis technique. The finding of the study states that with the presence of a labor market and regulation, banks' credit supply helps to reduce the level of unemployment. The study also suggested that market-based financing and labor market have a significant connection. Correspondingly, Armendariz *et al.* (2005), Robinson (2001) and Ernst (2019), revealed that the prevalence of micro-finance credit and financial sector development enables small enterprise efficiency and reduces unemployment rate. Ordine and Rose (2008) also demonstrated that a 10% spike in bank loan efficiency leads to a 5% reduction in unemployment rate and the presence of banks' inefficiency in the credit market leads to rise in the unemployment rate.

Borsi (2018) identified the relationship between credit contraction and unemployment in 20 OECD countries using data from 1980 to 2013. The result of the study suggests that credit supply contraction significantly increases the level of unemployment on all unemployment measures. It suggests that credit contraction or reduction in credit level retards youth employment and a constrained credit system with the presence of rigid institutions in the labor market aggravates unemployment. Similarly, Azolibe *et al.* (2022) studied whether the banking credit system in developing countries determines unemployment using data from 1991 to 2021 of Nigeria and South Africa. The study applied the vector error correction model and VAR impulse response function to identify the association between variables. The result of the study posits that banking credit provision is a significant tool for reducing the level of the unemployment rate. Other factors like government expenditure, population growth, and inflation rate also affect the unemployment rate in the region.

The other variable that is considered as the major determinant of unemployment is economic growth. Okun, (1962) also stated that economic growth is the strategic instrument to reduce the level of unemployment. Efrianti *et al.* (2018), Chand *et al*. (2017), and Al-Habees (2012) suggest that economic growth negatively and significantly determines the unemployment rate. The finding shows that increased production levels and labor productivity in the economy create a better arena for labor employment. Nations with increasing GDP rates can withstand the rising volume of the labor force and reduce unemployment level. This finding is also supported by Rahman (2013) who showed the negative and significant effect of per capita GDP on unemployment. The general increase in price level in the economy is also considered as the major determinant of unemployment by plenty of literature. Among this Chowdhury and Hossain (2014) suggest the existence of complementing relationship between inflation and unemployment using data from 2000 to 2011 in Bangladesh. Lewis *et al*. (2019) also figured out the presence of high unemployment due to inflationary pressure in Ghana. The positive long-run relationship between inflation and unemployment is also confirmed by Diakhoumpa (2020) by using data from 1991 to 2018 in Senegal which invalidates the presence of the Philip Curve.

On the other hand, studies associate the efficiency of the labor market with the prevalence of strong institutions in a country. Institutional quality is considered as a major determinant of unemployment by authors like Ernst *et al*. (2022) that argued labor marker efficiency and better functioning are highly influenced by the strength of institutional quality aspects like legal institutions. The legal institutional framework must be arranged to ensure labor market efficiency and to reduce the level of unemployment.

Cicen *et al.* (2023) also investigated the association between institutional quality and unemployment rate in 38 OECD countries using data from 2000 to 2018. The finding demonstrates that nations with strong institutions can reduce the unemployment rate. The study recommends that strengthening institutional structure especially in developing countries plays a significant role in ensuring labor market efficiency. The role of better institutional quality is also argued by Rodrik (2000), who claims economic crises and shocks can be handled with better institutional quality. The strength of political institutions arrangement has

a direct effect on economic institutions; hence they can manage basic macroeconomic indicators at the national level (Acemoglu *et al.,* 2005).

Literature also considers foreign direct investment as the determinant of unemployment. For instance, Karlsson *et al.* (2009) conducted a study using data from 1998 to 2004 and adopted a VAR approach to determine the effects of foreign direct investment on employment in China. The finding demonstrated that FDI inflow has a negative and significant effect on the unemployment level. The work of Waldkirch *et al.* (2009) also investigated the effects of foreign direct investment on employment creation using a dynamic labor demand function that comprises both white and blue-collar workers in Mexico. The finding of the study indicates that foreign direct investment significantly and positively affects employment creation, especially in export-oriented industries. Correspondingly, Wondimhunegn *et al.* (2022) also studied the inter-linkage between FDI and unemployment in East Africa IGAD member countries using panel data from 1996 to 2021. The finding concludes that foreign direct investment has an inverse association with unemployment rate. The study recommends that public sectors play a catalytic role in attracting foreign direct investment to reduce the unemployment level in the region. Similarly, Mustafa and Azizun (2020) considered FDI as a tool of skill and knowledge transfer that enhances economic growth and fosters new employment creation. Johnny *et al.* (2018) also identified the association between FDI and unemployment in Nigeria using data from 1980 to 2015. The finding indicates that foreign direct investment is negatively related to the unemployment rate.

The other most important determinant of unemployment is the fiscal policy of the government. Shadi (2020) assessed the effects of government expenditure on unemployment levels in Jordan using data from 1990 to 2019. ARDL Co-integration method is deployed to analyze data and the finding suggests that there was a statistically significant and negative relationship between government expenditure and unemployment in the long run. Government spending especially on capital expenditure aimed at expanding infrastructure enables the economy to attain maximum production. The increased output especially in the manufacturing sector increases the demand for labor, creates job opportunities, and reduces the unemployment rate. Holden and Sparrman (2016) also argued that the role of government expenditure in creating a good business arena and creating new job opportunities. Vincent *et*

al. (2017) determined the effects of public expenditure on the unemployment level in Nigeria using data from 1980 to 2013. The finding of the study suggests that capital expenditure and investment in the private sector has the potential to reduce the unemployment rate in the long run. However recurrent expenditure is insignificantly related to unemployment. The study recommends that the proportion of capital spending and private investment must be increased but the portion of recurrent expenditure must be reduced in Nigeria.

2.6.5. Implication of Access to Finance and Macroeconomic Determinants on Economic Growth

The literature argues that the abundance of financial capital substantially contributes to fair income distribution and economic growth in developing countries where the agriculture sector is dominant. The provision of agriculture loans has the potential to improve productivity and profitability by curbing financial capital constraints which enables low-income households in rural areas to acquire basic inputs and improve their income from better returns (Yin *et al.*, 2020). According to Siddiqi and Baluch (2009) the reliance of farmers on agricultural outputs to generate income, and timely access to financial capital was a key option to bridge their financial shortfall which is not covered by their savings. Ascertaining smooth and effective agricultural production and business in the sector, highly demand abundant and prompt access to credit. This indicates that through improving agricultural productivity, agriculture credit has the potential to improve agriculture income.

Abdella and Idris (2021) indicate that farmers' access to agriculture credit increases their participation in further expanding production in the sector and again demand capital loans which increase their income and ignite their morale in applying entrepreneurial skills. This cycle has the potential to increase farmer’s involvement in high-scale business and to reduce the divergence of income distribution between urban and rural areas. Several empirical literature associated the role of credit on improving economic growth. For instance, Joao and De Castro (2023) investigated the effects of agriculture credit on agriculture GDP in Angola using data from 2003 to 2022. They have applied VECM to analyze the data and the result shows that agriculture credit has a significant and positive effect on Agriculture GDP. Further, the study showed that there is a unidirectional causation between agriculture credit and agriculture GDP. The provision of agriculture credit must be accompanied by equitable

access, lower interest rate, and well-managed risk to get better results. In the end, the study recommended that to ensure agriculture sustainability, effective monitoring, and evaluation must take place to investigate the social as well as environmental impact. Correspondingly, Karlan (2014) and Assunção *et al.* (2020) also show that providing credit plays a significant role in improving agricultural income and the local economy.

Studies also associate inflation as a determining factor of output level. Empirical investigation made by Hasanov (2011) on the effects of inflation on economic growth in Azerbaijan using data from 2000 to 2009. The finding of the study reveals that higher inflation beyond a certain threshold negatively and significantly affects economic growth. A similar finding is suggested by Akgül and Özdemir (2012), Kremer *et al.* (2013), and Tung and Thanh (2015) revealing higher inflation rate above some threshold level retards economic growth. The inverse relationship of inflation and economic growth is also explained by Barro (1995) and Akinsola and Odhiambo (2017). Ezako *et al.* (2023) determined the relationship between inflation and total output level in Burundi using data from 1990 to 2020. The study adopted ARDL model to analyze data and the finding of the study suggests that higher inflation rate negatively and significantly affect economic growth.

The role of human capital in promoting economic growth is also suggested by tremendous literatures. Among this, Bassanini and Scarpetta (2001) determined the contribution of human capital on economic betterment using data from 1971 to 1998 in the OECD. The finding revealed that extended years of schooling or a high literacy rate positively and significantly affect GDP per capita. The work of Abbas and Nasir (2001) shows that secondary and tertiary school completion positively and significantly affects growth in Pakistan and Sri Lanka. The study recommends the decisive role of human capital in economic growth in developing countries. However, the study concludes exceptional finding that a negative relationship is found between primary school completion and economic improvement. Unlike the result of Abbas and Nasir (2001) the finding of Taylor (2007) magnifies the positive role of primary school enrolment on economic growth in Malaysia. Pereira and Aubyn (2009) identified the positive and significant effects of primary and secondary school enrolment in Portugal. However, tertiary education has a negative relation with growth due to unutilized labor enrolled in tertiary education in Portugal. Correspondingly, the role of human capital in

promoting GNP growth is investigated by Haldar and Mallik (2010) in India using data from 1996 to 2007. The result of the study demonstrates that investment made on human capital through education and health significantly and positively affects growth.

Ngouhouo *et al*. (2021) also stated that countries with better human capital have a higher capability to withstand economic shocks. According to Germinal and Marcella (2021) who figured out the impact of education on economic development in low-income countries argued that education substantially contributes to economic development. Mwatu (2023) also assessed the effects of human capital on economic growth. The study used per capita GDP as a measure of economic growth and the finding shows that per capita human capital stock positively and significantly affects per capital GDP. The role of physical capital in boosting economic growth is argued by Bunyamin (2021) who assessed the effects of human and physical capital on the Indonesian economy. The finding of the study suggests that physical and human capital has a positive implication in shaping Indonesian economic growth. Nicodemo (2018) investigated the effect of human and physical capital in Tanzania using data from 1990 to 2015 and the findings of the study reveals existence of a unidirectional causality running from physical capital per labor to GDP per capital. Hilary (2012) also investigated determinants of economic growth in sub-Sahara Africa using data from 1982 to 2000 and adopted the Generalized Method of Moments (GMM) to analyze data. The result revealed that physical and human capital remains the main drivers of economic growth in the region. The finding of a positive contribution of physical capital on economic growth is also suggested by (Solomon, 2013; Alemayehu and Befekadu, 2005; Belay, 2015).

The inflow of remittance by an immigrant who lives outside a country is the other most important factor associated with economic growth. Tremendous literature argued the positive role of remittance in supporting output level in developing countries. Among this Fayissa and Nsiah (2012) investigated the impact of remittance on economic growth in 37 African countries using unbalanced data from 1980 to 2004. The finding demonstrates that remittance plays a significant role in improving economic growth. Remittance has a positive implication on the economy of developing countries where the financial system is underdeveloped. It serves as an alternative source of finance for investment and solves the problem of liquidity in developing countries. On the other hand, Sutradhar (2020) revealed the role of remittance in

supporting economic growth differs in magnitude across different countries. Debelo and Fetene (2021) investigated the role of remittance on economic growth in Ethiopia using data from 1980 to 2015 and adopted ARDL as an estimation technique. The finding of the study revealed that remittance has a significant and positive effect on real GDP in the long run. The work of Anwar and Cooray (2015) investigated the role of financial flow on the per capita income of developing countries using data from 1970 to 2011. The result of the study indicates that remittance and FDI have positively and significantly affected per capita income in developing countries. This finding is confirmed by Brown *et al*. (2011) which suggests the positive role of remittance in promoting growth but this only takes place with the adherence of a better institutional framework. Kapur (2005) also revealed that the remittance sent to the home country by migrants plays a decisive role in countries with socially, economic, and political unstable by serving as stable financial sources.

The dragging effect of unemployment on economic growth is argued by literature like Hussain *et al*. (2010) and Airi *et al*. (2016). Yelwa *et al*. (2015) empirically determined the relationship between unemployment and economic growth in Nigeria using data from 1987 to 2012. The finding indicates that unemployment is inversely related to economic growth. The study further recommended that to handle the negative consequences of unemployment, government intervention is necessary. Bein and Ciftcioglu (2017) also studied the relationship between agriculture GDP and unemployment in central and Eastern Europe using data from 1996 to 2013. The study adopted Granger causality and dynamic panel data analysis. The result of the study indicates that unemployment in the region is negatively and significantly related to the relative share of agriculture in GDP. The causality test result for some countries shows the negative causality running from unemployment to agriculture GDP. An empirical investigation of the nexus between economic growth and unemployment in Jordan is also studied by Hjazeen *et al.* (2021) using data from 1991 to 2019. The study applied ARDL as data analysis technique and the findings of the study show the existence of a negative and significant relationship between unemployment and economic growth in the long run. The inverse relationship between output level and unemployment is also confirmed by Shah *et al.* (2022) and Yegnanew (2023).

2.6.6. Determinants of Credit Volume

Olokoyo (2011) determined factors that affect credit volume and lending decision of commercial banks in Nigeria by taking data from 1980 to 2005. He used loans and advances as dependent variables that determine credit volume like volume of deposits, interest rate, investment portfolio; cash reserve requirement, and liquidity ratio. The result of the study shows that independent variables of the model significantly determine loan granting behavior of commercial banks in Nigeria. Djiogap and Ngomsi (2012) undertook a study in selected 35 commercial banks from six African countries and investigated determinants of long-term loan decision. The results reveal that long-term loan is determined by bank size, capitalization, GDP growth and the influence of supply-side constraints on long-term loan provision.

Alhassan *et al.* (2013) determined the effects of bank asset quality on lending decisions in Ghana. The study used data from 2005 to 2010 from 25 banks in Ghana and adopted a random effect model to determine the association of dependent and explanatory variables. The study showed that poor asset quality or high level of loan default negatively affected bank lending decisions in Ghana.

To investigate the determinants of commercial banks' credit provision behavior in Ethiopia, Amano (2014) took panel data from 2001 to 2013 and applied a fixed effect model to data generated from eight commercial banks. The results indicate that deposit size and bank size have positive and significant effects on credit volume while liquidity ratio and interest rate have a significant and negative effect. Mohammed (2014) also investigated determinants of bank lending decisions in sub-Sahara Africa using 264 banks. The results show that the financial performance of the bank is the major determinant of credit provided. Further, the study suggests that regulatory initiatives, regulatory capital, and entry requirements affect the provision of credit by banks.

Berhanu (2016) analyzed determinants of credit provision decisions by private banks in Ethiopia. The study selected six private commercial banks and used data from 2001 to 2015 and analyzed using the ordinary least square method (OLS). The results suggests that liquidity ratio and capital adequacy ratio have substantially contributes to credit volume, but variables

like non-performing loans, lending interest rates, and cash reserve requirements have negative and significant effects on credit volume in private commercial banks of Ethiopia.

Zelalem (2017) studied factors that determine commercial banks' lending decisions in Ethiopia. The findings show that economic growth, deposit growth, and bank size positively and significantly influence credit decisions but liquidity ratio and cash reserve requirement negatively and significantly affect credit volume. The study recommends that commercial banks in Ethiopia have to increase their volume of deposit mobilization and asset size to increase their credit provision.

Taye (2020) investigated determinants of private commercial banks' lending decisions in Ethiopia by taking ten sample commercial banks in Ethiopia and using panel data from 2009 to 2018. The results indicate that deposit volume, capital adequacy ratio, return on asset, and interest rate positively and significantly affected loan provision. On the other hand, cash reserve requirement, credit risk, and liquidity ratio have negative and significant effect on credit volume. The remaining macroeconomic variables like inflation and GDP growth rate not significantly affect credit volume. Literatures also associate the change in climate condition as a determining factor of credit supply especially loan granted to agriculture sector. Considering the direct implication of climate change on agriculture production performance; literatures considered climate change as a determining factor of credit supplied to agriculture sectors by modern financial institutions. According to Choudhury et al., (2022), the change in climate condition remains a supply side constraint of agriculture credit supply since financial institutions consider bad climate condition a threatening factor for agricultural production and it increases the loan default rate. Financial institutions often respond to climate change by adjusting interest rate or reducing the volume of credit supplied to the sector for riskier agricultural activities (Weber and Musshoff, 2017).

The empirical reviews on determinants of bank credit volume show many factors bank-specific, industry-specific, and macroeconomic factors determine the credit level provided by banks. They also indicated that some of the findings differ in their results regarding factors that determine credit volume. For instance, Berhanu (2016) argued that banks liquidity ratio positively affects credit volume of commercial banks in Ethiopia. Contrary to this, the

findings of Amano (2014), Zelalem (2017), and Taye (2020) show that liquidity negatively and significantly affect credit volume. Apart from this, almost all of the empirical findings reviewed previously focused on identifying factors that determine aggregate credit volume or loans and advances provided to all sectors in Ethiopia. This indicates that no study investigated credit volume provided to different sectors in Ethiopia. For instance, agriculture credit is one of the lowest credit categories as compared to the total outstanding loans provided to other sectors in Ethiopia. This necessitates investigating factors that determine agriculture credit volume provided by commercial banks in Ethiopia.

The studies reviewed above have shown how access to credit reduces poverty and income inequality levels, especially in rural economies by facilitating access to short-term financial needs. The reviews also reflected the role of credit in improving per-capital income especially initiating small farmers to get the role of entrepreneur and increasing their return as well as diversifying their investments into different portfolios. Despite this, a few empirical studies were done in Ethiopian on how bank agriculture credit solves the problem of poverty and income inequality from the supply side. The highest credit provided in Ethiopia comes from commercial banks and its contribution to the agriculture sector is very limited. Investigating the effects of bank agriculture credit on the level of poverty and income inequality is essential since the majority of the population in Ethiopia still lives in the agrarian economy. Literature also shows that in recent times, the distribution of income was in favor of urban dwellers which may lead to unfair income distribution. Investigating determinants of bank agriculture credit volume is also essential to identify factors that determine the growth in agriculture credit provided by commercial banks in Ethiopia.

2.7. Conceptual Framework

The following conceptual framework constructed and demonstrated on Figure 1 is developed based on theoretical and empirical reviews made in chapter two. The role of bank agriculture credit on poverty, income inequality, unemployment and economic growth has been thoroughly determined in the study. Moreover, bank specific, industry specific as well as macroeconomic determinants of agriculture credit volume provided by commercial banks are also identified.

The framework, demonstrates effects of bank agriculture credit on poverty and income inequality by integrating other macroeconomic factors. GDP Per capita, inflation, literacy rate, unemployment, trade openness, institutional quality and population size are integrated with bank agriculture credit to determine its effect on poverty and income inequality in Ethiopia. The other illustration of the conceptual framework shows the effects of bank agriculture credit on unemployment in Ethiopia together with other macroeconomic determinants of unemployment like: Real GDP, FDI, literacy rate, institutional quality, inflation and government expenditure to overcome variable omission bias. In similar fashion, the role of agriculture credit on GDP per capita is also demonstrated on the framework together with other determinants of economic growth namely: trade openness, government expenditure, literacy rate, gross capital formation, remittance, and unemployment.

Finally, to figure out the determinants of agriculture credit volume provided by commercial banks in Ethiopia, factors like deposit volume, cash reserve requirement, return on asset, interest rate spread, bank branch, liquidity ratio, inflation, economic growth and climate change are demonstrated.

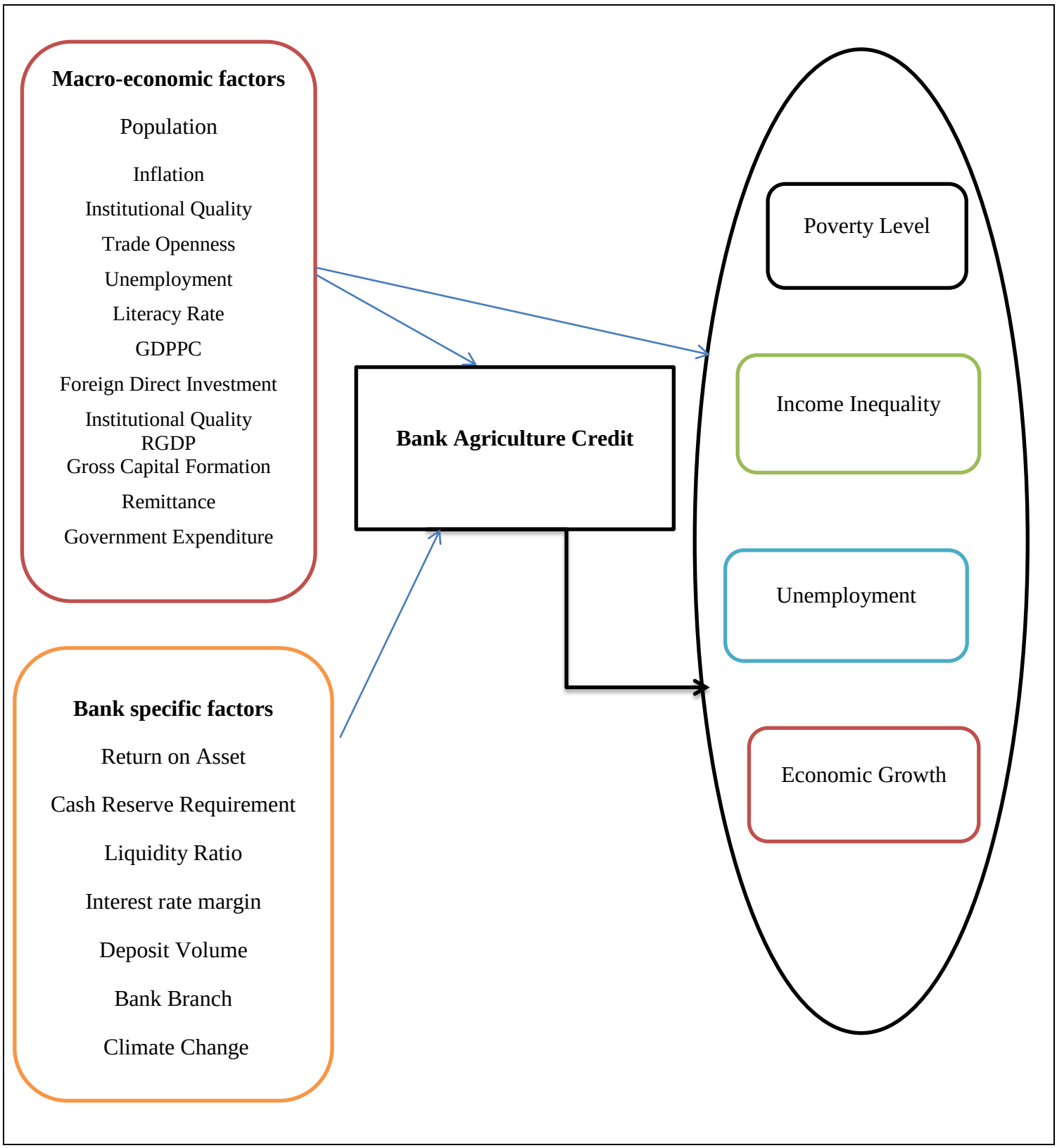


Figure 1: Conceptual framework

Source: Develop based on theoretical and empirical review

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

Ethiopia is one of the ancient landlocked countries in Africa between latitude and longitude of 8°00 N and 38°00 E, respectively. The latitude and longitudinal position of the country make it to be found in the tropic zone. However, the climate conditions in Ethiopia differ across different regions depending on altitude. Specifically, Ethiopia borders six countries, namely: Eritrea in the north, Somalia in south east, and Djibouti in the east, and Kenya in the south, Sudan in the west and South Sudan in the southwest. Ethiopia has an administrative structure using a federal parliamentary republic governance system, and the prime minister is the head of government. Ethiopia is sub-divided into 12 regions and Dire Dawa and Addis Ababa cities are under federal administration (László and Teketel, 2022).

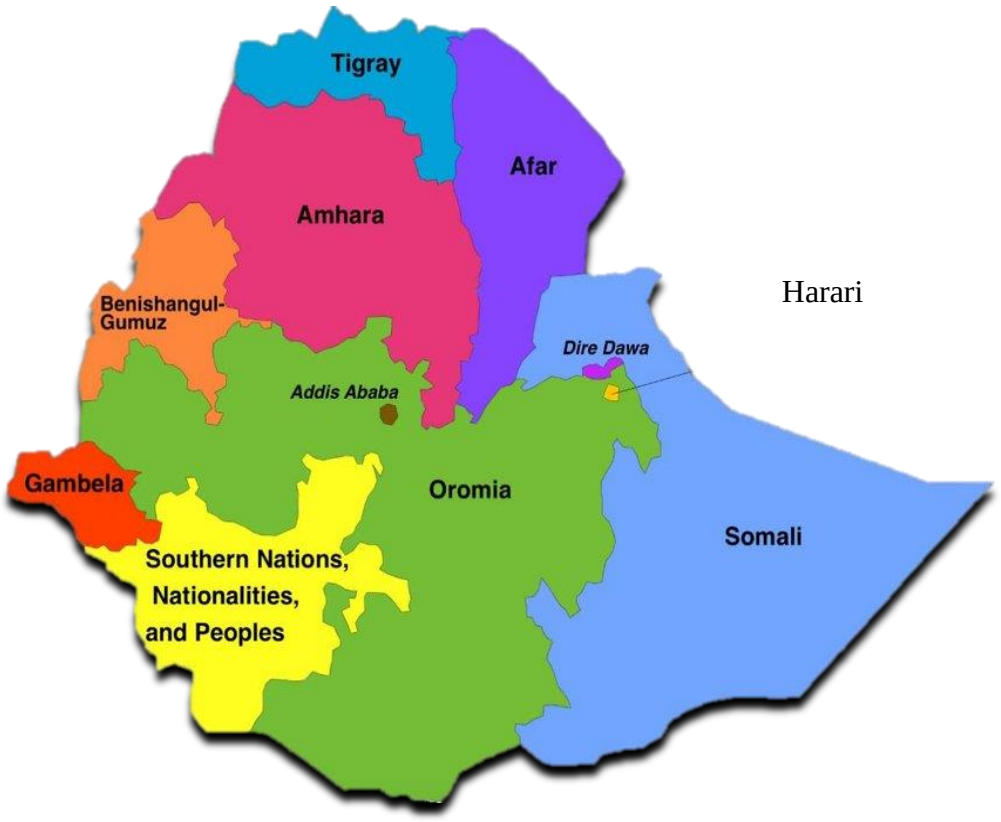


Figure 2: Map of the Study Area

The history of banking services in Ethiopia started in 1905 when Bank of Abyssinia was formed under the ownership of the Ethiopian government which was later owned by the British government. After the colonial power's departure, a state bank called the Bank of Ethiopia was established in 1942 which operated and competed with foreign banks. This condition came to an end when the military regime (the Dergue) came to power in 1976 and was forced to merge with private banks. The economic system during the command economy forced the banking system to be owned and operated under the control of the government. The downfall of the Dergue Regime in 1991 called for policy revision that liberalized and deregulated the financial sector under regulation 84/94. This condition gave rise to the establishment of several private banks and insurance companies. Currently, there are 2 state-owned banks and 29 private commercial banks in Ethiopia. The current banking environment is characterized by domination of the banking sector by privately owned banks (NBE, 2022).

3.2. Research Design and Approach

Selecting the best research design is based on the objective and problem of the research, nature and scope of the research, and types of data since research design is a strategy to effectively answer research problems and a blueprint for dealing with research data (Bell, 2005). From the nature of the study, objectives, and research problem, this study adopted an explanatory research design. The rationale behind adopting of explanatory research design is due to its nature in best explaining the association between dependent and independent variables (Kothari, 2004). The study also adopted a quantitative research approach to empirically determine the relationship between research variables. The quantitative research approach utilizes and analyzes quantitative data to quantify information and to make statistical treatments so that alternative knowledge is claimed. This approach works by employing of surveys and experiments to collect data based on pre-specified instruments to generate statistical data (Creswell, 2003).

3.3. Data Type, Source of Data, and Methods of Data Collection

This study used secondary data sets which are both panel and time series data. Firstly, the study used unbalanced panel data from 2000 to 2021 to determine the effects of bank agriculture credit on poverty level and income inequality by extracting data from all eleven

regional states in Ethiopia. The second-panel data setting is used from 2010 to 2021 to meet the last objective that figure out the determinants of volume of agriculture credit by commercial banks in Ethiopia. The study also used time series data from 1990 to 2021 to determine the effects of bank agriculture credit on GDP per capita and unemployment in Ethiopia.

The study utilized two different data sets for the first and the second objective. The rationale behind using of panel data for the first objective and time series data for the second objective is due to the nature and availability of data. For instance the first objective has variables with unbalanced data and using of time series data set for such data set becomes more problematic creating difficulty in analysis and model (Chawla *et al.,* 2004). Conversely, panel data has more advantage than time series data in handling unbalanced data through its flexibility and adjusting the missing value through estimating from existing observations (Hsiao, 2014).

Bank agriculture credit and bank specific variables data were collected from NBE, and commercial banks of Ethiopia. The data for other variables in the study were collected from Ministry of Planning and Development Commission, Global Data Lab, UNDP, Ethiopian Statistical Service (ESS), and World Bank.

3.4. Population, Sample Size and Sampling Technique

The fourth objective of the study aims at figuring out the determinants of the volume of bank agriculture credit granted by commercial banks using panel data from 2010 to 2021. The total population of this specific objective is state-owned commercial banks and all private commercial banks in Ethiopia. According to NBE (2021), there were 16 private and 1 state-owned commercial banks providing full-fledged banking services in Ethiopia. However, private banks were established at different periods and most of them started operating in recent years. Consequently, only five commercial banks namely, Abay Bank, Enat Bank, Addis International Bank, Debub Global, and Birhan International banks are excluded from the total population due to late establishment and unavailability of data during the study period. Undeniably, increasing sample size has the potential to represent the total population. In this regard, this study aims at maximizing the inclusion of banks or increasing observation hence purposively selected 12 commercial banks based on the availability of data. Saunders *et*

al. (2009) stated that the purposive sampling technique is used when the sample is small and the selected samples have informative behaviors. The selected sample commercial banks[1] have more than 93% market share and credit disbursement from all commercial banks in Ethiopia (NBE, 2021). The study decided to use panel data from 2010 to 2021 to obtain maximum observation by selecting twelve commercial banks.

3.5. Methods of Data Analysis

The framework of the study assumes that poverty is where the total share of population that has income or consumption level below the poverty line or the share of total population and the concern is how that portion of population below poverty line is reduced. This study used poverty headcount ratio to measure poverty. Further, the study also determines how income inequality or the divergence in income distribution in the population is influenced by bank agriculture credit. It is believed that the distance between rich and poor must be narrowed to reduce income inequality. Hence, income inequality is measured by the Gini Coefficient that assumes coefficient ranges between 0 and 1, where value zero indicates perfect equality and value one shows perfect inequality or the whole resources were owned by a single household.

The study adopted both descriptive and econometric analysis. The descriptive analysis depicts the patterns, mean differences, and trends of poverty, income inequality, and bank agriculture credit allocation to different sectors in Ethiopia for the study period. The mean difference test was also conducted to determine the existence of credit volume differences between Development Banks and commercial banks in Ethiopia. Furthermore, the study summarizes and describes study variables using statistical tools like mean, standard deviation, minimum, and maximum.

On the other hand, the econometric analysis part has Panel Corrected Standard Error (PCSE), Auto-Regressive Distributed Lag (ARDL), and Augmented Mean Group (AMG) models used to analyze panel and time series data of the study.

[1] The sample commercial banks selected for the last objective are: Commercial Bank of Ethiopia, Awash Bank, Dashen Bank, Bank of Abyssinia, and Cooperative Bank of Oromia, Wegagen Bank, Oromia International Bank, NIB Bank, Lion International Bank, Hibret Bank, Buna International and Zemen Bank.

3.5.1. Panel Corrected Standard Error (PCSE) Model

The first objective of the study that determine the effects of bank agriculture credit on poverty and income inequality using unbalanced panel data from 2000 to 2021 in Ethiopia adopted PCSE model. The study made a deep investigation by incorporating other important determinants of macroeconomic variables that affect poverty level and income inequality. As explained in the analytical framework of the study the rationale behind selecting this model is due to its robust and suitable nature to analyze panel data setting with longer time than the number of cross-sections. Additionally, the model is capable of effectively controlling spatial correlation, heteroscedasticity, and cross-sectional dependence.

The first two equations were formulated to achieve the first objective that investigates the implication of bank agriculture credit on poverty level and income inequality together with other macro-economic variables as follows:

$$lnPOVHC_{it} = \beta_0 + \beta_1 lnAGRIC_{it} + \beta_2 lnPOP_{it} + \beta_3 lnINF_{it} + \beta_4 lnLR_{it} + \gamma_5 lnGDPPC_t + \gamma_6 lnTO_t + \gamma_7 lnUNE_t + \gamma_8 IQ_t + \varepsilon_{it} \quad (18)$$

Where: β_0 is the intercept term, β_1, β_2, β_3, β_4, γ_5, γ_6, γ_7, and , γ_8, are coefficients of the model and ε_t is the error term. $lnPOVHC_{it}$ = log of poverty headcount ratio at region i and time t, $lnAGRIC_{it}$ = log of agriculture credit provided by banks through their branches in Ethiopian regions at time t, $lnLR_{it}$, log of literacy rate at region i and time t, $lnINF_{it}$ log of inflation at region i and time t and the remaining variables are control variables like: $lnTO_t$ = log of trade openness at time t, IQ_t = institutional quality at time t, $lnGDPPC_t$ = log of gross domestic product per capital at time t and $lnUNE_t$ log of unemployment at time t are taken at national level.

The second equation of the study was formulated to indicate the effects of bank agriculture credit on income inequality as follows:

$$lnGINI_{it} = \beta_0 + \beta_1 lnAGRIC_{it-1} + \beta_2 lnINF_{it} + \beta_3 lnPOVHC_{it} + \gamma_4 lnGDPPC_t + \gamma_5 lnUNE_t + \gamma_6 lnTO_t + \gamma_7 IQ_t + \varepsilon_{it} \quad (19)$$

Where $lnGINI_{it}$ = log of Gini coefficient to measure income inequality at region i and time t, and the rest variables and coefficients were explained above.

3.5.2. Auto-Regressive Distributed Lag (ARDL) Model

The second objective of the study investigates the effects of bank agriculture credit on unemployment and GDP Per Capita using time series data from 1990 to 2021 adopted the ARDL model to analyze the data.

The third equation which specifies the effects of bank agriculture credit on unemployment is formulated as follows:

$$lnUNR_t = \alpha_0 + \beta_1 lnUNR_{t-1} + \beta_2 lnAGRIC_{t-1} + \beta_3 RGDP + \beta_4 lnFDI_{t-1} + \beta_5 lnLR_{t-1} + \beta_6 IQ_{t-1} + \beta_7 lnINF_{t-1} + \beta_8 lnGE_{t-1} \sum_{i=1}^{p} \delta_1 \Delta lnUNR_{t-i} + \sum_{i=1}^{p} \delta_2 \Delta lnAGRIC_{t-i} + \sum_{i=1}^{p} \delta_3 \Delta RGDP + \sum_{i=1}^{p} \delta_4 \Delta lnTO_{t-i} + \sum_{i=1}^{p} \delta_5 \Delta lnLR_{t-i} + \sum_{i=1}^{p} \delta_6 \Delta IQ_{t-i} + \sum_{i=1}^{p} \delta_7 \Delta lnINF_{t-i} \sum_{i=1}^{p} \delta_8 \Delta lnGE_{t-i} + \varepsilon_t \quad (20)$$

Where: $lnUNR_t$ = log of the unemployment rate at time t, $lnAGRIC_t$ log of agriculture credit at time t, $lnRGDP_t$ = log of real gross domestic product at time t, $lnFDI_t$= log of foreign direct investment, IQ_t = institutional quality at time t, $lnLR_t$= log of literacy rate at time t, $lnINF_t$ = log of inflation at time t, Δ is the difference operator and β_1, β_2, β_3,β_4 β_5, β_6, and β_8, are coefficients of the model and ε_t is the error term.

The fourth equation formulated to show the effects of bank agriculture credit on GDP per capital income together with other macroeconomic factors as follows:

$$\Delta lnGDPPC_t = \alpha_0 + \beta_1 lnGDPPC_{t-1} + \beta_2 lnAGRIC_{t-1} + \beta_3 lnTO_{t-1} + +\beta_4 lnGE_{t-1} + \beta_5 lnLR_{t-1} + \beta_6 lnGCF_{t-1}\, \beta_7 lnREM_{t-1} + \beta_8 lnUNE_{t-1} \sum_{i=1}^{p} \delta_1 \Delta lnGDPPC_{t-i} + \sum_{i=1}^{p} \delta_2 \Delta lnAGRIC_{t-i} + \sum_{i=1}^{p} \delta_3 \Delta lnTO_{t-i} + \sum_{i=1}^{p} \delta_4 \Delta lnGE_{t-i} + \sum_{i=1}^{p} \delta_5 \Delta lnLR_{t-i} + \sum_{i=1}^{p} \delta_6 \Delta lnGCF_{t-i} + \sum_{i=1}^{p} \delta_7 \Delta lnREM_{t-i} + \sum_{i=1}^{p} \delta_8 \Delta lnUNE_{t-i} + \varepsilon_t \quad (21)$$

Where, $lnGDPPC_t$ = log of GDP per capital at time t, $lnTO_t = \log \text{of trade openness at time t}$, $lnGCF_t$ = log of gross fixed capital formation at time t, $lnREM_t$ = log of remittance at time t, and the rest variables and coefficients were explained above.

This section also integrated post estimation diagnostic tests to overcome the problem that violate basic econometric assumptions. Diagnostic and model stability tests were often undertaken in empirical studies to affirm whether the regression model fulfilled basic econometric assumptions that may lead to biased and unreliable results otherwise (Pesaran *et al.* 2001). In this study diagnostic tests like the Serial correlation test (Brush and Godfray LM test), normality test (based on Skewness and Kurtosis of residuals), and heteroscedasticity based on White test for heteroscedasticity and Breusch-Pagan/Cook Weisberg Test was applied. The study also undertook structural break tests to identify the presence of structural breaks in during the study period. With the presence of structural breaks, parameters of the regression models tend to change over time and the result generated from this model leads to unreliable estimates and leads to difficulty in forecasting as well. The study adopted the CUSUM of OLS residuals technique structural break test developed by (Ploberger and Kramer, 1992). According to CUSUM of OLS test, the null hypothesis states no structural breaks and parameter stability. Conversely, the alternative hypothesis states the presence of structural breaks. The test statistics are compared with critical values at 1%, 5%, and 10% significance values. If test statistics exceeded critical values, the null hypothesis parameter stability is rejected. Additionally this study has adopted graphical model stability test which are cumulative sum of recursive residual (CUSUM) and Cumulative sum square (CUSUMSQ) introduced by Brown *et al*. (1975).

3.5.3. The Augmented Mean Group (AMG) Model

The AMG model is used to identify determinants of agriculture credit volume provided by commercial banks in Ethiopia by using balanced panel data from 2010 to 2021. The following equation denotes determinants of bank agriculture credit volume provided by commercial banks. The AMG model developed by Eberhardt and Bond (2009) is specified as follows:

$$\begin{aligned} lnAGRCV_{it} = {} & \beta_0 + \beta_1 lnDV_{it} + \beta_2 lnCRR_{it} + \beta_3 lnROA_{it} + \beta_4 lnIRS_{it} + \beta_5 lnBB_{it} + \beta_6 lnLQR_{it} \\ & + \beta\gamma_7 lnINF_t + \beta\gamma_8 lnRGDP_t + \beta\gamma_8 lnCLC_t \\ & + \varepsilon_{it} \end{aligned} \quad (22)$$

Where: Where: β_0 is intercept term, β_1, β_2, β_3,β_4, β_5, β_6, γ_7, and γ_8, , are coefficients of the model and ε_t is the error term. $lnDV_{it}$ is the log of deposit volume mobilized by bank i and time t. $lnCRR_{it}$ is the cash reserve requirement by bank i and time t. $lnROA_{it}$ is log of return on asset of bank i and time t. $lnIRS_{it}$ is log of interest rate spread of bank i and time t. $lnBB_{it}$ stands for log of the bank branch owned by the bank i and time t. $lnLQR_{it}$ is log of liquidity ratio of bank i and time t. $lnINF_t$ is log of inflation at time t, $lnRGDP_t$ stands for log of real domestic product at time t and $lnCLC_t$ represents log of climate change at time t.

3.6. Description of Variables, Measurement and Hypothesis

Poverty Headcount Ratio (POVHC): It is calculated as a percentage of the total population living on less than the national poverty line at the national poverty line. In this study, the regional poverty headcount ratio is taken as a dependent variable in equation (18) above and the poverty headcount ratio of all 11 regional states of Ethiopia is used.

GINI Coefficient (GINI): This variable is used to measure income inequality and its value ranges from zero to one. The value of zero indicates that households have the same income or perfect equality but the value of one indicates a given household owns all income or perfect inequality. Income inequality is measured as the average difference of income in a population over the average income where the coefficient was obtained from the Lorenz curve. The cumulative percentage of income obtained by the cumulative share of the society was depicted by the Lorenz curve (Deaton, 2013). Income inequality is a dependent variable in equation (19) above and regional GINI Coefficient data is used.

Bank Agriculture Credit (AGRIC): It is a type of loan product provided by banks for the agriculture sector. Agriculture credit plays a pivotal role in reducing poverty levels and to enable equitable income distribution in the rural economy by bridging financial capital shortfalls of rural households through enabling them to acquire agricultural inputs (Croppenstedt *et al.*, 2017). Farmer's and agro-processing economic units' access to capital loans improves productivity and farmers' return which in turn increases income. Further, the abundance of agriculture credit has the potential to improve farmers' participation in entrepreneurial activities and this narrows the divergence of income distribution between urban and rural communities. In this study, this variable is measured by the total yearly

outstanding loan provided by banks to the agriculture sector. The variable is the independent variable in equations (18), (19), (20), (21), and the dependent variable in equation (22) represents the total volume of agriculture credit provided by commercial banks in Ethiopia. Bank agriculture credit is expected to negatively affect Poverty level, income inequality, and unemployment and positively affect GDP per capita.

Government Expenditure (GE): It is the total spending made by the government on recurrent and capital expenditure. Government recurrent expenditure on wages and salary increase the total money in the economy which further improves aggregate demand and employment in the economy. Further, government capital expenditures made to acquire or create fixed assets or investment in different infrastructures, and projects are considered as development expenditure. The increase in capital expenditure is expected to increase employment creation in the economy (see Holden and Sparrman, 2016; Shadi, 2020). In this study government expenditure is calculated as total government spending as a percentage of GDP and it is expected to have a negative effect on the unemployment rate and positively affect GDP per capita.

Trade Openness (TO): Trade openness is calculated by dividing the sum of export and import by gross domestic product. This variable is an independent variable and is expected to positively affect the economy through adaptation of technology from other countries through improved integration internationally. Apart from this, when there is high level of trade openness, the higher inclination to stick on comparative advantage by a nation. This in turn enables the country to become competitive at international market and to exchange and adopt technological improvement (Chang *et al.*, 2005).

Institutional Quality (IQ): This variable is calculated by amalgamating the average of six indicators: voice and accountability, political stability and absence of violence, control of corruption, government effectiveness, regulatory quality, and rule of law, and calculated from the database of Kaufman *et al*. (2003). The World Bank developed Governance indicator data that range from -2.5 and 2.5 which indicates the lowest value (-2.5) and the highest (2.5) which indicates the lowest value (-2.5) and the highest (2.5) respectively. In this study, the original data developed by the World Bank is rescaled to index zero and one through applying

a mini-max index where each indicator values were converted to index value by subtracting them from minimum value and dividing by the difference between maximum and minimum value and multiplied by 100. The presence of strong institutional quality has the potential to pull out populations out of poverty and income inequality and institutional environments remains one of the main influential factors in developing countries (Thelen and Busemeyer, 2012). This variable is expected to negatively affect poverty level, income inequality, and unemployment.

Literacy Rate (LR): According to Atkinson and Messy (2013) the existence of improved human development and better literacy rates enable societies to understand and participate in financial services which help to reduce poverty and income inequality, especially in less developed countries. In this study, the gross secondary school enrollment ratio is taken as a proxy for the literacy rate. The literacy rate is an independent variable and is expected to negatively affect poverty level and unemployment and positively affect GDP per capita.

Inflation (INF): It refers to the general surge in the price of goods and services of an economy. Money loses purchasing power during inflationary periods since each unit of currency buys progressively fewer goods. It was measured by a percentage change in basket goods price of this year divided by the base year price. The prevalence of inflation tends to reduce the purchasing power of money and tend to affect those societies who earn fixed income and aggravates poverty and income inequality (Palmer and Barth, 1977). Inflation is an independent variable and is expected to positively affect (aggravate) income inequality, poverty, and unemployment.

Unemployment (UNE): It refers to part of the workforce who is without work but actively seeking employment. In this study, the unemployment rate is measured as the total number of unemployed as a percentage of the total labor force. According to Deyshappriya (2017), unemployment has a significant effect in widening income inequality by restricting low-income group who has minimum accumulated wealth unlike those with higher income groups. Unemployment is an independent variable in equation (18), (19), (21), and the dependent variable in equation (20) is expected to positively affect poverty and income inequality.

Foreign Direct Investment (FDI): It is a category of international investment that reflects the objective of a resident in one economy (the direct investor) obtaining a lasting interest in an enterprise resident in another economy (the direct investment enterprise). According to Deardorff and Stern (1994), foreign direct investment has the potential to create jobs for mass unskilled labor and increase the income they earn. In this study, FDI is an independent variable in equations (20) and it is expected to negatively relate to the unemployment rate. In this study, the total net inflow of FDI measured in current USD is used.

Real Gross Domestic Product (RGDP): The sum of the total market value of domestically produced goods and services at constant price. The values of products are valued by the same year price to compare the purchasing power over time and in this instance, the effect of inflationary pressure or effect was removed. In this study, the variable is measured at the 2010 constant price to proxy economic growth. According to Valerie *et al.* (2021), economic growth has the potential to reduce poverty and has an ambiguous outcome on income inequality. Contrary to this, the work of Heyse (2006) shows that developing countries that experience high-income inequality are not connected with less economic growth. So, the effect of economic growth on income inequality is ambiguous.

Population size (POP): It indicates the total number of people that lives in a country and it's an explanatory variable in equation (18). Different studies provided different arguments regarding the effects of population growth on poverty. According to Hilmi *et al.* (2022), high population growth aggravates poverty levels through unemployment and pressure on wage rates. For instance, Klasen and Lawson (2007) concluded that expansion in population size leads to a decrease in per capita income growth. Peterson (2017) also states that high population growth in low-income countries seriously affects per capita income. In this study, population growth is an independent variable in the equation (18). The study used total population size in each regional state and a positive relation with poverty level is expected.

GDP Per Capita (GDPPC): It is the total amount of all domestically produced final goods and services produced in a given fiscal year divided by its total population and this measure is capable of better reflecting the economic wellbeing of a society than other economic growth measures like GDP. Real GDP per capita is calculated at a constant 2015 price. This variable

is the independent variable in the first two equations (18) and (19) respectively and the dependent variable on equation (21). According to Thorbecke (2023), to swiftly reduce poverty level by realizing better economic growth which fuels up labor demand and increases employment creation? In this study GDP per capita is expected to negatively affect poverty and income inequality.

Remittance (REM): It is measured by the inflow of income earned to the home country by migrant workers residing and working outside. According to Barajas *et al.* (2009), remittance fosters economic growth by strengthening the financial system and influencing total factor productivity through the improvement of physical investment. The variable is an independent variable and the study used the total amount of remittance inflow received in USD. Further, remittance is expected to positively relate to GDP per capita.

Gross Fixed Capital Formation (GCF): It is measured as the monetary value added to fixed assets like buildings, machinery, equipment, and inventory. The accumulation of physical capital coupled with well-developed human capital fosters GDP per capita (Nicodemo, 2018). In this study, gross fixed capital formation as a percentage of GDP is used and expected to positively affect GDP per capita.

Liquidity Ratio (LQR): This is a regulation on banks to maintain the minimum reserve and this ratio shows that banks' capability to repay short term creditors from its total cash. According to Pilbeam (2005), the loan provided by banks is considered as illiquid asset or they cannot be converted into cash and cash equivalent whenever necessary. As banks' liquidity is measured by dividing the total cash held by the bank to short-term borrowings to show how short-term borrowings are covered by total cash on hand. The presence of a high liquidity ratio or when commercial banks held more liquid assets shows a reduced proportion of provided loans. This means the level at which bank liquidity size affects the amount of loans they are going to provide and an equivalently high liquidity ratio indicates the high liquidity position of the bank and reduced proportion of loans provided (Rababah, 2015). In this study, the liquidity ratio is measured by dividing the total cash held by the bank to short-term borrowings.

Cash Reserve Requirement (CRR): The amount of cash a bank hold in its Volt or Federal Reserve Bank against a customer's deposit. This reserve requirement is set by the central bank of a country to protect the bank from liquidity problems and to guarantee depositors during bad economic conditions. To safeguard customer's cash withdrawal interest, government often urges banks to keep a certain amount of their deposit as a reserve requirement. In return, commercial banks get paid interest on the amount of reserve they have maintained which is decided by the central government. According to Christian and Pascal (2012) the rate of reserve requirement has an implication on the credit volume that banks provide to their customers. This means when central bank raises reserve requirements, the tendency of commercial banks to provide credit decreases. In this study reserve requirement is measured by taking the total amount of reserve commercial banks hold at national banks in accordance with their deposit level. The cash reserve requirement is expected to negatively influence the agriculture credit provided.

Deposit Volume (DV): It refers to the amount of cash banks collect and save from customers in the form of savings, current and time deposits. It is apparent that the primary objective of banks is to bridge between excess cash and cash shortage in the economy. They collect cash in the form deposit and lend it to customers and collect the principal with an interest charge. The amount of credit provided by commercial banks directly depends on the volume of deposits they have mobilized from the economy. The amount of deposit mobilized by banks has a significant impact on the level of credit provision (Olokoyo, 2011). This variable is measured by taking the yearly total deposit level commercial banks mobilize. High deposit mobilization is expected to positively influence the volume of agriculture credit disbursement.

Return on Asset (ROA): ROA is a proxy of profitability that measures the ability of management organs to convert a firm's asset into net earnings. Return on asset was considered as the best proxy to measure profitability since it represents the measure of how portfolio assets are used to generate revenue. The rationale behind selecting ROA as a proxy for this study lies in it indicates how bank managements convert banks financial and real investment resources into profit. Recently, ROA was considered the most utilized measure of bank profitability by much literature (Golin, 2001). Return on assets is calculated by dividing a

bank's net income by the average total assets. Better return asset is expected to have a positive relationship with credit volume.

Bank Branch (BB): It refers to the number of branches that banks have throughout a country to provide service and ensure accessibility for their customers. Increasing the number of branches creates a favorable condition for the customers through accessibility. This in turn enables the bank to acquire several customers and financial resources which are key to increasing credit provision in the economy (Sangjeong and Ellinger, 2008). The variable is measured by taking the total number of branches commercial banks has on a yearly bases. The extended branch network is expected to have positive signs.

Interest Rate Spread (IRS): The difference between lending interest rate and saving interest rate paid on demand and fixed time deposit. It is calculated by subtracting the interest charge on credit and the amount of interest banks pay for the customers to save money. An escalated interest rate spread frustrates a potential saver and jeopardizes potential investor since the cost of intermediating between a saver and an investor has strong implications for effective mobilization of funds. The inefficiency of financial intermediaries cause high intermediation costs and increases the loss of productive funds in intermediary process hence on credit volume (Sogut, 2008). In this study, IRS is expected to have a negative sign.

Climate Change (CLC): It refers to a prolonged change in atmospheric condition stemmed from a change in attributes like temperature, patterns of precipitation, rising sea levels etc… due to human activities as well as natural factors. Climate change has a direct implication on production efficiency of agriculture sector through affecting basic inputs like water, heat, soil and light which aggravate the risk associated with agricultural production (Kumar et al., 2021). The associated risk of agricultural production due to climate change poses a negative implication on farmer's income level which retards their credit repayment capability. This condition raises a doubt on the creditworthiness of farmers from formal financial institutions and becomes credit constraint (Choudhury et al., 2022). In this study annual average temperature measured by Degree Celsius at national level is used as a proxy for climate change and it is expected to have a negative effect on the amount of credit supplied to agriculture sector by commercial banks.

4. RESULTS AND DISCUSSION

This chapter presents detailed descriptive statistics as well as the study's econometric results. The descriptive part demonstrates summery of variables, trends of poverty and income inequality in Ethiopia at the regional and national levels. It also describes trends of sectorial credit disbursement in Ethiopia, mean difference test on credit provision between economic sectors as well as agriculture credit provision gap between commercial banks and Development Bank of Ethiopia. Finally, the econometric result of each objective was discussed with pre-estimation and diagnostic tests.

4.1. Descriptive Statistics Results

Table 1 summarizes and describes variables used in the study. Summary of variables in terms of mean, standard deviation, minimum and maximum values of each variable is discussed as follows.

Poverty level captured by poverty headcount ratio in Ethiopia has a mean value of 32.6 and standard deviation of 8.59 indicating that still poverty remains persistent in the country. The minimum and maximum values of poverty headcount ratio are 23.5 and 44.2 respectively. The minimum value of poverty headcount ratio indicates the lowest level of poverty rate that the country is able to achieve during the study period. Despite promising progress in poverty reduction in Ethiopia, tremendous people are still living below the poverty line. The income distribution disparity measured by the Gini Coefficient in Table 1 reveals the mean value of the Gini coefficient is 0.33 at the national level with a standard deviation of 0.06. This indicates that the country is experiencing relatively fair income distribution as compared to other developing countries. UNDP (2017) report indicates that sub-Sahara Africa remains or categorized as one of world’s most unequal region. Correspondingly, the trend of income inequality in Ethiopia shows an increasing trend. The minimum and maximum values are 0.28 and 0.44 during the study period. This shows how the disparity of income distribution in the nation has increased from time to time.

Table 1: Descriptive Statistics of Variables

Variable	Mean	St. Dev.	Min	Max.
Poverty Headcount	32.6	8.59	23.5	44.2
Income Inequality	0.33	0.06	0.28	0.44
Agriculture Credit	6717.89	8254.96	83.1	30779.85
Trade Openness	37.08	11.83	8.85	55.04
GDP Per Capita	417.39	201.49	215.64	834.99
Inflation	11.28	11.59	-8.48	44.36
Unemployment	2.88	0.52	2.25	3.93
Population	80.69	21.62	47.88	120.28
Institutional Quality	0.32	0.04	0.25	0.38
Literacy Rate	24.85	11.34	9.08	39.68
Remittance	314.74	392.34	5.22	1796.39
Gross Capital Formation	24.84	8.56	13.9	39.4
Foreign Direct Investment	1051.1	1388.17	0.17	4259.45
Real GDP	6.94	5.79	-8.9	13.5
Government Expenditure	19.12	3.65	13.77	27.04
Deposit Volume	36,798.91	90552.51	240.26	735700
Cash Reserve Requirement	2521.92	5056.01	59.84	30437.25
Return on Asset	3.38	0.94	1.01	6.72
Interest Rate Spread	3.21	1.47	0.17	6.82
Bank Branch	243	301	3	1872
Liquidity Ratio	0.33	0.18	0.04	0.89

Source: Authors calculations.

The provision of credit to agriculture sector on Table 1 above has a mean value of 6,717.89 which is measured in Billion Birr with the standard deviation of 8,254.96 during the study period. It was evident that the agricultural sector is the least recipient of bank agriculture credit as compared to other economic sectors. According to the NBE (2022), of the total outstanding loan delivered by banks in Ethiopia, the agricultural sector is only able to receive less than 10% of credit. This reveals that despite banks remaining the first and the major providers of credit in the economy, their credit disbursement is highly inclined towards the service and industry sector making the agriculture sector to benefit bagatelle as compared to the others. The maximum amount of bank agriculture credit provided during the study period is 30779.85 and the minimum value of 83.1 Billion Birr. Trade openness which shows Ethiopia's degree of trade liberalization or interaction in international trade has an average value of 37.08 with a standard deviation of 11.83 which is calculated by the ratio of import and export to country GDP. This shows that country's involvement in international trade is

dominated by imports revealing the country's infant role in exporting. The maximum value of trade openness is 55.03 and the minimum value is 8.85.

The average GDP per capita of Ethiopia during the study period is 412.39 USD with a standard deviation of 197.49. This shows that Ethiopia is categorized as low-income country. The maximum and minimum values of GDP per capita are 822.31 and 216.29, USD respectively. This measure is known for its advantage of taking into account of population residing in a given economy and it gives better insight into considering consumers' economic well-being. Ethiopia's GDP per capital status is low even when compared to the average of SSA countries. According to World Bank (2021) data the average GDP Per capita income of Sub Sahara Africa countries is 1580.49 USD which indicates the countries average GDP per capita lags behind the region GDP per capita. Despite progress in the yearly growth rate in GDP per capita, the country is still considered as the world's least developed country.

Being one of the macroeconomic curses, most developed world government give major emphasis on inflation to halt its welfare degradation impact. The result in Table 1 indicates the general increase in price level measured by inflation rate from 1990 to 2021 has an average value of 11.28 and a standard deviation of 11.59. Amid economic growth in Ethiopia, the rate of inflation also remains persistent. A stable price level in the economy is one indicator of macroeconomic strength in a given nation and contrary to this high inflationary pressure seriously erodes the welfare of the society. The recent increase in the inflation rate in Ethiopia remains the greatest macroeconomic challenge. The maximum and minimum values of the inflation rates are 44.36 and -8.48, respectively. According to the Word Bank (2022) data, the inflation rate of Ethiopia is 33.9 percent in 2022 which shows a 7.1% increase from the preceding year. It was evident that an extremely high inflation rate impedes the economic status of the societies especially those who earn fixed income.

The unemployment level measured by the total unemployed workforce as a ratio of the total labor force has a mean value of 2.88 with a standard deviation of 0.52. During the study period, the minimum and maximum value of unemployment in Ethiopia were 2.25 and 3.93 respectively. The total population size measured by the number of total population in million

shows the average population size of Ethiopia is 80.69 with a standard deviation of 21.62 (in millions) in Ethiopia during the study period.

The population growth rate of Ethiopia in 2021 is 2.6 percent which is almost close to Sub Sahara Africa population growth rate which is 2.59 percent for the same year. However, this figure highly surpasses the population growth rate of world population which is 0.87 in 2021 (World Bank, 2021). This indicates that the population growth in Ethiopia remains high making the country one of the most populous countries in Africa after Nigeria. The maximum population size in Ethiopia is 120.28 million and minimum is 47.88 million.

Institutional quality (IQ) which measures the average of six governance indicators has a mean value of 0.32 and standard deviation of 0.04. The indicators are rescaled between 0 and 1 to show the quality of institution, where value close to 1 indicates better institutional quality while institutional quality value closer to 0 shows the opposite. As indicated in the Table 1 the maximum value of IQ in Ethiopia is 0.38 and the minimum value is 0.25. The maximum value of the variables shows the highest level of good governance that the country is able to achieve during the study period. This shows that Ethiopia is categorized under nations with poor institutional quality.

Literacy rate measured by gross secondary school enrollment ratio has a mean value of 24.85 and standard deviation of 11.34 in Ethiopia. The minimum and the maximum values of literacy rate are 9.08 and 39.68, respectively. Undoubtedly, literacy rate plays a decisive role in the human capital development of a nation. However, the World Bank (2020) shows that Ethiopia's human capital index is 0.38 which is less than the average of Sub-Sahara African regions indicating the country's lower level stage in education.

Remittance is the other variable in the study measured by the total amount of money dispatched by Ethiopian origins that live outside of Ethiopia. The mean value of remittance and standard deviation are 314.74 and 392.34 respectively. The minimum and maximum values of remittance measured by million dollars are 5.22 and 1,796.39, respectively. This shows that the gross amount of remittance to Ethiopia is increasing tremendously which increases the country's foreign currency earnings. Debelo and Fetene (2021) revealed the supporting role of remittance in economic growth.

The mean value of gross capital formation in Ethiopia which is measured as a ratio of GDP is 24.84 with a standard deviation of 8.56. The minimum and maximum values of GCF are 13.9 and 39.4 respectively during the study period. The accumulation of capital accompanied by human capital is a key to facilitating the production in the economy.

Foreign direct investment measured by the net inflow in current USD has a mean value of 1051.1 and a standard deviation of 1388.17. The minimum and maximum values of FDI in million dollars are 0.17 and 4259.45 respectively. This indicates that the highest FDI Ethiopia has achieved during the study period was 4.26 Billion Dollar in 2021. Although, the Ethiopian government issued an incentive to attract FDI, the current political instability and persistent insecurity in the Horn of Africa shrink the inflow of FDI (Surafel, 2024).

The real GDP growth in Ethiopia used to represent economic growth has a mean value of 6.94 and a standard deviation of 5.79. The minimum and maximum values of economic growth during the study period are -8.9 and 13.5 respectively. This shows that the economy of Ethiopia grew at 6.94 during the study period.

Table 1 also demonstrates total government expenditure measured by the ratio of government expenditure to GDP. The mean value of government expenditure as a percentage of GDP in Ethiopia during the study period is 19.12 with standard deviation of 3.65. The maximum and minimum values of government expenditure are 27.04 and 13.77, respectively.

Deposit volume measured by millions of birr mobilized by commercial banks in Ethiopia as savings, current and fixed time deposit has a mean value of 36, 798.91 with a standard deviation of 90552.51. This shows that a very significant portion of savings in the economy is circulated in commercial banks. The loanable funds available to economic sectors highly stem from commercial banks as they mobilize significant amounts of money from customers. The minimum and the maximum values of total deposits mobilized by commercial banks are 240.26 and 735,700 million, respectively during the study period. However, from this huge deposit mobilized by commercial banks, only a small portion of it was injected as a credit to the agriculture sector. The cash reserve requirements of commercial banks in Ethiopia measured by millions of birr have a mean value of 2521.92 and a standard deviation of 5056.01. This is the amount of money commercial banks are obliged to hold in reserve to

meet their sudden liabilities. The minimum and maximum values of CRR are 59.84 and 30347.25 respectively. As the proportion of cash reserve requirement set by NBE, the total amount of funds available to credit provided by commercial banks gets reduced.

The indicator of financial performance measured by the Return on Asset of Commercial banks in Ethiopia has a mean value of 3.38 with standard deviation of 0.94. This shows the average return on assets earned by commercial banks is 3.38 between 2010 and 2021. The standard deviation shows the disparity in ROA earned by commercial banks in Ethiopia. The minimum and maximum values of ROA are 1.01 and 6.72 during the study period. This shows that there exists in financial performance disparity between commercial banks in Ethiopia. Interest rate spread is measured by the difference between the lending interest rate charged by commercial banks and the saving interest rate paid to a customer's deposit. The average IRS of commercial banks is 3.21 with a standard deviation of 1.47. It was evident that as the gap between lending and saving interest rate gets high the motive for saving gets low and similarly charging a high lending rate leads to an increased cost of investment which seriously hamper the motive for investment.

Banking service accessibility measured by the number of bank branches held by commercial banks has a mean value of 243 with a standard deviation of 301. The minimum and the maximum values for the bank branch are 3 and 1,872 respectively. This shows that the highest number of branches owned by one bank during the study period was 1,872. The result also shows the presence of a high disparity in the number of bank branches owned by commercial banks in Ethiopia. Finally, liquidity ratio that shows the capability and position of commercial banks to pay debt obligation of customers has a mean value of 0.33 and a standard deviation of 0.18. The minimum and the maximum value of liquidity ratio held by commercial banks are 0.04 and 0.89, respectively.

4.2. Poverty and Income Inequality in Ethiopia

Figure 2 reveals that poverty was highly prevailed in the 2000 which is close to 44.2% and tends to slightly decline until 2016 at national level. The poverty reduction endeavor shows substantial improvement especially in 2016 dropping the poverty headcount ratio to 23.5 percent. According to the World Bank (2015), the country was able to reduce poverty from 44

percent in 2000 to 30 percent in 2011, and as compared to other African countries Ethiopia shows an imperative poverty reduction rate after Uganda onward from 2000. However, this figure was high in 2021 due to multi-faceted reasons. The incidence of the COVID-19 pandemic and the persistent war in the north part of the country aggravated the number of societies below the poverty line (UNDP, 2022). Although government coined different Sustainable Development Goals to end poverty and to ensure stable income distribution, the pace of poverty reduction between urban and rural areas vary indicating the poverty reduction in urban area is better than rural area. Further, still significant portion of societies were poor especially in rural part of Ethiopia (Tassew and Melese, 2019).

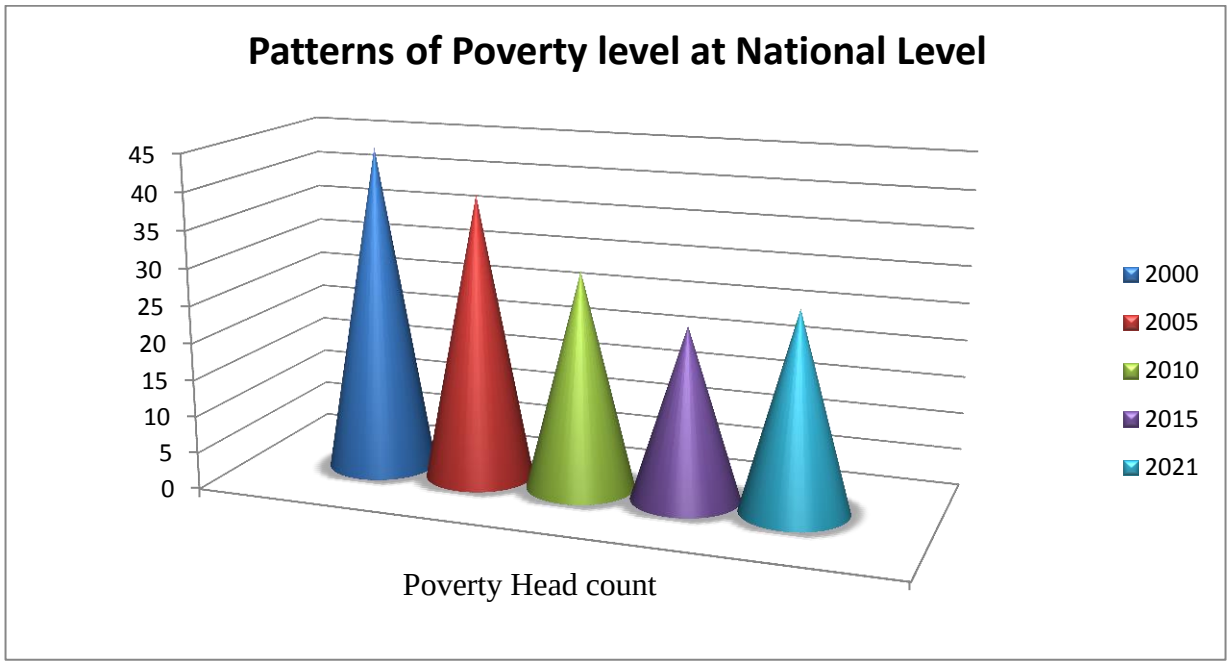


Figure 3: Trends of Poverty in Ethiopia

Source: Ethiopian Statistical Service and United Nations Development Program

The income distribution pattern starting from 2000 to 2021 at national level is also depicted at the following Figure 4. The income inequality measured by the Gini Coefficient at the national level indicates there was a relatively fair income distribution in Ethiopia until 2011 in Ethiopia. Despite the country experiencing a successful trend in poverty reduction until 2016, the trend of income inequality shows a rising trend and became very high in 2021. The income distribution gap starts to spike after 2011 and the divergence in income distribution gets wide in 2021.

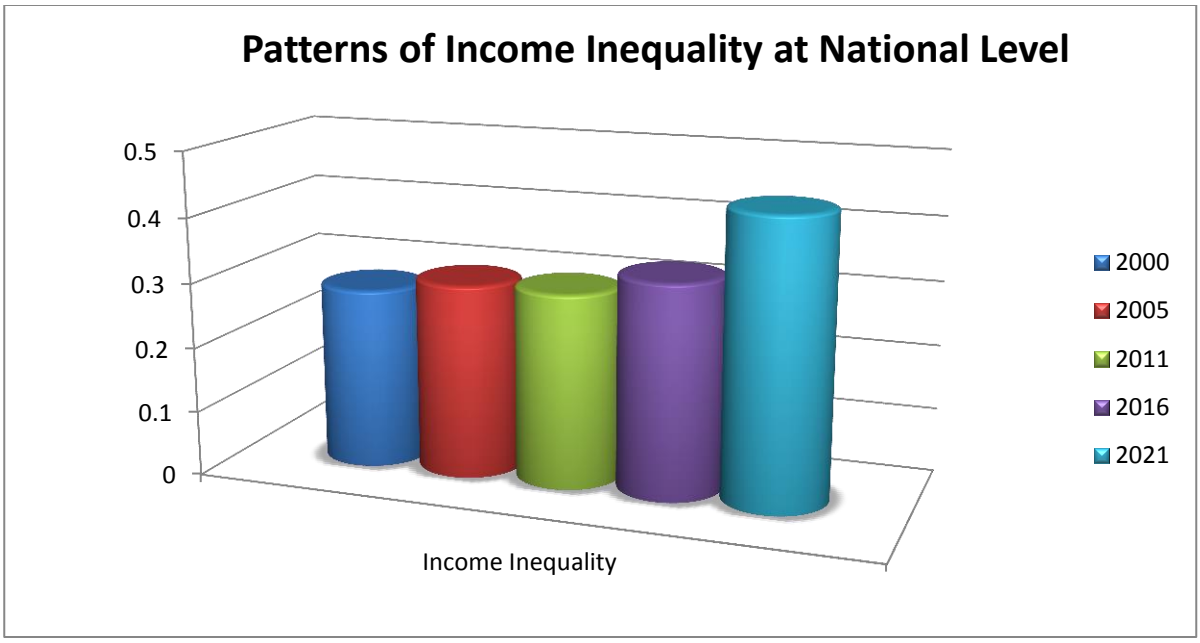


Figure 4: Trends of income inequality in Ethiopia: Source: Ethiopian Statistical Service and Global Data Lab

The disaggregated poverty level in Ethiopia's regional state measured by poverty headcount ratio is demonstrated on the following Figure 5. The following figure demonstrates the regional poverty rate distribution of 11 regional states in Ethiopia namely: Tigrai, Afar, Amhara, Oromia, Somali, Benishangul Gumuz, Southern Nation Nationalities and People (SNNP), Gambella, Harari, Addis Ababa and Dire Dawa covering a period from 2000 to 2021.

The regional poverty distribution measured by poverty headcount ratio is depicted in the following figure 5 reveals that in 2000 Tigrai, Afar and Benishangul Gumuz had the highest poverty rate with poverty headcount ratios of 61.4%, 56%, and 54% respectively. In the same year, Harari, Dire Dawa, and Addis Ababa have the lowest poverty levels which are 25.8%, 33.1 and 36.1 respectively. However, a substantial reduction in poverty level is observed in 2005 and 2010 for all regional states in Ethiopia except Somali and Dire Dawa which experienced a bit increase in poverty level in 2005. The majority of regional states recorded a substantial reduction in poverty levels in 2016.

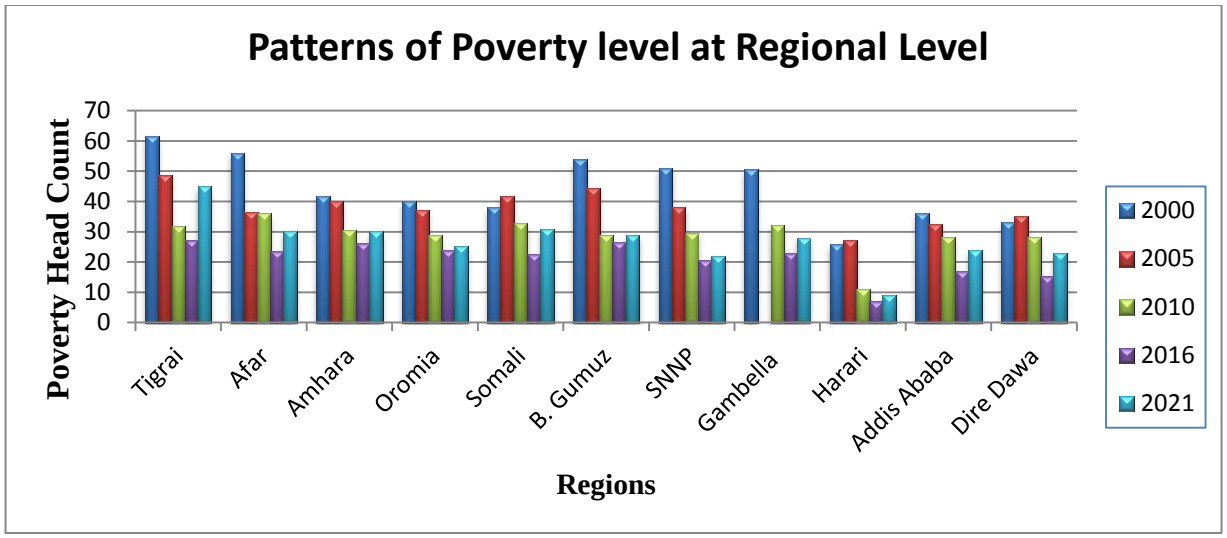


Figure 5: Trends of Poverty in Ethiopia Regional States
Source: Ethiopian Statistical Service and UNDP

Despite a good endeavor in poverty reduction the level of poverty in the majority of regions shows an increased figure in 2021. According to UNDP (2022), the prevalence of war in the northern part of the country, COVID-19 pandemic, and damage caused by drought further aggravated the poverty level. The level of poverty is high in Tigrai, Afar, Amhara and Somali with poverty headcount ratios of 45%, 30%, 30%, and 31% respectively. Although the poverty level is high in these regions, the remaining regions also experienced a moderate increase in poverty level.

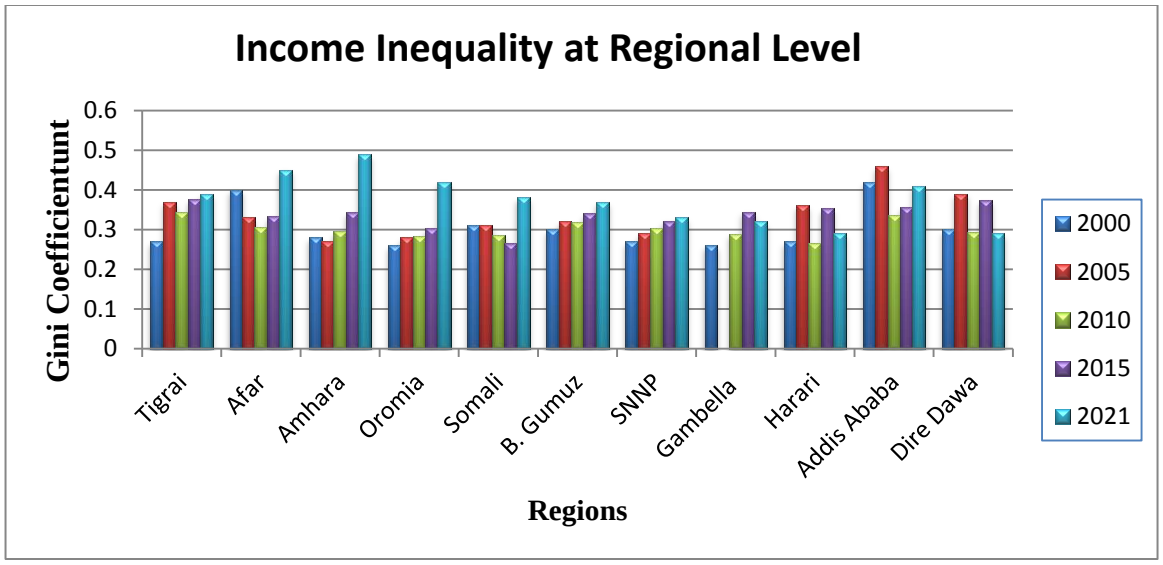


Figure 6: Trends of regional States Income Inequality
Source: Ethiopian Statistical Service and Global Data Lab

Figure 6 indicates the Ethiopia regional states income distribution measured by Gini Coefficient from 2000 to 2021. In 2000 five regional states namely, Afar, Addis Ababa, Dire Dawa and Somali has a Gini Coefficient 0.3 and above indicating relatively high income distribution gap in the region. The remaining has a Gini Coefficient less than 0.3 and among this Oromia and Gambella recorded the lowest Gini Coefficient indicating relatively fair income distribution. However, income inequality tended to increase in regional states like Tigrai, Benishangul Gumuz, Harari, Addis Ababa, and Dire Dawa in 2005 with Gini Coefficients of 0.37%, 0.32%, 0.36%, 0.46%, and 0.39% respectively. In 2011 regional states like Tigrai, Afar, Somali, Harari, Addis Ababa and Dire Dawa experienced a reduction in income inequality. Generally, the majority of regional states show an increasing income inequality status in 2016 and 2021 respectively.

4.3. Descriptive Statistics of Sectorial Credit Distribution

The following Figure 7shows the trend of sectorial credit disbursement from 1990 to 2021 in Ethiopia. The trend of credit disbursement in Ethiopia shows that a significant portion of the loan was granted to the service sector, followed by industry and the least portion goes to the agriculture sector. After the introduction of financial liberalization the total loans going to the service sector showed an increasing trend and credit provision to the industry sector tended to decrease until 2010. Onward from 2005 the credit outstanding hugely goes to service sector. This is due to revival of dominants business activities like, domestic and international trade, construction, hotel and tourism that are categorized under service sector. Hence, the credit provision to service sector continued to simultaneously rise with the sectors domination in the economy (NBE, 2010). However, the industry sector share from total outstanding loan began to rise in 2009. The increased share of industry sector in Ethiopia's economy especially after 2011 enables the sector to share portion of credit injected by banks from the service sector (Gizaw *et al*., 2024). Although, the credit provision going to the industry sector shows an improvement between 2010 and 2014 but onward from 2014, it was overtaken by the service sector. However, agriculture sector remains the least recipient of credit in Ethiopia and has a flat trend in credit disbursement as compared to other sectors. In Countries like Ethiopia where the majority of the population relay on the agriculture sector, constrained credit facilities to the sector has its own implication on the societies. The sector plays a fundamental

role in export performance, playing a decisive role in foreign currency earning capability and providing input and labor for other economic sectors in Ethiopia. Unfair credit disbursement at the national level restricts the majority of the population who resides in agriculture and agri-business from exploiting their maximum potential in terms of production efficiency, investment and entrepreneur capability. To realize the result of green revolution agriculture sector needs priority in terms of better input and availability of capital through credit allocation. As the sector remains dominant in terms of employment creation, providing export items, and source of food items; neglecting of the agriculture sector poses a serious question on the realization of macroeconomic policies that aim at ensuring poverty eradication, ensuring fair income distribution and reducing the unemployment rate at the national level.

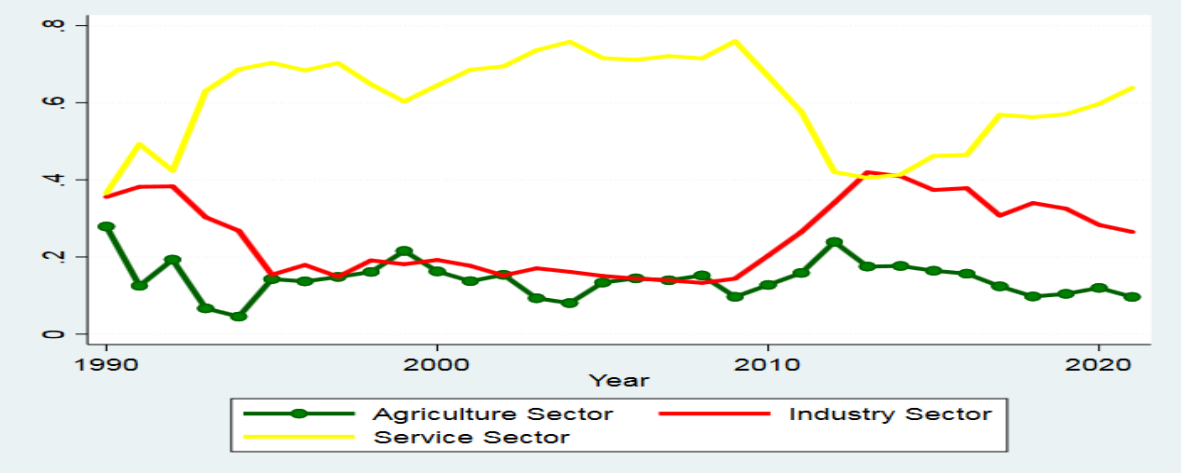


Figure 7: Trends of Sectorial Credit Disbursement: Source: National Bank of Ethiopia

The study also adopted the mean difference test to identify whether significant differences exist in sectorial credit disbursement in the following Table 2. The result reveals that the result of mean difference statistics shows that the agriculture sector shows the lowest recipient of bank agriculture credit with 14%. Whereas the service and industry sector shares 61% and 25% respectively which indicates the highest credit disbursement goes to this sector.

The result from the Table 2 shows that there is a significant difference in credit provision between agriculture and industry sector with mean value of -0.11 at 1% level of significance. Similarly, there was a significant difference between the agriculture and service sector in credit provision with a mean difference of -0.47 at a 1% significance level. Hence, the null

hypothesis of no difference in credit provision between economic sectors was rejected. This confirms the existence of unfair credit injection between economic sectors in Ethiopia.

Table 2: Mean Difference Test between Agriculture and Industry Sector

Credit Distribution by Sectors			
Sectors	Mean	Standard Deviation	
Agriculture	0.14	0.05	
Industry	0.25	0.09	
Combined	0.19	0.09	
Mean Difference	-0.11		
Ho: diff = 0			
Ha: diff < 0			t = -5.7110
			Degrees of Freedom = 62
Pr(T < t) = 0.000			Observation = 32

Source: Authors calculations.

The other most important descriptive statistics portion in this section is the mean difference test conducted on the percentage share of agriculture credit provided to the agriculture sector between Commercial Banks and the Development Bank of Ethiopia.

Table 3: Mean Difference Test between Agriculture and Service Sector

Credit Distribution by Sectors			
Sectors	Mean	Standard Deviation	
Agriculture	0.14	0.04	
Service Sector	0.61	0.12	
Combined	0.37	0.25	
Mean Difference	-0.47		
Ho: diff = 0			
Ha: diff < 0			t = -20.7327
Pr(T < t) = 0.000			Degrees of Freedom = 62
			Observation = 32

Source: Authors calculations.

Table 4 demonstrates the mean difference test adopted to confirm the existence of significant difference in agriculture credit provision between the Development Bank of Ethiopia and Commercial Banks in Ethiopia. The result revealed that from its total loan disbursement Development Bank of Ethiopia allocates 23% to the agriculture sector and commercial Banks in Ethiopia only share 6% of their credit to the agriculture sector in the study period. This shows that the disbursement of loans to the agriculture sector from total credit provided by development banks is high as compared to commercial banks. The result from the table 4 indicates that that there is a significant difference in credit allocation between development bank and commercial banks with mean value 0.18 at 1% level of significance. This indicates that the total credit that goes to the agriculture sector from commercial banks is much lower than Development Bank of Ethiopia which shows the existence of a significant difference in credit allocation between these two banks. Despite, enormous credit potential and the highest market share in Commercial Banks; significant portion of their loan goes to other economic sectors. Unlike Development Bank of Ethiopia, Commercial Banks give a little emphasis to the sector where a very scanty proportion of outstanding loan is provided to agriculture sector. Hence, this result served as a benchmark to empirically investigate determinants of agriculture credit volume provided by commercial banks in Ethiopia by excluding development bank.

Table 4: Mean Difference Test of Agriculture Credit Provision between Development Bank and Commercial Banks in Ethiopia

Agriculture Credit Distribution by Banks		
Banks	Mean	Standard Deviation
Commercial Banks	0.06	0.02
Development Bank	0.23	0.09
Combined	0.14	0.11
Mean Difference	-0.18	
Ho: diff = 0		
Ha: diff < 0		
		t = -6.4353
Pr(T < t) = 0.000		Degrees of Freedom = 22
		Observation = 12

Source: Authors calculations.

Table 5: Correlation Analysis

Correlation Analysis: Equation (18)

Variables	lnPOVHC	lnAGRIC	lnPOP	lnINF	lnLR	lnGDPPC	lnTO	lnUNE	IQ
lnPOVH	1								
lnAGRIC	-0.28	1							
lnPOP	0.25	0.61	1						
lnINF	-0.18	0.13	0.01	1					
lnLR	-0.06	0.21	0.26	0.08	1				
lnGDPPC	-0.57	0.41	0.04	0.18	0.02	1			
lnTO	-0.35	-0.12	-0.02	0.08	0.04	-0.23	1		
lnUNE	0.129	0.07	0.01	-0.07	-0.04	0.17	-0.53	1	
IQ	-0.61	0.39	0.07	0.14	0.01	0.60	-0.28	0.24	1

Correlation Analysis: Equation (19)

Variables	lnGINI	lnAGRIC	lnINF	lnPOVHC	lnGDPPC	lnUNE	lnTO	IQ
lnGINI	1							
lnAGRIC	-0.31	1						
lnINF	0.01	0.13	1					
lnPOVH	0.26	-0.28	-0.18	1				
lnGDPPC	-0.38	0.41	0.18	-0.57	1			
lnUNE	0.21	0.07	-0.07	0.12	0.17	1		
lnTO	-0.32	-0.12	0.08	-0.35	-0.23	-0.53	1	
IQ	-0.39	0.39	0.14	-0.61	0.60	0.24	-0.28	1

Correlation Analysis: Equation (22)

Variables	lnAGRCV	lnDV	lnCRR	lnROA	lnIRS	lnBB	lnLQR	lnINF	lnRGDP	lnCLC
lnAGRIC	1									
lnDV	0.77	1								
lnCRR	0.68	0.63	1							
lnROA	-0.01	0.01	-0.07	1						
lnIRS	-0.19	-0.04	-0.05	-0.31	1					
lnBB	0.71	0.78	0.64	-0.19	0.30	1				
lnLQR	-0.55	-0.64	-0.50	0.15	-0.17	-0.77	1			
lnINF	0.06	0.17	0.12	0.01	0.05	0.10	-0.03	1		
lnRGDP	-0.27	-0.52	-0.27	0.007	-0.19	-0.53	0.57	-0.50	1	
lnCLC	0.15	0.18	0.17	-0.032	-0.005	0.16	-0.16	-0.10	-0.19	1

Source: Authors calculations

Correlation analysis is often undertaken to avoid the problem of collinearity and multi-collinearity between variables in panel data analysis. The result from Table 5 depicts the correlation result of equations that use panel data. Hence, the correlation results for all panel data models were less than 0.8 which serves as a rule of thumb to detect the problem. This

indicates that the problem of multi-collinearity as well as collinearity is non-existent in the data.

4.4. Econometric Results

This section sequentially presents the regression results together with diagnostic tests of each econometric model following studies objectives. The first sub-section presents the result from PCSE regression on effects of bank agriculture credit on poverty level and income inequality. The second sub-section presents the time series regression result which answers the second objective using ARDL model. Finally, the AMG regression results aimed at figuring out main determinants of agriculture credit volume of commercial banks in Ethiopia is presented.

4.4.1. Effects of Bank Agriculture Credit on Poverty Level and Income Inequality

PCSE regression results on the effects of agricultural credit on poverty level and income inequality are presented in Table 6.

4.4.1.1. Diagnostic tests

Table 6: Pesaran (2004) Cross-Sectional Dependence Analysis

Pesaran (2004) CSD Result					
	Equation (18)[2]			Equation (19)[3]	
Variables	CD-Test	P-Value	Variables	CD-Test	P-Value
lnPoverty Headcount Ratio	14.35***	0.000	lnGini Coefficient	5.933***	0.000
lnBank Agriculture Credit	28.41***	0.000	lnBank Agriculture Credit	28.41***	0.000
lnPopulation	33.71***	0.000	lnInflation	23.61***	0.000
lnInflation	23.61***	0.000	lnPoverty Headcount Ratio	14.35***	0.000
lnLitracy Rate	14.04***	0.000	lnGDP Per capita	31.91***	0.000
lnGDP Per Capita	31.91***	0.000	lnUnemployment	34.77***	0.000
lnTrade Openness	34.79***	0.000	lnTrade Openness	34.78***	0.000
lnUnemployment	34.76***	0.000	Institutional Quality	34.78***	0.000
Institutional Quality	34.78***	0.000			

[2] Equation (18) represents model specification of effects of bank agriculture credit on poverty level in section 3.5.1.

[3] Equation (19) represents model specification of effects of bank agriculture credit on income inequality in section 3.5.1.

***indicates a 1% level of Significance
Source: Authors calculations

The section starts with presenting basic pre estimation tests like: cross-sectional dependence test, second generation panel unit root test, and panel co-integration test of equation (18) and (19) together and discuss the PCSE regression results.

Panel data analysis often begins with cross-sectional dependence test to identify its presence and to select suitable econometric models that can handle the problem. In this study, the widely used cross-sectional dependence test introduced by Pesaran (2003) was used. The results in Table 6 comprise of results of two panel data models indicating that all variables in the two models are cross-sectional dependent. The persistence of cross-sectional dependence in the variables is a precondition and serves as criteria in selecting regression models, and pre-estimation tests that can accommodate the persistence of CSD problem.

Table 7: Second Generation Panel Unit Root Test

CIPS Panel Unit Root Test			
Variables	At level	At First Difference	Order of Integration
lnBank Agriculture Credit	-2.40	-4.87	I(1)
LnTrade Openness	-2.68		I(0)
lnGDP per capita	-1.52	-4.76	I(1)
lnInflation	-3.90		I(0)
lnUnemployment	-5.07		I(0)
lnPopulation	-1.40	-4.89	I(1)
Institutional Quality	-3.19		I(0)
lnLitracy Rate	-1.49	-5.43	I(1)
lnGini Coefficient	-5.78		I(0)
lnPoverty Heeacount Ratio	-5.29		I(0)

Source: Author's calculations

Before undertaking regression analysis, it was imperative to undertake a unit root test to confirm whether research variables are stationary or non-stationary which helps to avoid the problem of spurious regression that leads to inconsistent and unreliable results. Variables are said to be stationary when they have constant mean and variance over time. Regression results committed with the presence of non-stationary variables frequently soar the occurrence of spurious regression (Wooldridge, 2016).

This study applied second-generation unit root test for panel data models by considering the presence of CSD problem in the data. The study utilized the second generation panel unit root test specifically the cross-sectional augmented Im-Pesaran-Shin (CIPS), panel unit root test for panel data analysis since they accommodate the presence of cross-sectional dependence in the panel.

The result from CIPS in Table 7 shows that lnBank Agriculture Credit, lnGDP Per capita, lnPopulation and lnLiteracy Rate are integrated at first difference I(1) and the remaining variables namely, lnTrade Openness, lnInflation, lnUnemployment, Institutional Quality, lnPoverty Headcount and lnGini Coefficient are integrated at level I(0) at 1, 5 and 10 percent significance level.

Table 8: Co-Integration Test

Westerlund test for co-integration				
	Equation (18)		Equation (19)	
	Statistics	P-Value	Statistics	P-Value
Variance Ratio	5.38	0.000	6.62	0.000

Source: Authors calculations

To affirm the long-run association between variables the study undertook a co-integration test. This study adopted the second-generation co-integration test introduced by Westerlund (2007) due to its capability to deal with cross-sectional dependence in panel data analysis. Table 8 demonstrates panel long-run co-integration test results of the two equations.

The results presented on Table 8 indicate the presence of co-integration in the two-panel models and the study rejects the null hypothesis of no co-integration at a 1% level of significance. The above section briefly discussed the pre-estimation tests in panel and the result shows that the model is free from the aforementioned problems. Hence, the following section presents the regression results of PCSE model.

Table 9: PCSE Regression Result on Effects of Bank Agriculture Credit on Poverty Level

PCSE Regression Result				
Variables	Coefficient	S. Error	Z	P-Value
lnBank Agriculture Credit	-0.04*	0.02	-1.85	0.065
lnPopulation	0.14***	0.02	5.88	0.000
lnInflation	-0.06	0.04	-1.62	0.105
lnLiteracy Rate	-0.02	0.04	-0.44	0.659
lnGDP per capita	-0.19***	0.07	-2.91	0.004
lnTrade openness	-0.21**	0.08	-2.47	0.014
lnUnemployment	0.48***	0.11	4.40	0.000
Institutional Quality	-2.58***	0.65	-3.96	0.000
Constant	4.63	0.39	11.88	0.000

Dependent Variable lnPOVHC
R-Squared = 0.67
Wald Statistics = 537.32
Prob > Chi2 = 0.0000

***, **, and * indicates a 1%, 5% and 10% level of Significance respectively
Source: Authors calculations

Table 9 presents the regression results of the effects of bank agriculture credit on the level of poverty in Ethiopia. The result indicates that bank agriculture credit has a negative and significant effect on the poverty level in Ethiopia at a 10% significance level. The coefficient of lnBank Agriculture Credit (-0.04) indicates a 1% increase in the disbursement of bank agriculture credit reduces the poverty level by 0.04 percent revealing that as banks inject more agriculture loans in the economy, the level of poverty at the national level tend to dwindle. The provision of agriculture credit has the potential to bridge the short-term financial needs of the mass of the population that base their livelihood on agriculture production and agri-business. The concept of agriculture credit is broader since it incorporates those who participate in agriculture production and the agriculture value chain. The disbursement of agricultural loans encompasses those who present better seed, pesticide, fertilizer and related agricultural input which strengthen farmers' access to improved inputs. Those customers that work in farm, selling of agricultural input and technologies, selling of agriculture product, agro-processing and distribution channels are all categorized under agriculture credit. The

injection of this credit to the sector helps those who participate in the aforementioned areas by helping them to alleviate their capital bottleneck and catalyze their involvement in entrepreneurial activities. The provision of loans in the sector also strengthens farmers by enabling them to easily get agricultural input and technologies and realize mechanized farming. Apart from these, farmers' access to agriculture credit helps that portion of the societies that work in agricultural related business by equipping them with capital and alleviating short-term capital shortfalls.

These finding is supported by Croppenstedt *et al.* (2017) who suggest providing agriculture credit helps to reduce poverty levels and deprivation and improve the majority's income by enabling the sector to realize productivity. Increased supply of agriculture credit disbursement facilitates crop production, livestock, and fisheries and facilitates better market access. This condition creates a better arena for the mass societies employed in the agriculture sector to improve their income. Osabohien *et al.* (2018) also concluded that the abundance of agriculture credit is a strategic tool to halt the poverty level and ensure food security. Khan (1996) also supported this finding and suggested that the availability of credit is a benchmark to support the poor. Tenaw and Islam (2009) reveal that the prevailing bottleneck in the agriculture sector like inadequate technological adaptation, poor infrastructure, market failure, and bad climate scenarios can be contained with better access to credit and simultaneous help to reduce the level of poverty. Supporting of marginalized parts of the societies in the agriculture sector, through providing bank credit with a moderate interest rate significantly strengthens the entrepreneur role and side business motives in rural areas which further boosts agriculture GDP (Joao and De Castro, 2023).

Table 9 shows that population size has a positive and significant effect on the poverty level in Ethiopia. This reveals that as the size of the population rises, it drives up the level poverty in Ethiopia. The coefficient of lnPopulation (0.14) conveys that a 1 % increase in population size leads to an increase in poverty level by 0.14 percent at a 1% significance level. The condition of high population growth puts a lot of pressure on family resources and this condition reduces per capita income and limits access to employment. With increasing family size, children's access to education at an early stage is low due to the high pressure on family income to be spent for survival. High pressure on resources at hand forced the majority of work forces to be

underemployed. Further, the government fails to withstand to meet the basic requirements like the provision of basic infrastructure, job opportunities, health, and education services for the increasing population coupled with high dependency pressure on the employed adults creating significant burden on income generated at the family level.

According to the UNDP (2022) report, although developing countries can reduce the proportion of the population living in poverty, the absolute number of population living in poverty increased because of high population growth; indicating that increased population size ignites the tendency of population to live in poverty. The finding is supported by the findings of Hilmi *et al*. (2022) which state that high population growth leads to the prevalence of unemployment and reduces wage rate, especially for those who earn low income. In densely populated areas, high population growth puts tremendous pressure on land use which leads to landlessness and aggravates poverty. The finding is consistent with Ahlburg (1996) that argues fast population growth negatively affects per capita income and well-being of the society. Weil and Wilde (2009) who support Malthusian theory also confirms that developing countries with large rural populations and high population growth face reduced income levels.

The negative and significant effect of GDP per capita on the level of poverty in Ethiopia is demonstrated in Table 9 above. The coefficient of lnGDP per capita (-0.19) shows that a 1 percent increase in GDP per capita reduces the poverty level by 0.19 at a 1% level of significance. The revival of the economy helps to get out of the poverty cycle through its role in reinitiating private sector investment. The increased output level fuel-up the demand for labor hence creating employment opportunities for the mass labor force. The level of poverty gets high when there is a shock in economic growth. This finding is also congruent with the result of Thorbecke (2023) who argues that the fastest way to reduce poverty level is through ensuring fast economic growth. Economic growth initiates job opportunities and drives up the demand for labor which in turn improves the income level. According to Nandori (2010), the response of the poverty level to economic growth is highly elastic and a one percent increase in GDP leads to 2.14 reductions in the poverty level. Correspondingly, Garza-Rodriguez (2018) indicates that a percentage increase in economic growth reduces the poverty level by 2.4%. The finding is also consistent with the findings of (Afzal *et al.,* 2012; Garza-Rodriguez, 2018; Mndebele *et al.,* 2023).

Trade openness also negatively and significantly affects the poverty level in Ethiopia at a 5% significance level. Trade openness is one mechanism that stimulates economic growth. Trade liberalization paves the way for domestic producers to compete in the international arena with their existing resource endowment and improve their income. With better market access increased export diversification and volume increase the return for producers domestically. Countries with cheap and abundant labor get better employment opportunities from trade liberalization and this in turn increases the income level from being employed. The gain from better market access and employment opportunities help to earn improved income and alleviate poverty level. According to Fernández (2015) and Gnangnon (2019) nations can benefit more from increased trade liberalization which has a potential to reduce the rampant poverty level in the region. Better trade liberalization has a direct implication on the income level of farmers since it reduces uncertainty and distortions in the international markets. Trade openness creates employment opportunity and efficiency in rural areas which helps farmers to earn better income. Trade liberalization also helps the agriculture sector to utilize its comparative advantage which helps to reduce the level of poverty (Hynes and Lammersen, 2017).

Table 9 indicates that the unemployment level has a positive and significant effect on the poverty level in Ethiopia at 1% significance level, indicating that as the unemployment rate increases it significantly intensifies the poverty level in Ethiopia. The coefficient of lnUnemployment (0.48) indicates that a 1 percent increase in the unemployment rate in Ethiopia leads to 0.48 percent increase in poverty level at a 1% significance level. The majority of population who earns reduced income utilizes their highest proportion of income for consumption purpose and easily falls below poverty line due to their incapability to generate income from other sources amid losing their job. The result is supported by the findings of (Meo *et al.,* 2018; Mndebele *et al.,* 2023). They suggested that that as more individuals loss their job majority of people are forced to live under poverty. Similarly, Ariski *et al*. (2022) and Alghina *et al*. (2019) also suggested that an increase in unemployment by a 1% leads to 0.61 percent rise in the poverty level.

Finally, the prevalence of institutional quality has a negative and significant effect on the poverty level in Ethiopia. This shows that the adherence of institutional quality halts the

prevalence of poverty level. The coefficient of institutional quality (-2.58) indicates that a 1 percent increase in institutional quality will drag the level of poverty by 2.58 percent at a 1% significance level. The poverty level reduction role of institutional quality works through the government's capability to improve the enforcement and making of rules where people get better service which is fundamental to reducing the poverty level. This finding is congruent with the findings of Kaufmann *et al*. (2011) who argue adherence to institutional quality and good governance is a requirement to drag the level of poverty down. Tebaldi and Ramesh (2010) also argue that an improvement in institutional quality components serves as a means to fair income distribution, poverty reduction, and economic development. The remaining variables namely inflation and literacy rate remain insignificant.

The Wald Statistics demonstrated in Table 10 indicate the result is statistically significant at 1% level of significance revealing that the data fitted the adopted model.

Table 10: PCSE Regression Result on Effects of Bank Agriculture Credit on Income Inequality

PCSE Regression Result				
Variables	Coefficient	S. Error	Z	P-Value
lnBank Agriculture Credit	-0.01***	0.01	-2.79	0.005
lnInflation	-0.01	0.05	-0.26	0.792
lnPoverty Headcount Ratio	-0.08	0.06	-1.35	0.179
lnGDP per capita	-0.07*	0.04	-1.76	0.078
lnUnemployment	0.23**	0.09	2.39	0.017
lnTrade openness	-0.11*	0.06	-1.91	0.056
Institutional Quality	-0.94*	0.48	-1.96	0.050
Constant	4.78	0.32	14.93	0.000
Dependent Variable lnGINI R-Squared = 0.31 Wald Statistics = 1519.46 Prob > Chi2 = 0.0000				

Source: Authors calculations; ***, **, and * indicates a 1%, 5% and 10% level of Significance respectively

The second regression result from panel-corrected standard error in Table 10 above demonstrates the effects of bank agriculture credit on income distribution gap in Ethiopia.

Bank agriculture credit has a negative and significant effect on income inequality in Ethiopia. The coefficient lnBank Agriculture Credit (-0.01) indicates that a percentage increase in bank agriculture loan provision reduces income inequality by 0.01 at a 1% significance level. This shows that as the amount of bank agriculture credit disbursement increases the tendency of fair income distribution improved. The majority of people employed in the agriculture sector who earn reduced income get benefit from loans provided in the sector to improve their productivity as well as their return. Unlike, the conventional credit provision trend that grants high or concentrated amounts to limited customers in the service and industry sector, extending of bank credit to the agriculture sector is inclusive and increases the portion of societies that participate in credit service. This condition pulls up the marginalized mass society's income and thereby reduces the income gap. Partial credit provisions that inclined to other economic sectors left the majority of individuals employed in the agriculture sector. This condition further aggravates the income gap by specifically benefiting a small portion of societies involved in other economic sectors. However, the extension of this agriculture credit helps the majority of the populations to generate extra income through capital accumulation and better return. Better agriculture productivity and increasing participation in agriculture-related business help farmers to generate better capital and to spend proceeds on different portfolios. Improved entrepreneur role and high chance of involving in different business helps poor to get multiple sources of income.

This finding is similar to Rajan and Zingales (2003), Demirguc and Levine (2008), Beck *et al.* (2007) and Claudio and Guilherme (2023) who suggested that access to finance and bank credit to the poor significantly reduce income inequality. Correspondingly, the findings of Brei *et al*. (2018), Omar and Inaba (2020) and Turégano and Herrero (2018) revealed that in developing countries efficient financial system and better credit provision help to ensure fair distribution of income.

The result from Table 10 demonstrates per capita GDP has a significant and negative effect on income inequality in Ethiopia at a 10% level of significance. The coefficient of lnGDP per capita (-0.07) suggests that a 1 percent increase in GDP per capita at the national level reduces income inequality by 0.07 percent, ceteris paribus. Economic growth is often associated with the improvement of investment, and high employment creation which increases the demand

for labor thereby creating a way to generate improved income for the majority poor. the finding of the study is supported by Henry and Panotani (2019) who demonstrated the negative relationship between per capita national income and economic growth in the long run. Correspondingly, the findings of Akinbode *et al.* (2020) and Majumdar *et al.* (2009) reveals that economic growth has a significant and negative effect on income inequality. The result also holds the (Kuznets, 1955) long-run hypothesis which argues that the later stage of economic development is inversely related to income inequality. This implies that in the long run, the increase in the economy reduces the income distribution gap in society.

The demonstration in Table 10 reveals that the unemployment level has a significant and positive effect on income inequality in Ethiopia. The coefficient of lnUnemployment (0.23) shows that a 1 percent increase in the unemployment level drove up the income distribution gap by 0.23 percent at a 5% significance level. This shows that as the level of unemployed labor force spikes it aggravates the income inequality at the national level. Through dragging down to bottom income distribution those who earn wages lose their income due to unemployment which further increases income inequality in the society. The increase in layoff and unemployment seriously impedes the low-income group or working population with the relatively low-income recipient. The result is confirmed by previous studies (Levernier *et al.*, 1995; Mocan, 1999; Ukpere, 2011; Cysne, 2009 and Murahwa, 2019).

Trade openness also negatively and significantly affects income inequality in Ethiopia. The coefficient of lnTrade Openness (-0.11) shows a 1 percent increase in trade openness decreases income inequality by 0.11 percent in Ethiopia and statistically significant at a 10% significance level, demonstrating, as countries' involvement at international trade increases, the income distribution gap decreases. Ethiopia is characterized by the abundance of cheap labor and agricultural items dominating export volume which create a favorable arena for most of unskilled laborers to benefit from access to international trade. The finding supports Stolper-Samuelson theorem explained by the Heckscher-Ohlin model that reveals how trade liberalization helps to reduce the income distribution gap. The model assumes that as developing countries liberalize their trade they benefit from reduced poverty levels and improvement of their economy. Trade openness reduces income inequality in developing countries by creating efficiency and returns to relatively abundant and cheap factors (Li and

Fu, 2021). Similarly, Feenstra (2004) argues that developing countries get better benefits to narrow their income distribution gap if their volume of export is overwhelmed by agriculture or primary goods since it benefits unskilled labor that is involved in the production of primary goods. This finding is also consistent with the findings of (Jaumotte *et al*., 2013; Bergh and Nilsson, 2014; Dorn *et al.*, 2022).

Finally, the result of institutional quality shows a negative and significant effect on income inequality in Ethiopia at a 10% level of significance. The coefficient of Institutional Quality (-0.94) shows that a unit improvement in institutional quality drags the income inequality gap by 0.94, ceteris paribus. This reveals that the prevalence of a good institutional framework helps the country to realize fair income distribution among the nation. Strong institution creates a favorable environment in an economy to efficiently utilize human capital through healthy competition in the labor market thereby reducing the divergence of wealth distribution. The result corresponds to literature like Acemoglu and Johnson (2005), Asamoah (2021), Acemoglu and Robinson (2010), Bahamonde and Trasberg (2021), and Adams and Akobeng (2021), who suggested that the gap between poor and rich narrows and fair distribution of resources take place when nations are able to build efficient and strong institution.

The results in Table 10 reveal the Wald Statistics is statistically significant at a 1% level of significance conveying that the data fitted the adopted model very well.

4.4.2. Effects of Bank Agriculture Credit on Unemployment

This sub section is intended to meet the second objective of the study and presents time series regression results on the effects of bank agriculture credit on the unemployment level in Ethiopia. The following sub-sections are first discussed: pre-estimation and diagnostic tests of the study and finally the ARDL regression.

4.4.2.1. Time series unit root test

Before proceeding to time series regression analysis, testing the presence of unit root in the data is critical and the study applied unit root analysis for time series data from 1990 to 2021 to meet the second objective of the study. According to Gujarati and Porter (2009), one way of

detecting whether the time series was stationary or not, unit root test analysis was adopted. To identify the presence of non-stationary in time series, the unit root hypothesis was taken by comparing the null hypothesis against the alternative one. If the null hypothesis is not accepted then the alternative hypothesis was taken revealing that the time series was free from the problem. In line with this Augmented Dickey-Fuller Test Statistics (ADF Test) is adopted to check the persistence of unit root problem in time series analysis. Table 11 summarizes the unit root test of all-time series variables from both equations (20) and (21).

Table 11: Time Series Unit Root Test Based on Augmented Dickey Fuller Test

Augmented Dickey-Fuller Test Statistics (ADF Test)			
Variables	At level	At First Difference	Order of
lnGDP per capita	1.69	-4.39	I(1)
lnTrade Openness	-4.35	--	I(0)
lnBank Agriculture Credit	-0.45	-3.89	I(1)
lnLitracy Rate	-0.19	-4.27	I(1)
lnGross Capital Formation	-0.66	-5.30	I(1)
lnUnemployment	-2.81	-8.72	I(1)
lnInflation	-5.43	--	I(0)
lnRemittance	-1.05	-5.84	I(1)
lnRGDP	-2.87	-5.79	I(1)
lnForeign Direct Investment	-3.77	--	I(0)
lnGovernment Expenditure	-1.25	-7.36	I(1)
Institutional Quality	-2.23	-8.29	I(1)

Source: Authors calculations

Table 11 displays comprise the unit root test result for both time series analyses of the second objective and the result from ADF test reveals that only three variables, namely: lnTrade Openness, lnInflation and lnForeign Direct Investment are stationary at a level or I(0). The other variables are stationary after first difference or integrated at the order of I(1). Hence unlike other time series models application of the ARDL model with the presence of equations with mix of stationery and non-stationery variables is suitable to estimate (Pesaran *et al*., 2001).

After ensuring study variables are stationary the next basic step in applying the ARDL model is to check the presence of log run association or co-integration between variables. In this

study ARDL Bound test is utilized to figure out the existence of co-integration where the long run association of variables is identified by comparing F-Statistics with the lower and upper bound calculated critical values. ARDL co-integration technique proposed by (Pesaran, 2001) is the most congruous estimation technique to detect the long-run association among the variables which is applied in the study.

Table 12: Time Series Co-integration Test (ARDL Bound Test)

Co-integration Test Result from Pesaran/Shin/Smith (2001) ARDL Bounds Test		
Series Models	F-Statistics	Decision
lnUnemployment	17.32	Co-integrated
lnBank Agriculture Credit	17.32	Co-integrated
lnRGDP	17.32	Co-integrated
lnForeign Direct Investment	17.32	Co-integrated
lnLiteracy Rate	17.32	Co-integrated
Institutional Quality	17.32	Co-integrated
lnInflation	17.32	Co-integrated
lnGovernment Expenditure	17.32	Co-integrated

Critical values of F-statistic and t-statistics (0.1 -0.01) Bound Critical Values				
F-statistics	(2.03 3.13)***,	(2.32 3.50)**,	(2.60 3.84)**,	(2.96 4.26)*
Significance	10%	5%	2.5%	1%
t-statistics	(-2.57 -4.23)***,	(-2.86 -4.57)**	(-3.13 -4.85)**	(-3.43 -5.19)*
Significance level	10%	5%	2.5%	1%

Source: Authors calculations

The regression result from the ARDL bound test of the F-test on joint significance of the variables above reveals the occurrence of long-run association between variables at 1, 5, and 10 percent significance level. To determine the presence of co-integration the F-statistics were related with the upper and lower bound critical values. The result from above Table 12 shows that all upper and lower values of F-statistics and t-statistics critical value are less than the overall F-statistics (17.32) indicating the long run association between variables.

4.4.2.2. Diagnostic and stability test

The following section briefly presents diagnostic and structural break tests estimated to detect the existence of potential problems like: serial correlation, heteroscedasticity, normality and

structural break test. The result on Table 13 demonstrates the detailed results of aforementioned diagnostic tests.

Table 13: Diagnostic Test Result

Model Diagnostic Test		
Problem to be Tested	Applied Test	Probabilities
Serial Correlation	Breusch-Godfrey LM test	0.53
Normality	Skewness	0.87
	Kurtosis	0.58
Heteroscedasticity	White test for Heteroscedasticity	0.39
Heteroscedasticity	Breusch-Pagan/Cook Weisberg Test	0.14

Source: Authors calculations

The diagnostic test results from Table 13 demonstrate that the model has fulfilled all the diagnostic and stability tests. The Serial correlation test from Brush and Godfray LM test shows the absence of serial correlation with (Prob = 0.53) which is greater than the 5 percent significance level. The result from Skewness and Kurtosis of residuals has a p-value of 0.87 and 0.58 respectively. The Heteroscedasticity based on the White test and Breusch-Pagan/Cook Weisberg Test result also shows that the model has Prob = 0.39 and 0.14, respectively which is greater than the 5 percent significance level. Furthermore, the following graphical method based on the CUSUM plot was used to confirm long-run parameter stability, and CUSUM of OLS residuals tests were used to figure out the persistence of structural breaks in the model. Additionally, the graphical model stability test based on CUSUM and CUSUMQ also reveals that the plot is found within critical bound at 5 percent level of significance indicating presence of model stability and the result is attached at appendix VII.

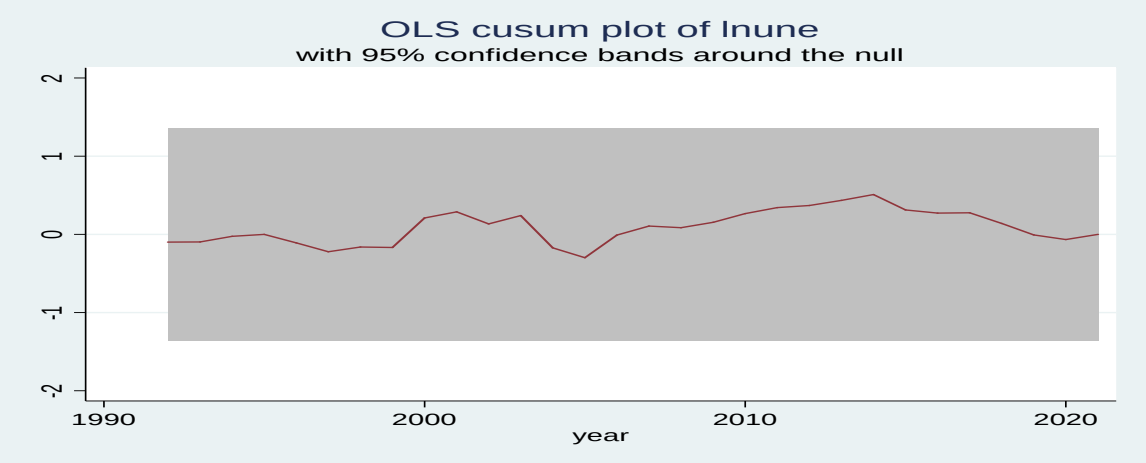


Figure 8: Parameter Stability Test

The graphical parameter stability test above indicates that plots of the OLS CUSUM process don't cross the 99% band which indicates the presence of parameter stability in the model.

Table 14: Structural Break Test

Cumulative sum test for parameter stability			
Test Statistics	1% Critical value	5% Critical value	10% Critical value
0.3778	1.6276	1.3581	1.224

Source: Author's calculations

The result from the above structural break test on Table 15 shows that the test statistics are lower than the critical values. Hence, we accept the null hypothesis of parameter stability at 1%, 5%, and 10% significance levels which confirm the absence of structural breaks in the model.

Table 15: ARDL Regression Result on Bank Agriculture Credit and Unemployment

Mode of Estimation ARDL Approach			R-Squared = 0.96	
Source: Output of STATA Version 15 Software			Adj. R-Squared = 0.92	
Dependent Variable lnUnemployment				
Observation from 1990 to 2021				
Significance @ 1,5&10,%				
ADJ	Coefficient	Standard Error	t-statistic	Prob.
lnUNE L1.	-0.92	.09	-9.99	0.000
Short Run Coefficients				
Regressor	Coefficient	S. Error	t-statistics	Prob.
lnBank Agriculture Credit D1.	-0.05	0.03	-1.71	0.118
lnRGDP D1	0.04	0.03	1.57	0.148
Institutional Quality D1	-0.81*	0.42	-1.92	0.084
Constant	2.65	0.34	7.75	0.000
Long-run Coefficients				
lnBank Agriculture Credit	-0.08***	0.02	-4.26	0.002
lnRGDP	-0.12**	0.04	-3.12	0.011
lnForeign Direct Investment	-0.01**	0.01	-2.81	0.019
ln Literacy Rate	0.03	0.04	0.83	0.425
Institutional Quality	1.08	0.67	1.60	0.140
lnInflation	0.04**	0.02	2.31	0.044
lnGovernment Expenditure	-.04***	0.01	-4.09	0.002

***, **, and * indicates a 1%, 5% and 10% level of Significance respectively
Source: Author's calculations

The result from Table 15 suggests that bank agriculture credit has a negative and significant effect on unemployment in the long run, indicating that the injection of bank agriculture credit in the economy stimulates investment and creates improvement in the labor market where the majority of the population in the country is employed under agriculture sector. The coefficient of lnBank Agriculture Credit (-0.08) indicates that holding other things Constant a 1 percent increase in bank agriculture credit disbursement leads to a -0.08 percent decrease in the unemployment level in Ethiopia at a 1% significance level.

The rate of joblessness improved when the disbursement of credit in the economy increases through financial leverage. As the majority of the labor force was employed in agriculture and

agri-business, increasing the access to credit in the sector ignites the demand for labor to fit the increased production and increase the labor participation rate in agriculture-related business activities. The availability of financial resources catalyzes the entrepreneur and diversifies business insight which supports the efficacy of the labor market through employment creation. On the other hand, the prevalence of an imperfect credit market hurts labor market performances. However, the increased competition in the credit market has the potential to improve labor market performance hence employment rate (Gatti, *et al.*, 2012). According to Keynes (1936), in the Keynesian theory of employment, interest, and money, as the supply of money in the economy increases it lowers interest rate and catalyzes investment and this leads to increased output level, income, and employment. This result is consistent with the findings of Borsi (2018) and Azolibe *et al.* (2022), who assert that banks' credit supply at optimal cost creates capital availability for investment and increases total production in the economy leaving a positive implication on employment creation. Correspondingly, the results of Armendariz *et al.* (2005), Ordine and Rose (2008), Robinson (2001), and Ernst (2019) suggested the positive implication of credit supply by financial institutions in handling the rise of unemployment rate.

Economic growth has negatively and significantly affected the unemployment level in Ethiopia in the long run. Holding other things constant a 1 percent increase in economic growth leads to a -0.12 percent decrease in unemployment in the long run at a 5 percent significance level. This indicates that the increased production level in the economy stimulates the demand for more labor that is expected to participate in the production. Improvement in the economy reduces the level of labor inefficiency hence unemployment gets reduced. On the other hand, when countries experience reduced economic growth constrained production forces employers to lay off employees to reduce their costs and this condition leads to the prevalence of the unemployment rate. The inter-linkage of economic growth and the unemployment rate is best experimented with by the literature of Okun’s law which states that unemployment and economic growth have an inversely proportional relationship. Further, the study states that to realize a one percent reduction in unemployment the real gross domestic product must grow at 3 percent (Okun, 1962). The finding is supported by literature like Rahman (2013), Efrianti, *et al*. (2018), Chand *et al.* (2017), Al-Habees (2012) and Dejene

(2019) that claimed economic growth significantly and negatively related to the unemployment rate.

Foreign direct investment has also a significant and negative effect on the unemployment rate in Ethiopia in the long run. The coefficient of lnForeign Direct Investment (-0.01) in Table 15 reveals that holding other things constant a 1 percent increase in foreign direct investment resulted in a 0.01 percent decrease in the unemployment rate in Ethiopia at a 5 percent level of significance. In less developed countries like Ethiopia characterized by abundant and cheap labor the increased inflow in FDI creates a favorable condition for the labor market performance. Specifically, labor-intensive investments want to reap the benefit of cheap labor to optimize their cost. The finding is consistent with previous studies such as Karlsson *et al.* (2009), Waldkirch *et al.* (2009), Göçer *et al.* (2013), Wondimhunegn *et al.* (2022), Mustafa and Azizun (2020) and Johnny *et al*. (2018).

The results from Table 15 also indicate that institutional quality has negatively and significantly affected unemployment rate in Ethiopia in the short run. This indicates that a better institutional set-up free from corruption, better rule of law, good governance etc… help the country to reduce the unemployment rate. The adherence of accountable and transparent institutions and better access to justice creates a favorable condition in the labor market to compete based on labor capability. Improved institutional quality safeguards investment which improves the interest of investors to start up new businesses through implementing better property rights. Hence, increased investment and expanded new business boost job opportunities and decrease unemployment. The coefficient of Institutional Quality (-.81) indicates, holding other things constant a unit improvement in institutional quality leads to a 0.81 percent reduction in unemployment at a 10% level of significance. This finding is in line with the results of Ernst *et al.* (2022) and Cicen *et al.,* 2023) which determined the existence of a strong relationship between legal institutions and labor market institutions. Legal institutions must be arranged in such a way that they can reduce the pressure on the labor market and reduce the unemployment level. Rodrik, (2000) also argued that institutional quality has a significant influence on stabilizing the macro economy, through controlling the negative implication of shocks and crises. Similarly, Acemoglu *et al*. (2005) stated that since political institutions had a significant effect on economic institutions, it was imperative to

consider the issue of institutional quality while analyzing economic indicators. According to Kaufmann *et al*. (2011) better institutional quality guarantees an effective legal system and property rights which smooth investment and production levels in the economy. The increased investment triggers demand for labor, job creation, and a reduction in unemployment level.

The positive and significant effect of inflationary pressure on unemployment is demonstrated in Table 15 above. The coefficient of lnInflation (0.04) indicates holding other things constant, a 1 percent increase in the inflation rate increases unemployment by 0.04 percent in the long run at a 5 percent significance level. This finding violates the Philip Curve introduced in 1958 that argues the existence of inverse relationship between inflation rate and unemployment. Contrarily Friedman (1977) disproved it by stating the simultaneous occurrence of a high inflation rate with a high unemployment rate. According to Friedman (1977), the inverse relationship between inflation rate and unemployment was only in the short run and it tended to dissolve in the long run due to temporary demand for labor and increased wage as firms tried to attract new workers aiming the price of the product to be high in the future. The result corresponds to literature such as Chowdhury and Hossain, (2014); Lewis *et al*., (2019), Folawewo and Adeboje (2017), and Diakhoumpa (2020) that invalidates the Philip Curve hypothesis.

The result from Table 15 Shows that lnGovernment Expenditure has a negative and significant effect on the unemployment rate at a 1% significance level in the long run. This indicates that increased government spending improves infrastructures and creates favorable conditions for economic sectors which pave the way for job creation. The increased output level due to improved infrastructure in the economy increases the demand for a factor of production which attracts more labor and lowers the unemployment level. Additionally, government recurrent expenditure in the form of wages and salary increases aggregate demand hence creating employment for the public. Holding other things constant, the coefficient of lnGovernment Ependiture (-0.04) indicates a 1 percent increase in government expenditure to reduce unemployment by 0.04 percent. This finding is consistent with Shadi (2020) who investigated the effects of government spending on the unemployment rate in Jordan. He suggested that government spending has a negative and significant effect on the unemployment rate in the long run. Similar findings like Fedderke *et al.* (2006), Holden and Sparrman (2016), and

Vincent *et al*. (2017) suggested that government expenditure has a significant and negative effect on the unemployment rate.

The demonstration in Table 16 indicates the goodness of fit measured by R^2 and Adjusted R^2 has 0.96 and 0.91 values respectively. This suggests that a percentage variation in the dependent variable is 92% stems from a change in explanatory variables in the model. Additionally, the convergence of short run disequilibrium to run long-run equilibrium stemmed from shocks in the current period is represented by the coefficient of the speed of adjustment. The speed of adjustment coefficient value (-0.92) in Table 15 above indicates the current period disequilibrium adjusted to the right magnitude and converges to long-run equilibrium at a 1% level of significance.

4.4.3. Effects of Bank Agriculture Credit on GDP Per Capita

This is the other section intended to meet the second objective effects of bank agriculture credit on GDP per capita in Ethiopia using time series data from 1990 to 2021. The unit root test of the time series data from 1990 to 2021 is tested in Table 11 above. Now this section starts with determining the existence of long run association between variables and checking whether the model fulfills the basic econometric assumptions through diagnostic and parameter stability tests. Finally, the ARDL regression results are reported with detailed discussion.

Based on the regression result from the ARDL Bound test in Table 16, the F-test on the joint significance of the variables indicates that there is a long-term association between the variables at the 1 percent, 5 percent, and the 10 percent significance levels. The upper and lower bound critical values were compared with the F-statistics to ascertain whether co-integration exists. As can be seen from Table 16, there is a long-run relationship between the variables because all upper and lower values of the F-statistics and the t-statistics critical value are smaller than the overall F-statistics 18.26.

Table 16: Time Series Co-integration Test (ARDL Bound Test)

Co-integration Test Result from Pesaran/Shin/Smith (2001) ARDL Bounds Test		
Series Models	F-Statistics	Decision
lnGDP per capita	18.26	Co-integrated
lnBank Agriculture Credit	18.26	Co-integrated
lnTrade Openness	18.26	Co-integrated
lnGovernment Expenditure	18.26	Co-integrated
lnLiteracy Rate	18.26	Co-integrated
lnGross Capital Formation	18.26	Co-integrated
lnRemittance	18.26	Co-integrated
lnUnemployment	18.26	Co-integrated

Critical values of F-statistic and t-statistics (0.1 -0.01) Bound Critical Values				
F-statistics	(2.03 3.13)***,	(2.32 3.50)**,	(2.60 3.84)**,	(2.96 4.26)*
Significance	10%	5%	5%	1%
t-statistics	(-2.57 -4.23)***,	(-2.86 -4.57)**	(-3.13 -4.85)**	(-3.43 -5.19)*
Significance level	10%	5%	5%	1%

***, **, and * indicates a 1%, 5% and 10% level of Significance respectively
Source: Authors calculations

Ascertaining whether basic econometric assumptions are fulfilled or not, is critical to get reliable and unbiased estimates. Like the previous time series model, this section also made diagnostic and structural break tests for this specific model. Table 17 presents a summary of diagnostic test results.

Table 17: Diagnostic Test

Model Diagnostic Test		
Problem to be Tested	Applied Test	Probabilities
Serial Correlation	Breusch-Godfrey LM test	0.43
Normality	Skewness	0.11
	Kurtosis	0.82
Heteroscedasticity	White test for Heteroscedasticity	0.41
Heteroscedasticity	Breusch-Pagan/Cook Weisberg Test	0.31

Source: Authors calculations

The result from the Breusch-Godfrey LM test of serial correlation shows the probability of the test has a 0.43 P-value which is greater than a 5% significance level, suggesting that the model

is free from serial correlation problem. Similarly, normality and heteroscedasticity tests had a p-value greater than a 5 percent level of significance indicating that the model has fulfilled the aforementioned diagnostic test criteria.

Table 18: Structural break test

Cumulative Sum Test for Parameter Stability			
Test Statistics	1% Critical value	5% Critical value	10% Critical value
0.3799	1.6276	1.3581	1.224

Source: Authors calculations

The other test in this model is the structural break test based on the CUSUM of the OLS residuals technique. As depicted in Table 18, the structural break test output reveals that test statistics is lower than the critical values at 1, 5, and 10 percent respectively. Hence we accept the null hypothesis of parameter stability at 1%, 5%, and 10% significance level which confirm the absence of structural breaks in the model. Additionally, the graphical model stability test based on CUSUM and CUSUMQ also indicates that the plot is found within critical bound at 5 percent level of significance indicating presence of model stability and the result is sketched at appendix VII.

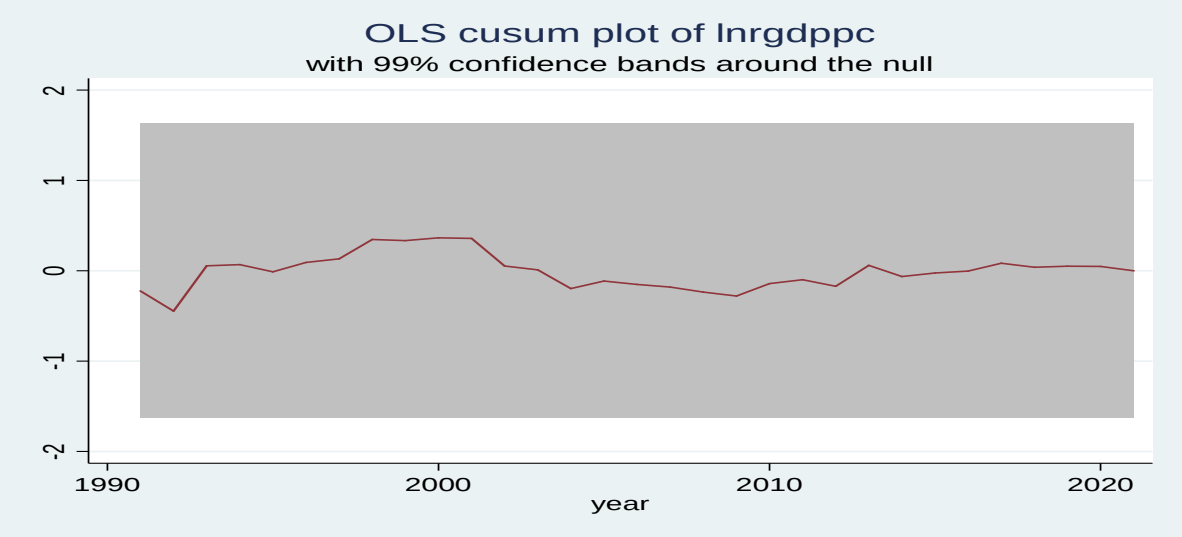


Figure 9: Parameter Stability Test Model IV

The other important test used to show long-run parameter stability is through the graphical method depicted in Figure 9. The result of the parameter stability test above indicates that plots of the OLS CUSUM process don't cross the 99% band demonstrating presence of parameter stability in the model.

Table 19: ARDL Regression Result on Bank Agriculture Credit and GDP per capital

Mode of Estimation ARDL Approach			R-Squared = 0.89	
Source: Output of STATA Version 15 Software			Adj. R-Squared = 0.84	
Dependent Variable lnGDP per capita				
Observation from 1990 to 2021				
Significance @ 1,5&10,%				
ADJ	Coefficient	Standard Error	t-statistics	Prob.
lnGDP per Capita L1.	-0.19	0.04	-4.48	0.000
Short Run Coefficients				
Regressor	Coefficient	Standard Error	t-statistics	Prob.
lnTrade Openness D1.	-0.01	0.01	-1.65	0.115
lnLiteracy Rate D1	0.17**	0.07	2.30	0.033
lnGross Capital Formation D1	0.18**	0.07	2.49	0.022
Constant	0.41	0.14	3.00	0.007
Long-run Coefficients				
lnBank Agriculture Credit	0.09**	0.04	2.32	0.031
lnTrade Openness	0.13**	0.05	2.39	0.027
lnGovernment Expenditure	0.08**	0.03	2.21	0.039
lnLiteracy Rate	-0.03	0.16	-0.18	0.859
lnGross Capital Formation	-0.02	0.34	-0.05	0.960
lnRemittance	0.10***	0.03	3.07	0.006
lnUnemployment	-0.47*	0.24	-1.98	0.062

***, **, and * indicates a 1%, 5% and 10% level of Significance respectively
Source: Authors calculations

The regression results from Table 19 indicate that bank agriculture credit has positively and significantly affected GDP per capita in the long run at a 5% significance level. The coefficient of lnBank Agriculture Credit (0.09) indicates that a 1 percent increase in the supply of bank agriculture credit disbursement leads to a 0.09 percent increase in GDP per capital at

the national level. The injection of credit to the agriculture sector builds up the capital requirement of the mass in the sector and receives better returns from achieved productivity as well as business diversification in the sector. Those who depend on farm production and work in agri-business related works benefits from enhanced market access, increase the capability of acquiring working and fixed capitals, better seeds and technologies where the proceed from agricultural production increases the income generation of the mass. Better access to finance improves the tendency of adopting modern agricultural practices, better seed and fertilizer, and utilization of current agricultural tools and irrigation that break subsistent based farming and benefit the increased income from productivity. Bounded and restricted understanding of participant in the agriculture sector become relaxed and turn their face to participate in other farm-related activities by using the income generated from better crop yield. Those employed under agri-business and value chain get a better arena to revoke capital constraints, re-invest the income and to better distribute the products to end users. This study is consistent with the findings of several studies (Joao and De Castro, 2023; Karlan *et al*., 2014 and Assunção *et al*., 2020).

The demonstration from Table 19 conveys that trade openness positively and significantly affects GDP per capita in Ethiopia at a 5% level of significance in the long run. This indicates that as the country liberalizes its trade or highly interacts with the rest of the world, it improves nation's income by opening the room for specialization, innovation, and technological adaptation which give rise to increased total factor productivity. Export volume concerning comparative advantage gets high and increases capital inflow from the rest of the world. This shows that trade liberalization enables a country to efficiently use its abundant resources and other factor of production. The coefficient of lnTrade Openness (0.13) indicates that a 1 percent increase in trade openness increases GDPPC by 0.13 percent ceteris paribus. The improved domestic productivity due to imitated knowledge and technology poses positive implications on income level and the living standards of the nation. The finding is consistent with (Frankel and Romer, 1999; Yanikkaya, 2003; Anwar and Cooray, 2015).

The literacy rate has also a positive and significant effect on GDP per capita income in the short run at a 5% level of significance. A high literacy rate is often associated with high GDP per capita since it enables nations to get better jobs, better salary and increases spending

which in turn increases output at national level. The improvement in human capital increases efficiency in country's output levels through labor productivity which in turn improves the income generated from employment. The low literacy rate is often associated with low income levels since being illiterate forced people to be employed at low paying job and to earn less. Improved literacy rate especially in developing countries with huge human capital boosts the high earning population which further improves government income through tax. The coefficient of literacy rate (0.17) shows that a 1 percent increase in gross secondary school enrollment leads to a 0.17 percent increase in GDPPC in Ethiopia. This claim is supported by similar studies (Bassanini and Scarpetta, 2001; Abbas and Nasir, 2001; Taylor, 2007; Pereira and Aubyn, 2009; Haldar and Mallik, 2010; Germinal and Marcella, 2021; Ngouhouo *et al.*, 2021; Bunyamin, 2021; Mwatu, 2023).

The gross capital formation result revealed in Table 19 above indicates it has a significant and positive effect on GDP per capita in the short run at a 5% level of significance. This accumulation of capital over time enables the level of production to rise tremendously. Household savings help the country to acquire more capital goods that drive up the yearly production of goods and services in the economy. The coefficient of lnGross Capital Formation (0.18) reveals that a 1 percent increase in gross capital formation leads to a 0.18 percent increase in GDPPC in Ethiopia. The result of the study is supported by literature: (Hilary, 2012; Solomon, 2013; Alemayehu and Befekadu, 2005; Belay, 2015; Nicodemo, 2018; Bunyamin, 2021).

The results in Table 19 convey that remittances positively and significantly affect GDP per capital at a 1% level of significance in the long run. The positive coefficient of lnRemittance (0.10) shows that a 1 percentage increase in incoming remittance to Ethiopia leads the GDPPC to increase by 0.10% ceteris paribus. A high inflow of remittance is associated with improved GDP per capita because of an increase in high consumption spending and demand drove up the output level to meet the increasing demand level in the country. Further, the inflow of funds from nations residing abroad serves as a source of capital formation in developing countries where constrained finance and erratic saving has prevailed. The result corresponds to the findings of many studies (see: Kapur, 2005; Brown *et al.*, 2011; Fayissa and Nsiah, 2012; Anwar and Cooray, 2015; Sutradhar, 2020; Debelo and Fetene, 2021).

The implication of unemployment on GDP per capital demonstrated in Table 19 above reveals a negative and significant effect of unemployment on GDP per capita at a 10% significance level in the long run. The coefficient of unemployment (-0.47) reveals that holding other things constant a 1 percent increase in unemployment leads to a 0.47 percent decrease in GDP per capita in Ethiopia. Unemployment drags down GDP per capita income due to its negative implication on human capital efficiency. The performance of the labor market gets hampered due to a high level of unemployment which poses a negative implication on the total output at the national level. The increased unemployment level often reduces consumption level and investment posing a serious effect on economic performance. An unutilized labor force creates human capital inefficacy, especially in labor-intensive economies posing a huge burden on macroeconomic stability. This finding is consistent with previous studies (Hussain *et al*., 2010; Airi *et al.,* 2016; Yelwa *et al*., 2015; Bein and Ciftcioglu, 2017; Hjazeen *et al.,* 2021; Shah *et al.,* 2022; Yegnanew, 2023).

Models goodness of fit explained by R^2 and Adjusted R^2 indicated in Table 19 has 0.89 and 0.84 respectively; conveying that the percentage of variation in the dependent variable is 89% explained by the change in independent variables in the model. Moreover, the convergence of short run disequilibrium to long-run equilibrium stemming from shocks is represented by the coefficient of the speed of adjustment. The speed of adjustment coefficient value (-0.19) in Table 19 above indicates the current period disequilibrium adjusted to the right magnitude and converged to long-run equilibrium at a 1% level of significance.

4.4.4. Determinants of Volume of Commercial Banks' Agriculture Credit

The final objective aimed at identifying the basic determinants of agriculture credit volume provided by commercial banks in Ethiopia. Depending upon the significant mean difference test evidenced on Table 3 above; it was undeniable that the total amount credit provided by commercial banks in Ethiopia is significantly low as compared to the Development Bank of Ethiopia. Hence, this section is intended to figure out bank specific, industry specific and macroeconomic factors that determine the volume of agriculture credit disbursed using Augmented Mean Group (AMG) regression analysis. Before presenting of the regression result, this section presents, cross sectional dependence test, Panel Unit Root Test, and Panel Co-integration Test as follows. This section also starts with figuring out the presence of cross-

sectional dependence in the panel which precedes other tests and regression analysis in panel data. Additionally, it helps to adopt the necessary panel unit root, co-integration, and regression models that are capable of accommodating and solving the presence of cross-sectional dependence.

Table 20: Pesaran (2004) Cross-Sectional Dependence Analysis

	Pesaran (2004) CSD Result	
Variable	CD-Test	P-value
lnAgriculture Credit Volume	10.71	0.000
lnDeposit Volume	19.39	0.000
lnCash Reserve Requirement	9.31	0.000
lnReturn on Asset	2.09	0.045
lnInterest Rate Spread	3.63	0.000
lnBank Branch	26.52	0.000
ln Liquidity Ratio	21.77	0.000
lnInflation	28.14	0.000
lnRGDP	28.14	0.000
lnCLC	28.14	0.000

***, **, and * indicates a 1%, 5% and 10% level of Significance respectively
Source: Authors calculations

The result from the above CSD test based on Pesaran (2004) indicates that all variables above are cross-sectional dependent. Hence, the study adopted the CIPS unit root test, Westerlund test for co-integration, and the AMG model.

Table 21: Second Generation Panel Unit Root Test

	CIPS Panel Unit Root Test		
Variables	At level	At First Difference	Order of Integration
lnAgriculture Credit Volume	-2.31	-3.03	I(1)
lnDeposit Volume	-1.62	-3.46	I(1)
lnCash Reserve Requirement	-2.64		I(0)
lnReturn on Asset	-2.58		I(0)
lnInterest Rate Spread	-2.47	-3.62	I(1)
lnRGDP	-2.04	-2.73	I(1)
lnInflation	-2.97		I(0)
lnBank Branch	-2.89		I(0)
lnLiquidity Ratio	-2.13	-3.18	I(1)
lnClimate Change	-5.67		I(0)

Source: Authors calculations

The presence of CSD in the variables necessitates the application of second-generation panel unit root test specifically the cross-sectional augmented Im-Pesaran-Shin (CIPS), panel unit root test for panel data analysis. The results from CIPS in Table 21 demonstrate that variables are integrated at a level and after the first difference at a 1 percent, 5 percent, and a 10 percent level of significance.

Table 22: Co-integration test Result

Westerlund test for co-integration		
	Statistics	P-value
Variance Ratio	3.16	0.000

Source: Authors calculations

The long-run association between variables is undertaken using Westerlund test for co-integration which is capable of dealing with the problem of cross-sectional dependence. The result in Table 22 shows that there was a co-integration between variables at a 5% significance level.

The regression result in Table 23 below outlined determinants of bank agriculture credit volume in commercial banks in Ethiopia. Deposit volume has a positive and significant effect on the amount of agriculture credit injected by commercial banks. The positive coefficient of lnDeposit Volume (0.49) shows that a 1 percent increase in the amount of deposits mobilized by commercial banks increases the amount of agriculture credit disbursed by 0.49 in the economy at 1% significance level. A massive resource mobilization through attracting new customer with excess cash at hand enables the bank to provide more agriculture credit. Commercial banks grant credit to the customer to avoid the burden of paying saving interest and simultaneously to benefit the interest income collected from the customers before the loan is fully settled. Effective channeling of the excess money in the economy through saving enables commercial banks to provide increased credit to the agriculture sector. The previous literature like Olokoyo (2011), Amano (2014), Zelalem (2017) and Taye, (2020) found a similar finding that deposit volume has a significant and positive effect on credit volume.

Table 23: AMG Regression Result

Variables	Coefficient	S. Error	Z-Value	P-Value
lnDeposit Volume	0.43***	0.16	2.66	0.008
lnCash Reserve Requirement	0.02	0.16	-0.17	0.863
lnReturn on Asset	0.66*	0.35	1.89	0.059
lnInterest Rate Spread	-1.92*	1.08	-1.78	0.075
lnBank Branch	0.60**	0.30	1.97	0.048
lnLiquidity Ratio	0.32	0.27	1.16	0.245
lnInflation	-9.39***	2.85	-3.30	0.001
lnRGDP	360.02***	108.89	3.31	0.001
lnClimate Change**	-2.19	0.90	-2.43	0.015
_00000R_c	0.65**	0.19	3.30	0.001
Constant	-876.07	269.42	-3.25	0.001

Dependent Variable: lnAgriculture Credit Volume
Observation per group:
Minimum = 12
Average = 12.0
Maximum = 12
Wald Statistics = 407.79
Prob > Chi2 = 0.0000

***, **, and * indicates a 1%, 5% and 10% level of Significance respectively

Source: Authors calculations

The financial performance represented by return on assets has a significant and positive effect on the volume of agriculture credit provided by commercial banks in Ethiopia. The coefficient of lnReturn on Asset (0.68) indicates that a percentage increase in return on assets increases agriculture credit provided by banks by 0.68 percent at a 10% significance level. This shows that as the bank's profitability or financial performance improved, the amount of loan disbursed to the agriculture sector improved. With the improvement of net income, commercial banks are able to expand their operation as well as asset size which enables them to get high market share which is a key to disbursing increased agriculture credit. The result of the study is confirmed by the findings of Mohammed (2014) and Taye (2020), indicating financial performance is a stepping stone that drives banks to provide increased loan to their customers.

As demonstrated in Table 23, interest rate spread has a significant and negative effect on bank agriculture credit volume. This shows that as the bank lending and saving interest rate gaps are high, the amount of credit provided to agriculture sector get constrained. The coefficient of lnInterest Rate Spread (-1.88) stands for a percentage increase in interest rate spread reduce the amount of agriculture credit disbursement by 1.88 percent at a 10% significance level. Due to the significant impact that higher IRS has on the efficient mobilization of funds, higher IRS deters potential savers and acts as a barrier for potential investors. Reduced interest rate for deposit as compared to credit interest rate frustrates customer inclination towards deposit and the relatively higher credit interest rate frustrates investors from taking loan from banks. This finding is consistent with the findings of Sogut (2008) and Zerihun *et al.* (2022), who argued that higher interest rate spreads leads to loss of productive fund and negatively affect the amount of loan disbursed.

The result in Table 23 shows that inflation rate in the economy has a significant and negative effect on agriculture credit volume. The coefficient of lnInflation (-6.42) reveals that a percentage increase in general price level in the economy leads to 6.42 reduction in agriculture credit provided by commercial banks at a 5% significance level. As the economy experience's inflationary pressure commercial banks motive to provide credit get reduced. Inflationary pressure affects credit volume through discouraging savers due to risks associated with purchasing power and the associated uncertainty in the future. Further, banks may react by increasing lending rate to avoid potential risk associated with dwarfed purchasing power and this in turn retards borrowers from taking loan from banks. The result is consistent with the findings of Dereje (2018) and Taner (2000) that confirms the sustained increase in general price level has a significant and negative effect on credit supply.

The other macroeconomic determinants is economic growth measured Real GDP in Table 23 reveals that it has a positive and significant effect on agriculture credit volume of commercial banks at a 5% significance level. This shows that commercial banks provide more loans to agriculture credit when the country's economy improved. The increase in economic growth is a sign of relatively good macroeconomic environment which initiates investors to borrow money and forces commercial banks to provide credit to get the benefit from these stable macroeconomic conditions. The finding is congruent with the results of several studies

(Dereje, 2018; Berhanu, 2016; Olokoyo, 2011), that indicate economic growth has a positive and significant effect on credit supply.

The demonstration on Table 23 reveals that climate change negatively and significantly contributes to agriculture credit supply at 5 percent level of significance. The coefficient of lnClimate Change (-2.19) suggests that a percentage increase in climate change leads to 2.19 reduction in agriculture credit provided by commercial banks in Ethiopia. This reveals that commercial banks provides a reduced amount of credit to agriculture sector since the change in climate condition has a direct implication on the production performance of the sector which increases the loan default rate of debtors. In other words commercial banks shift their credit provision to other economic sector to avoid the risk associated with the repayment capability of debtors on the agriculture sector. This finding is congruent with Choudhury *et al.* (2022) and Weber and Musshoff (2017) who considered bad weather condition as a supply side constraint in agriculture credit supply.

The relationship between bank branches and agriculture credit above reveals that bank branch has a positive and significant effect on bank agriculture credit volume at a 5 percent significance level. Holding other things constant, the coefficient of lnBank Branch (0.51) indicates that a 1 percent increase in branch expansion increases agriculture credit volume disbursed by 0.51 percent. Expanded branch helps commercial banks to access unbanked societies and to mobilize new savings which further enables them to disburse more agriculture credit. The expansion of branches in a wide range of geographic areas fosters society's accession to the banking service and the proportion of inclusive population to the service improved. Penetrating to areas with limited financial service through better branch networks enables banks to mobilize financial resources. This finding is confirmed by Beck *et al*. (2007) and Wanniarachchige *et al.* (2012). However, explanatory variables like cash reserve requirement and liquidity ratio are insignificantly related to bank agriculture credit volume.

The Wald Statistics demonstrated in Table 23 indicate the result is statistically significant at a 1% level of significance revealing that the data fitted the adopted model very well.

5. SUMMARY, CONCLUSION AND POLICY IMPLICATION

5.1. Summary

Handling the issue of poverty and ensuring equitable income distribution become the major macroeconomic issues, especially in less developed economies. Government organs implement different development goals to curb the prevalence of poverty level and to narrow the income distribution gaps. From the sophisticated nature of poverty, plenty of actions and macroeconomic measures were adopted to halt its economic and social crises. Among others, access to credit especially for vulnerable masses is a key to equipping them to generate improved income which further strengthens living standards and other welfare. Abundant financial capital further catalyzes investment in education and initiates the engagement of the poor towards entrepreneurial activities. In developing countries like Ethiopia where the majority of its population relies in the agriculture sector agri-business faces a bottleneck from accessing financial services like credit facilities. Conventional credit provision by banks to specific services dominated by a very small proportion of businessmen might support economic growth but this system disregards the masses or poor who suffer from capital shortfalls. Even this condition increases the income distribution between the poor and those who get the benefit from it. Hence, an in-depth analysis of how better credit access to the agriculture sector that supports the majority of the societies in Ethiopia is critical to identifying its role in improving income, reducing poverty level, employment creation, and narrowing income inequality at the national level.

Therefore, this study investigated the effects of bank agriculture credit on poverty level, income inequality, per Capita GDP, and unemployment at the national level by utilizing both panel and time series data. Finally, after identifying the significant difference between the Development Bank of Ethiopia and commercial banks in agriculture credit provision, the study also empirically identified banks specific, industry-specific, and macroeconomic determinants of agriculture credit volume provided by commercial banks in Ethiopia. The study used different models to analyze the data by considering the comparative advantages of each model to different data settings. The first objective which uses unbalanced panel data from 2000 to 2021 to investigate the effects of bank agriculture credit on poverty level and income inequality in Ethiopia is analyzed using the Panel Corrected Standard Error (PCSE)

model which is robust in panel data setting with T>N and control spatial correlation, heteroscedasticity, and cross-sectional dependence. The second objective that utilizes time series data from 1990 to 2021 to determine the effects of agriculture credit on per capita GDP and unemployment in Ethiopia; the adopted Auto-Regressive Distributed Lag (ARDL) model is applied by considering its many advantages over other time series models. Further, the last objective that investigates the determinants of agriculture credit provided by commercial banks in Ethiopia using balanced panel data with an equal number of cross sections and time period (T=N) uses an Augmented Mean Group (AMG) model. This is also recent and robust with the presence of cross-sectional dependence, and endogeneity problems. In addition, the study also conducted all the necessary pre-estimation and post-estimation tests to confirm that all the aforementioned models are in line with basic econometric assumptions.

The result from the first objective indicates that bank agriculture credit negatively and significantly affects poverty level and income inequality in Ethiopia. This implies that better credit disbursement to agriculture credit helps the masses to alleviate the capital constraint they face in agricultural activities. The majority of societies residing in the agriculture sector get better credit access hence the welfare disparity between rural and urban areas gets narrowed which further reduces the income distribution gap at the national level. Other macroeconomic variables were introduced to avoid the problem of variable bias and the result reveals that GDP per capital, trade openness, and institutional quality are significantly and negatively related to poverty level. On the other hand unemployment rate and population size have a positive and significant relationship with the poverty level. With regard to the second equation GDP per capita, trade openness, and institutional quality have a negative and significant effect on income inequality. However, the unemployment rate has a positive and significant effect on income inequality.

The result from the second objective implies that bank agriculture credit has a negative and significantly affects the unemployment rate and positively and significantly affects per capita GDP in Ethiopia indicating that increased agriculture credit supply reduces unemployment through its positive implication in employment creation in agriculture and agriculture related business. On the other hand access to agriculture credit enables the mass poor to relieve capital constraints used to utilize better seeds, machinery, and fertilizer, and to extend the

finance to engage in other entrepreneurial activities. The majority of societies which is encircled by subsistence modes of living conditions can participate in different agriculture portfolios and generate improved income.

In the end the result from the last objective which investigates the determinants of bank agriculture credit volume reveals that bank-specific factors like deposit volume, bank branches, return on asset and real GDP positively and significantly affect the agriculture credit volume disbursed by commercial banks. This implies that better deposit mobilization enables commercial banks to supply more credit which increases the efficiency of unutilized funds in the economy. Branch expansion also boosts the provision of credit to the sector by attracting unbanked societies into the financial system which increases financial literacy and deposit mobilization. Bank profitability measured by return on asset also shows the financial position of a bank and better profitability strengthens the investment made by banks. This in turn helps the banks to introduce different credit products. On the other hand interest rates spread negatively and significantly related to agricultural credit supply in Ethiopia. This reveals that as the gap between the saving rate and lending rate increases depositors lack the motive to deposit money and investors or debtors are frustrated to take credit since the increased lending rate significantly reduces their net income. Among macroeconomic variables economic growth positively and significantly affects the agriculture credit volume of commercial banks in Ethiopia. However, the inflation rate is negatively and significantly related to agriculture credit volume.

5.2. Conclusion

The prevalence of poverty, unemployment and low income level with growing income distribution gap is considered as one of macroeconomic curse in Ethiopia for couple of decades. Although the government and policy makers launched different measures, the problem continued to persist. Among others, enriching agriculture sector with better credit supply in economies overwhelmed by agriculture sector is considered as a prime strategy by plenty literatures to leverage the sector productivity and to enable the mass to harness the economic benefit from it. In accordance with this, bank agriculture credit reduces poverty and income inequality level in Ethiopia. The inverse implication of bank agriculture credit on poverty and income inequality is congruent with financial inclusion theory that conveys

inclusive credit distribution especially for marginalized portion of the society is a key to reduce poverty and income distribution gap. The disbursement of agricultural loans encompasses those who present better seed, pesticide, fertilizer and related agricultural input which strengthen farmers' access to improved inputs. Those customers that work in farm, selling of agricultural input and technologies, selling of agriculture product, agro-processing and distribution channels are all categorized under agriculture credit. The injection of this credit to the sector helps those who participate in the aforementioned areas by helping them to alleviate their capital bottleneck and catalyze their involvement in entrepreneurial activities. The provision of loans in the sector also strengthens farmers by enabling them to easily get agricultural input and technologies and realize mechanized farming. Apart from these, farmers' access to agriculture credit helps the portion of the societies that work in agricultural related business by equipping them with capital and alleviating short-term capital shortfalls. Unlike, the conventional credit provision trend that grants high or concentrated amounts to limited customers in the service and industry sector, which increases the divergence of income distribution in the economy. Conversely, extending of bank credit to the agriculture sector is inclusive and increases the participation of societies in the credit service. This condition pulls up the marginalized mass society's income and thereby reduces the income distribution gap. Partial credit provisions that inclined to other economic sectors left the majority of individuals employed in the agriculture sector. This condition further aggravates the income gap by specifically benefiting a small portion of societies involved in other economic sectors.

The inverse relationship between bank agricultural credit and unemployment matches the underpinning theoretical foundation in this study that suggests the importance of inclusive credit provision in the economy ensures labor efficiency and reduces the level of unemployment in the economy. The finding suggests that well-developed financial service fosters investment and productivity which creates job opportunities. This implies that abundance of credit facility for economic sectors that serves as source of employment for the majority of labors in the economy reduces the problem of capital shortfalls. Bridging of funds from surplus areas to agriculture sector helps to acquire better inputs accompanied by recent technology to attain better productivity through expanded investment in the sector. The availability of financial resources catalyzes the entrepreneur and diversifies business insight which supports the efficacy of the labor market through employment creation. This condition

able to absorb the majority of labor forces which resides under agriculture production. Additionally, the provision of investment oriented facility has the capacity to increase the production of goods and service in the economy through increased return from factors of production. The positive implication of bank agriculture credit on per capita income suggests, enriching of the agriculture sector with capital which is used to utilizing improved input to attain maximized output. Better access to finance improves the tendency of adopting modern agricultural practices, better seed and fertilizer, and utilization of current agricultural tools and irrigation that break subsistent based farming and benefit the increased income from productivity. Bounded and restricted understanding of participant in the agriculture sector become relaxed and turn their face to participate in other farm-related activities by using the income generated from better crop yield. Additionally, the abundance of financial resource in the sector revokes the conventional subsistence agriculture habit and revives the agriculture production for market purpose. Those employed under agri-business and value chain get a better arena to solve capital constraints, re-invest the income and to better distribute the products to end users.

Finally, the result from the last objective which investigates determinants of bank agriculture credit volume reveals that bank-specific factors like deposit volume, bank branch, and return on asset positively and significantly affect the agriculture credit volume disbursed by commercial banks. This implies that better resource mobilization enables commercial banks to supply more credit which increases the efficiency of unutilized funds in the economy. Improvement of deposit size which is channeled from surplus area enables commercial banks to provide extra credit for agriculture sectors. Mobilizing surplus funds outside the bank in the form of saving strengthens the liquidity position of the bank and enables them to disburse extra loan. Branch expansion also boosts the provision of credit to the sector by attracting unbanked societies into the financial system which increases financial literacy and deposit mobilization endeavor. This is because, expanding branch especially to unbanked societies channels currencies saved in traditional manner to financial institution which is necessary to grant extra loan to customers. Hence, commercial banks are able to exploit this untapped financial resource to build their deposit volume. In similar fashion, bank profitability measured by return on asset also shows the financial position of a bank and better profitability strengthens the investment made by banks. Better return on asset forges re-investment of the

return and increases the size of banks which further improves their capability to extend extra credit. Contrarily, high interest rate spread negatively affects the volume of agriculture credit provided by commercial banks. This suggests that when the gap between saving and lending interest rate widens, depositors interest to save with existing very low interest rate gets hurt while debtors motives for investment was halted due to the imposed high lending interest rate. This Condition creates prevalence of inefficient and idle financial resources in the economy.

Among macroeconomic variables economic growth positively and significantly affects the agriculture credit volume of commercial banks in Ethiopia, indicating that better economic condition increases the motive of banks to provide increased deposit since they expect investments made during better economic condition has less chance to fail which reduces the chance of loan default rate. Additionally, improved economic growth increases the financial transaction in the economy which is conducted through banks. The increased volume transaction due to improved output in the economy avails the loanable funds to deficit areas. However, the inflation rate is negatively and significantly related to agriculture credit volume. The presence of inflationary pressure in the economy constrains the total loan provided to agriculture sector. This reveals that during inflationary pressure customers motive to deposit dwindles especially when the saving interest rate falls behind inflation rate in the economy and they turn their face to convert their surplus cash into fixed asset in order to benefit from fixed asset price appreciation in the future. Finally, the inverse relationship between agriculture credit supply and climate change reveals that harvesting seasons accompanied by bad climatic condition restrain commercial banks from extending of loan to agriculture system to avoid the associated risk of bad loan. Climate change poses a catastrophic consequence on agriculture production since it directly influence basic agricultural inputs like water, light, soil and heat. Unsatisfactory harvesting season retards the income stream of agriculture sector participants which constrain the loan repayment capability. To avoid these kinds of risk commercial banks responds by limiting the volume of credit they inject to the sector.

5.3. Policy Implications

The study suggests the following recommendations to curb poverty level, narrow income inequality, and improve other economic welfare at the national level. The recommendations are provided depending on the findings of the study.

It was imperative for National Bank of Ethiopia and government organs to formulate a credit policy in favor of agricultural credit to strategically support economically vulnerable groups and maximize the welfare of the society. Implementing inclusive credit policies that balance the loan disbursement between economic sectors and encourage formal financial institutions in Ethiopia to increase their inclination towards supplying credit to this important sector is decisive. Inclusive credit supply in favor of the agriculture sector enables neglected groups to solve their capital constraint problem through better agriculture production and agri-business activities. The disbursement of credit in the sector not only benefits farmers in terms of solving their liquidity problem but also catalyzes the availability of improved agriculture inputs like better seed, fertilizer, machinery, and adaptation of better technology in the sector. This condition in turn improves the income stream of farmers and those who depend on agri-business through better financial literacy and entrepreneurial activity. From its inclusive point of view, agriculture credit strengthens poverty reduction and narrows income disparity, at the national level.

Increasing the share of credit supply in the agriculture sector also plays an important role in reducing the growing unemployment rate and increasing per capita GDP. Hence, strengthening this service promotes labor efficiency in countries like Ethiopia characterized by the abundance of labor resources. As one part of input, ensuring of employment creation encourages the production at national level which leads to improved income earned by society. Policymakers of Ethiopia also have to ensure economic growth, trade liberalization, and adherence to strong institutional quality to reduce poverty and income inequality at the national level at the same time, macroeconomic components like population growth, unemployment, and inflation must be managed to curb their effect in aggravating poverty and income inequality. Vanquishing the rampant unemployment rate requires government organs to delve into and formulate attractive economic policies capable of attracting FDI which facilitates employment for cheap labor domestically. Transparent government expenditure on recurrent and capital goods is also advised since it plays significant role in increasing aggregate demand, and building human capita which further increase employment creation. Policy makers should also facilitate mechanisms like increasing national saving to improve gross fixed capital formation and increase investment in human capital through increasing literacy rate to ensure labor productivity. The government has to ensure adherence of a

competitive and accessible financial environment is critical to attract the formal flow of remittance through financial institutions which simultaneously help the country's foreign currency earnings and increase GDP per capita.

Commercial banks in Ethiopia has to aggressively work on financial resource mobilization from untapped sources and expand their branch accessibility to increase their unsatisfactory and erratic credit supply to the agriculture sector which enables them to vent social responsibility and maximize the welfare of the masses. In collaboration with the government commercial banks have to extend their branch tier to less banked areas through agent banking to mobilize untapped resources and to diversify their banking service portfolio. The national bank of Ethiopia should facilitate a better and competitive financial environment to support commercial banks to realize improved profitability which fasten their endeavor to invest in banking products and services that foster inclusiveness of the financial service horizon. On the other hand, National Bank of Ethiopia has to introduce an optimum credit interest rate floor to narrow the interest rate spread and to reduce its negative implication on investment by the debtors. Commercial banks should also launch competitive credit interest rates, especially for the agriculture sector to increase their participation rate in the credit system. The government also ensures increased output at the national level since it has positive impact on aggregate demand which in turn boosts commercial banks' appetite to lend money to the sector. On the other hand, ensuring stable general prices at the national level is critical to help commercial banks to mobilize deposits from savers. With the prevalence of high inflation credit supplies in the sector get reduced due to a reduced level of saving since the motive of savers gets hurt to save when the interest rate is lower than the inflation rate and this condition forces them to damp their money on a fixed asset rather than saving to benefit from the appreciation of fixed assets value in the future.

Based on the implication of climate change on access to agriculture credit, government has promote the establishment of agriculture insurance system on one hand and inducing farmers to utilize the service through awareness creation to build the confidence of commercial banks while granting of loan to the sector. This establishment can serve as a mitigating mechanism for devastation created by bad climatic conditions which reduce credit constraint. Moreover, the government has to use instruments like setting fair lending rate, incentives and subsidizing

interest rates associated with agriculture credit to better harness the benefit of immense financial resources circulated in the bank.

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7. APPENDICES

Appendix I: Mean Difference Test

```
. ttest agriculturesector == industrysector, unpaired

Two-sample t test with equal variances
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
agricu~r	32	.142108	.0084478	.0477882	.1248785	.1593374
indust~r	32	.2506952	.0170338	.0963575	.2159546	.2854358
combined	64	.1964016	.0116505	.0932041	.1731199	.2196833
diff		-.1085873	.0190135		-.1465948	-.0705797

```
    diff = mean(agriculturesec~r) - mean(industrysector)          t =  -5.7110
Ho: diff = 0                                     degrees of freedom =       62

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

```
. ttest agriculturesector == servicesector, unpaired

Two-sample t test with equal variances
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
agricu~r	32	.142108	.0084478	.0477882	.1248785	.1593374
servic~r	32	.6071968	.0207812	.117556	.5648134	.6495803
combined	64	.3746524	.0313396	.2507171	.3120251	.4372797
diff		-.4650889	.0224326		-.5099311	-.4202467

```
    diff = mean(agriculturesec~r) - mean(servicesector)           t = -20.7327
Ho: diff = 0                                     degrees of freedom =       62

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

```
. ttest commercialbanks == developmentbank, unpaired

Two-sample t test with equal variances
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
commer~s	12	.0554521	.0064832	.0224586	.0411826	.0697216
develo~k	12	.2305	.0264173	.091512	.172356	.288644
combined	24	.142976	.0225831	.1106341	.0962593	.1896927
diff		-.1750479	.0272012		-.2314597	-.1186361

```
    diff = mean(commercialbanks) - mean(developmentbank)          t =  -6.4353
Ho: diff = 0                                     degrees of freedom =       22

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

Appendix II: Descriptive Statistics Summary

```
. pwcorr lnpovhc lnagric lnpop lninf lnlr lngdppc lnto lnune iq
```

	lnpovhc	lnagric	lnpop	lninf	lnlr	lngdppc	lnto
lnpovhc	1.0000						
lnagric	-0.2884	1.0000					
lnpop	0.2531	0.6197	1.0000				
lninf	-0.1890	0.1372	0.0169	1.0000			
lnlr	-0.0692	0.2109	0.2638	0.0882	1.0000		
lngdppc	-0.5744	0.4192	0.0446	0.1803	0.0283	1.0000	
lnto	-0.3561	-0.1200	-0.0249	0.0850	0.0460	-0.2349	1.0000
lnune	0.1269	0.0706	0.0165	-0.0724	-0.0404	0.1792	-0.5389
iq	-0.6113	0.3915	0.0746	0.1420	0.0190	0.6032	-0.2823

	lnune	iq
lnune	1.0000	
iq	0.2487	1.0000

```
. pwcorr lngini lnagric lninf lnpovhc lngdppc lnune lnto iq
```

	lngini	lnagric	lninf	lnpovhc	lngdppc	lnune	lnto
lngini	1.0000						
lnagric	-0.3149	1.0000					
lninf	0.0103	0.1372	1.0000				
lnpovhc	0.2624	-0.2884	-0.1890	1.0000			
lngdppc	-0.3845	0.4192	0.1803	-0.5744	1.0000		
lnune	0.2169	0.0706	-0.0724	0.1269	0.1792	1.0000	
lnto	-0.3290	-0.1200	0.0850	-0.3561	-0.2349	-0.5389	1.0000
iq	-0.3979	0.3915	0.1420	-0.6113	0.6032	0.2487	-0.2823

	iq
iq	1.0000

```
. pwcorr lnagrc lndv lncrr lnroa lnirs lnbb lnlqr lninf lnrgdp lnclc
```

	lnagrcv	lndv	lncrr	lnroa	lnirs	lnbb	lnlqr
lnagrcv	1.0000						
lndv	0.7749	1.0000					
lncrr	0.6899	0.6337	1.0000				
lnroa	-0.0110	0.0179	-0.0716	1.0000			
lnirs	-0.1982	-0.0478	-0.0551	-0.3055	1.0000		
lnbb	0.7142	0.7873	0.6444	-0.1970	0.3080	1.0000	
lnlqr	-0.5584	-0.6460	-0.5019	0.1551	-0.1718	-0.7744	1.0000
lninf	0.0676	0.1763	0.1227	0.0141	0.0582	0.1040	-0.0305
lnrgdp	-0.2732	-0.5231	-0.2713	0.0073	-0.1931	-0.5381	0.5748
lnclc	0.1525	0.1821	0.1665	-0.0324	-0.0050	0.1659	-0.1601

	lninf	lnrgdp	lnclc
lninf	1.0000		
lnrgdp	-0.5043	1.0000	
lnclc	-0.1032	-0.1960	1.0000

Appendix III: Panel and Time series Unit Root Test Result

```
. xtcips lnagric, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnagric
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -2.401        N,T = (11,22)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips d.lnagric, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for D.lnagric
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* =    -4.874        N,T = (11,21)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips lnto, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnto
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -2.679        N,T = (11,22)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips lngdppc, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lngdppc
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -1.522        N,T = (11,22)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
.
. xtcips d.lngdppc, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for D.lngdppc
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* =    -4.758        N,T = (11,21)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips lninf, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lninf
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -3.903        N,T = (11,22)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips lnune, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnune
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process
```

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* = -5.070 N,T = (11,22)

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips lnpop, maxlags(1) bglags(1)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnpop
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* =    -1.402        N,T = (11,22)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips d.lnpop, maxlags(1) bglags(1)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for D.lnpop
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* =    -4.898        N,T = (11,21)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips iq, maxlags(1) bglags(1)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for iq
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -3.187        N,T = (11,22)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips lnlr, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnlr
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -1.489        N,T = (11,22)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips d.lnlr, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for D.lnlr
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* =    -5.428        N,T = (11,21)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips lnpovhc, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean included for lnpovhc
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* =    -5.299        N,T = (11,22)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips lngini, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnginic
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* =    -5.783        N,T = (11,22)
```

	10%	5%	1%
Critical values at	-2.14	-2.25	-2.45

```
. xtcips lnagrcv, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnagrcv
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -2.312        N,T = (12,12)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips d.lnagrcv, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for D.lnagrcv
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -3.028        N,T = (12,11)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips lninf, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean included for lninf
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -2.971        N,T = (12,12)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips lndv, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lndv
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -1.624        N,T = (12,12)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips d.lndv, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for D.lndv
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* =    -3.455        N,T = (12,11)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips lncrr, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lncrr
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -2.635        N,T = (12,12)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips lnroa, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnroa
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* =    -2.579        N,T = (12,12)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips lnirs, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnirs
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* =    -2.468        N,T = (12,12)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips D.lnirs, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for D.lnirs
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -3.622        N,T = (12,11)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips lninf, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lninf
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -2.971        N,T = (12,12)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips lnrgdp, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnrgdp
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -2.042        N,T = (12,12)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
.
. xtcips d.lnrgdp, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for D.lnrgdp
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -2.731        N,T = (12,11)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips lnbb, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnbb
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -2.893        N,T = (12,12)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips lnlqr, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for lnlqr
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -2.127        N,T = (12,12)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips d.lnlqr, maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean inc
> luded for D.lnlqr
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS =    -3.183        N,T = (12,11)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. xtcips lnclc,  maxlags(2) bglags(2)

Pesaran Panel Unit Root Test with cross-sectional and first difference mean included for lnclc
Deterministics chosen: constant

Dynamics: lags criterion decision General to Particular based on F joint test

Individual ti were truncated during the aggregation process

H0 (homogeneous non-stationary): bi = 0 for all i

CIPS* =    -5.666        N,T = (12,12)
```

	10%	5%	1%
Critical values at	-2.16	-2.28	-2.52

```
. dfuller lnrgdppc

Dickey-Fuller test for unit root                    Number of obs   =        31

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)                1.692           -3.709            -2.983           -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9981

. dfuller d.lnrgdppc

Dickey-Fuller test for unit root                    Number of obs   =        30

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)               -4.393           -3.716            -2.986           -2.624
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0003
```

```
. dfuller lnagric

Dickey-Fuller test for unit root                   Number of obs   =        31

                                 ------------ Interpolated Dickey-Fuller -----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -0.447           -3.709            -2.983           -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9019

.
. dfuller d.lnagric

Dickey-Fuller test for unit root                   Number of obs   =        30

                                 ------------ Interpolated Dickey-Fuller -----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -3.895           -3.716            -2.986           -2.624
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0021

. dfuller lnto

Dickey-Fuller test for unit root                   Number of obs   =        31

                                 ------------ Interpolated Dickey-Fuller -----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -4.346           -3.709            -2.983           -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0004

.
. dfuller lnlr

Dickey-Fuller test for unit root                   Number of obs   =        31

                                 ------------ Interpolated Dickey-Fuller -----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -0.192           -3.709            -2.983           -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9395

.
. dfuller d.lnlr

Dickey-Fuller test for unit root                   Number of obs   =        30

                                 ------------ Interpolated Dickey-Fuller -----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -4.273           -3.716            -2.986           -2.624
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0005
```

```
. dfuller lninflation

Dickey-Fuller test for unit root                   Number of obs   =        29

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              -5.432            -3.723            -2.989           -2.625
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

.
. dfuller lngcf

Dickey-Fuller test for unit root                   Number of obs   =        31

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              -0.656            -3.709            -2.983           -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.8578

.
. dfuller d.lngcf

Dickey-Fuller test for unit root                   Number of obs   =        30

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              -5.303            -3.716            -2.986           -2.624
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

```
. dfuller lnune

Dickey-Fuller test for unit root                   Number of obs   =        31

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————
 Z(t)             -2.813           -3.709            -2.983            -2.623
——————————————————————————————————————————————————————————————————————————

MacKinnon approximate p-value for Z(t) = 0.0565

.
. dfuller d.lnune

Dickey-Fuller test for unit root                   Number of obs   =        30

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————
 Z(t)             -8.716           -3.716            -2.986            -2.624
——————————————————————————————————————————————————————————————————————————

MacKinnon approximate p-value for Z(t) = 0.0000


. dfuller lnrem

Dickey-Fuller test for unit root                   Number of obs   =        31

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————
 Z(t)             -1.052           -3.709            -2.983            -2.623
——————————————————————————————————————————————————————————————————————————

MacKinnon approximate p-value for Z(t) = 0.7340

.
. dfuller d.lnrem

Dickey-Fuller test for unit root                   Number of obs   =        30

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————
 Z(t)             -5.844           -3.716            -2.986            -2.624
——————————————————————————————————————————————————————————————————————————

MacKinnon approximate p-value for Z(t) = 0.0000
```

```
. dfuller lnfdi

Dickey-Fuller test for unit root                   Number of obs   =        30

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value            Value
——————————————————————————————————————————————————————————————————————————
 Z(t)             -3.771           -3.716            -2.986           -2.624
——————————————————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0032

. dfuller iq

Dickey-Fuller test for unit root                   Number of obs   =        31

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value            Value
——————————————————————————————————————————————————————————————————————————
 Z(t)             -2.228           -3.709            -2.983           -2.623
——————————————————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.1962

.
. dfuller d.iq

Dickey-Fuller test for unit root                   Number of obs   =        30

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value            Value
——————————————————————————————————————————————————————————————————————————
 Z(t)             -8.287           -3.716            -2.986           -2.624
——————————————————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0000
```

```
. dfuller lnrgdp

Dickey-Fuller test for unit root                   Number of obs   =        23

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              -2.868            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0492

.
. dfuller d.lnrgdp

Dickey-Fuller test for unit root                   Number of obs   =        20

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              -5.798            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

.

. dfuller lnge

Dickey-Fuller test for unit root                   Number of obs   =        31

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              -1.250            -3.709            -2.983           -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.6518

. dfuller d.lnge

Dickey-Fuller test for unit root                   Number of obs   =        30

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              -7.358            -3.716            -2.986           -2.624
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

Appendix IV: Panel Cross-Sectional Dependence Analysis

```
. xtcdf lnpovhc lnagric lnpop lninf lnlr lngdppc lnto lnune iq

xtcd test on variables lnpovhc lnagric lnpop lninf lnlr lngdppc lnto lnune iq
Panelvar: cid
Timevar: year
```

Variable	CD-test	p-value	average joint T	mean ρ	mean abs(ρ)
lnpovhc	14.352	0.000	4.64	0.90	0.90
lnagric	28.41	0.000	21.82	0.82	0.82
lnpop	33.739	0.000	22.00	0.97	0.97
lninf	23.609	0.000	20.31	0.71	0.71
lnlr	14.043	0.000	22.00	0.40	0.44
lngdppc	31.906	0.000	22.00	0.92	0.92
lnto	34.785	0.000	22.00	1.00	1.00
lnune	34.766	0.000	22.00	1.00	1.00
iq	34.779	0.000	22.00	1.00	1.00

Notes: Under the null hypothesis of cross-section independence, CD ~ N(0,1)
P-values close to zero indicate data are correlated across panel groups.

```
. xtcdf lngini lnagric lninf lnpovhc lngdppc lnune lnto iq

xtcd test on variables lngini lnagric lninf lnpovhc lngdppc lnune lnto iq
Panelvar: cid
Timevar: year
```

Variable	CD-test	p-value	average joint T	mean ρ	mean abs(ρ)
lngini	5.933	0.000	4.82	0.36	0.54
lnagric	28.41	0.000	21.82	0.82	0.82
lninf	23.609	0.000	20.31	0.71	0.71
lnpovhc	14.352	0.000	4.64	0.90	0.90
lngdppc	31.906	0.000	22.00	0.92	0.92
lnune	34.766	0.000	22.00	1.00	1.00
lnto	34.785	0.000	22.00	1.00	1.00
iq	34.779	0.000	22.00	1.00	1.00

Notes: Under the null hypothesis of cross-section independence, CD ~ N(0,1)
P-values close to zero indicate data are correlated across panel groups.

```
. xtcdf lnagrc lndv lncrr lnroa lnirs lnbb lnlqr lninf lnrgdp lnclc

xtcd test on variables lnagrcv lndv lncrr lnroa lnirs lnbb lnlqr lninf lnrgdp lnclc
Panelvar: cid
Timevar: year
```

Variable	CD-test	p-value	average joint T	mean ρ	mean abs(ρ)
lnagrcv	10.705	0.000	12.00	0.38	0.55
lndv	19.388	0.000	12.00	0.69	0.69
lncrr	9.31	0.000	12.00	0.33	0.46
lnroa	2.009	0.045	12.00	0.07	0.25
lnirs	3.631	0.000	12.00	0.13	0.43
lnbb	26.516	0.000	12.00	0.94	0.94
lnlqr	21.773	0.000	12.00	0.77	0.78
lninf	28.142	0.000	12.00	1.00	1.00
lnrgdp	28.142	0.000	12.00	1.00	1.00
lnclc	28.142	0.000	12.00	1.00	1.00

```
Notes: Under the null hypothesis of cross-section independence, CD ~ N(0,1)
       P-values close to zero indicate data are correlated across panel groups.
```

Appendix V: Panel Co-integration Result

Westerlund test for cointegration

Ho: No cointegration — Number of panels = 11
Ha: Some panels are cointegrated — Avg. number of periods = 4.8182

Cointegrating vector: Panel specific
Panel means: Included
Time trend: Not included
AR parameter: Panel specific

	Statistic	p-value
Variance ratio	5.3781	0.0000

Westerlund test for cointegration

Ho: No cointegration — Number of panels = 11
Ha: Some panels are cointegrated — Avg. number of periods = 4.8182

Cointegrating vector: Panel specific
Panel means: Included
Time trend: Not included
AR parameter: Panel specific

	Statistic	p-value
Variance ratio	6.6203	0.0000

Westerlund test for cointegration

Ho: No cointegration — Number of panels = 12
Ha: Some panels are cointegrated — Number of periods = 12

Cointegrating vector: Panel specific
Panel means: Included
Time trend: Not included
AR parameter: Panel specific

	Statistic	p-value
Variance ratio	3.1602	0.0008

Appendix VI: PCSE Regression Result

```
Linear regression, correlated panels corrected standard errors (PCSEs)

Group variable:   cid                          Number of obs     =          50
Time variable:    year                         Number of groups  =          11
Panels:           correlated (unbalanced)      Obs per group:
Autocorrelation:  no autocorrelation                           min =           3
Sigma computed by casewise selection                           avg =   4.5454545
                                                               max =           5
Estimated covariances      =         66        R-squared         =      0.6691
Estimated autocorrelations =          0        Wald chi2(6)      =      537.32
Estimated coefficients     =          9        Prob > chi2       =      0.0000
```

lnpovhc	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnagric	-.0428566	.0232172	-1.85	0.065	-.0883614	.0026483
lnpop	.1434668	.0243837	5.88	0.000	.0956756	.1912579
lninf	-.0592007	.0364985	-1.62	0.105	-.1307365	.0123351
lnlr	-.0183763	.041665	-0.44	0.659	-.1000382	.0632856
lngdppc	-.1983597	.0681524	-2.91	0.004	-.3319359	-.0647835
lnto	-.2094955	.0848451	-2.47	0.014	-.3757889	-.043202
lnune	.4788348	.1089413	4.40	0.000	.2653138	.6923558
iq	-2.582459	.6525102	-3.96	0.000	-3.861356	-1.303562
_cons	4.628556	.3895807	11.88	0.000	3.864992	5.39212

```
Linear regression, correlated panels corrected standard errors (PCSEs)

Group variable:   cid                          Number of obs     =          50
Time variable:    year                         Number of groups  =          11
Panels:           correlated (unbalanced)      Obs per group:
Autocorrelation:  no autocorrelation                           min =           3
Sigma computed by pairwise selection                           avg =   4.5454545
                                                               max =           5
Estimated covariances      =         66        R-squared         =      0.3105
Estimated autocorrelations =          0        Wald chi2(5)      =     1519.46
Estimated coefficients     =          8        Prob > chi2       =      0.0000
```

lngini	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnagric	-.0131191	.0046989	-2.79	0.005	-.0223289	-.0039094
lninf	-.0129122	.0489257	-0.26	0.792	-.1088047	.0829803
lnpovhc	-.0795879	.059169	-1.35	0.179	-.1955571	.0363812
lngdppc	-.073244	.0416141	-1.76	0.078	-.1548061	.008318
lnune	.2264065	.0946488	2.39	0.017	.0408983	.4119148
lnto	-.1107675	.057853	-1.91	0.056	-.2241572	.0026223
iq	-.9388634	.4785698	-1.96	0.050	-1.876843	-.0008838
_cons	4.784606	.3204928	14.93	0.000	4.156451	5.41276

Appendix VII: Diagnostic Test Result for Time Series Analysis

```
. estat bgodfrey, lags(1)

Number of gaps in sample:  2

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	0.400	1	0.5269

H0: no serial correlation

```
.
. estat imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(21)     =     22.00
         Prob > chi2  =    0.3995

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

Source	chi2	df	p
Heteroskedasticity	22.00	21	0.3995
Skewness	5.99	11	0.8737
Kurtosis	0.31	1	0.5791
Total	28.30	33	0.7002

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of lnune

         chi2(1)      =     2.23
         Prob > chi2  =   0.1356
```

```
. estat sbcusum, ols

Cumulative sum test for parameter stability

Sample: 2 - 32                                      Number of obs =         31
Ho: No structural break
```

Statistic	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
ols	0.3778	1.6276	1.3581	1.224

```
. estat bgodfrey, lags(1)

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	0.625	1	0.4291

H0: no serial correlation

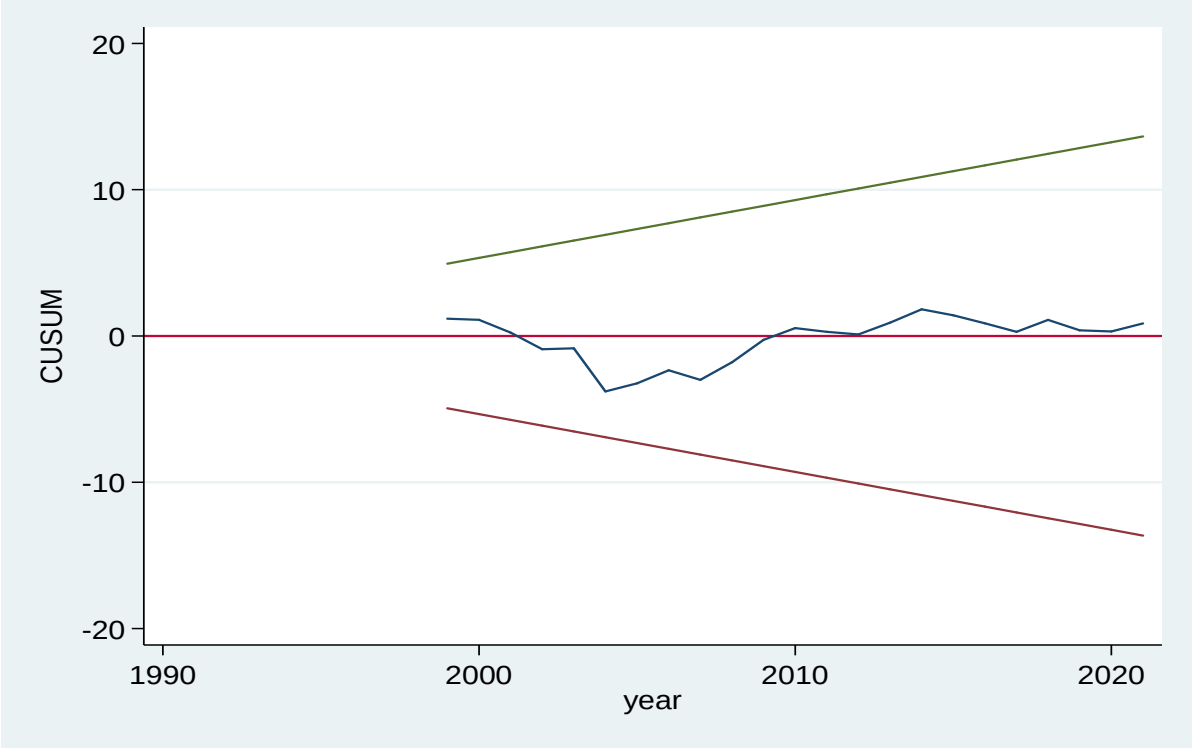
```
. estat imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(30)     =     31.00
         Prob > chi2  =    0.4154

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

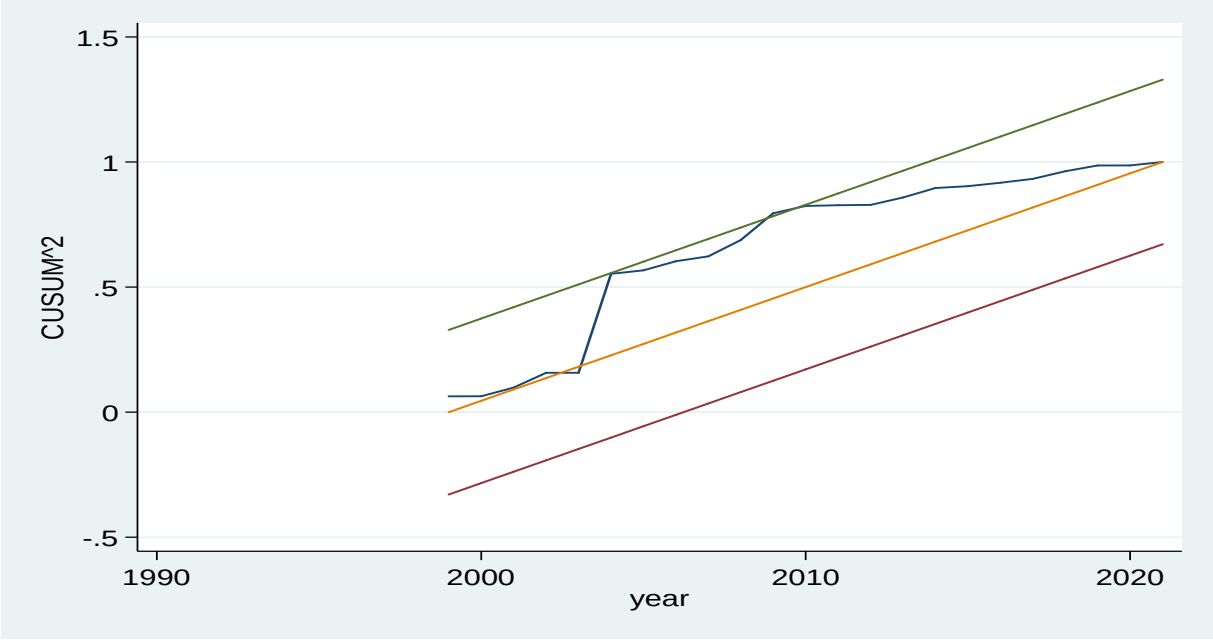
Source	chi2	df	p
Heteroskedasticity	31.00	30	0.4154
Skewness	16.79	11	0.1143
Kurtosis	0.05	1	0.8169
Total	47.84	42	0.2476

```
.
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of lnrgdppc

         chi2(1)      =     1.03
         Prob > chi2  =   0.3106

.

. estat sbcusum, ols

Cumulative sum test for parameter stability

Sample: 2 - 32                                  Number of obs =         31
Ho: No structural break
```

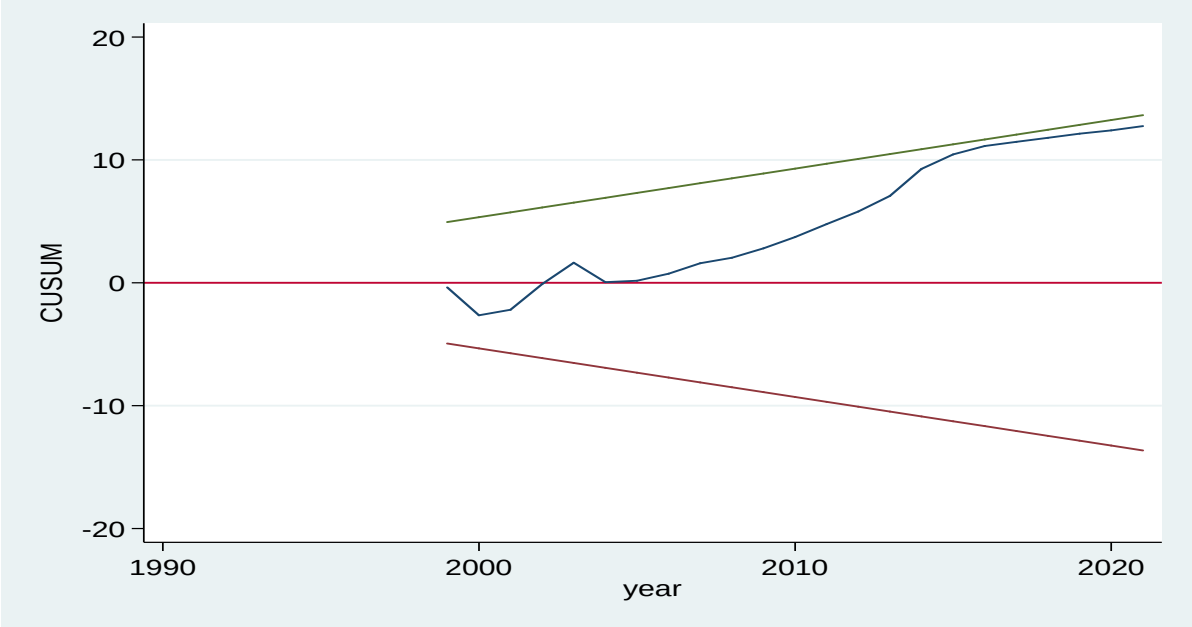
Statistic	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
ols	0.3799	1.6276	1.3581	1.224

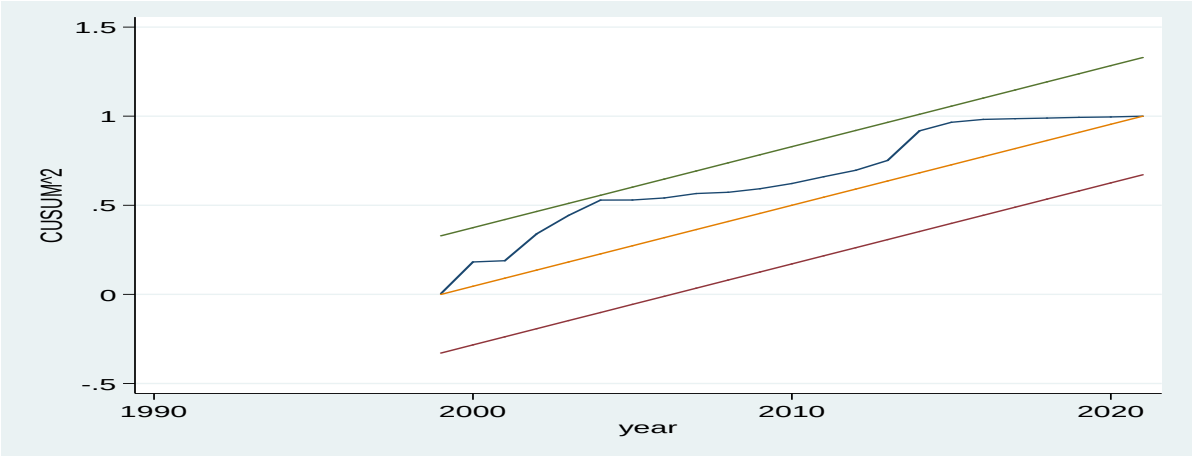
CUSUM and CUSUMQ Result for Equation 20





CUSUM and CUSUMQ Results for Equation 21





Appendix VIII: ARDL Regression Result

```
. ardl lnune lnagric lnrgdp lnfdi lnlr iq lninflation lnge, maxlags(1 1 1 0 0 1 0 0) ec btest

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

Sample:     1994 -     2021, but with gaps      Number of obs     =         22
                                                R-squared         =     0.9604
                                                Adj R-squared     =     0.9168
Log likelihood =     57.675                     Root MSE          =     0.0261
```

D.lnune	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
lnune						
L1.	-.9205632	.0921198	-9.99	0.000	-1.125819	-.7153074
LR						
lnagric	-.0819529	.0192591	-4.26	0.002	-.1248648	-.0390411
lnrgdp	-.1240236	.0397076	-3.12	0.011	-.2124978	-.0355495
lnfdi	-.0146805	.0052264	-2.81	0.019	-.0263255	-.0030354
lnlr	.0335525	.0403481	0.83	0.425	-.0563486	.1234537
iq	1.07666	.6711474	1.60	0.140	-.4187498	2.57207
lninflation	.035187	.0152516	2.31	0.044	.0012043	.0691697
lnge	-.0396866	.0097112	-4.09	0.002	-.0613246	-.0180486
SR						
lnagric						
D1.	-.0472936	.0276885	-1.71	0.118	-.1089874	.0144001
lnrgdp						
D1.	.0409997	.0261275	1.57	0.148	-.017216	.0992155
iq						
D1.	-.8064689	.4208662	-1.92	0.084	-1.744217	.1312795
_cons	2.650721	.3422444	7.75	0.000	1.888153	3.413289

```
note: estat btest has been superseded by estat ectest
      as the prime procedure to test for a levels relationship.
      (click to run)

Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship              F =  17.323
                                        t = -9.993

Critical Values (0.1-0.01), F-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_7	2.03	3.13	2.32	3.50	2.60	3.84	2.96	4.26

```
accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), t-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_7	-2.57	-4.23	-2.86	-4.57	-3.13	-4.85	-3.43	-5.19

```
accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)

.
```

```
. ardl lnrgdppc lnagric lnto lnge lnlr lngcf lnrem lnune, maxlags (1 0 1 0 1 1 0 0) ec btest

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

Sample:     1991 -     2021                     Number of obs      =         31
                                                R-squared          =     0.8963
                                                Adj R-squared      =     0.8363
Log likelihood =  79.509845                     Root MSE           =     0.0238
```

D.lnrgdppc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
lnrgdppc L1.	-.1994429	.0444822	-4.48	0.000	-.2925453	-.1063405
LR						
lnagric	.0886815	.0381825	2.32	0.031	.0087647	.1685983
lnto	.1271069	.0531889	2.39	0.027	.0157812	.2384326
lnge	.0750087	.0339043	2.21	0.039	.004046	.1459713
lnlr	-.0282146	.1568616	-0.18	0.859	-.3565298	.3001006
lngcf	-.0172998	.3404253	-0.05	0.960	-.7298182	.6952186
lnrem	.1011808	.032917	3.07	0.006	.0322847	.1700769
lnune	-.4696715	.237259	-1.98	0.062	-.9662603	.0269174
SR						
lnto D1.	-.0100153	.0060672	-1.65	0.115	-.0227141	.0026835
lnlr D1.	.170763	.0744018	2.30	0.033	.0150381	.3264878
lngcf D1.	.1784334	.0715449	2.49	0.022	.0286881	.3281787
_cons	.4082031	.1362861	3.00	0.007	.1229531	.6934531

```
note: estat btest has been superseded by estat ectest
      as the prime procedure to test for a levels relationship.
      (click to run)

Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship              F =  18.261
                                        t = -4.484

Critical Values (0.1-0.01), F-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_7	2.03	3.13	2.32	3.50	2.60	3.84	2.96	4.26

```
accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), t-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_7	-2.57	-4.23	-2.86	-4.57	-3.13	-4.85	-3.43	-5.19

```
accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)

.
```

Appendix IX: Augmented Mean Group Regression Results

Augmented Mean Group estimator (Bond & Eberhardt, 2009; Eberhardt & Teal, 2010)

Common dynamic process included as additional regressor
All coefficients present represent averages across groups (cid)
Coefficient averages computed as unweighted means

Mean Group type estimation		Number of obs	= 144
Group variable: cid		Number of groups	= 12
		Obs per group:	
		min	= 12
		avg	= 12.0
		max	= 12
		Wald chi2(9)	= 407.79
		Prob > chi2	= 0.0000

lnagrcv	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lndv	.4329316	.1627943	2.66	0.008	.1138606	.7520026
lncrr	-.0280527	.1624991	-0.17	0.863	-.3465451	.2904396
lnroa	.6599387	.3494347	1.89	0.059	-.0249407	1.344818
lnirs	-1.91672	1.076445	-1.78	0.075	-4.026514	.1930731
lnbb	.6014837	.3047083	1.97	0.048	.0042664	1.198701
lnlqr	.3156301	.2714071	1.16	0.245	-.216318	.8475782
lninf	-9.395281	2.849485	-3.30	0.001	-14.98017	-3.810394
lnrgdp	360.0243	108.8958	3.31	0.001	146.5924	573.4562
lnclc	-2.194203	.9024944	-2.43	0.015	-3.963059	-.4253462
__00000R_c	.6479398	.1963181	3.30	0.001	.2631634	1.032716
_cons	-876.0727	269.4154	-3.25	0.001	-1404.117	-348.0282

Root Mean Squared Error (sigma): 0.0982
Variable __00000R_c refers to the common dynamic process.

Appendix IX: Data

Objective One: Panel Data

Year	lnPOVHC	lnGINIC	lnLR	lnPOP	lnINF	lnGDPPC	lnTO	lnUNE	IQ	CODE	Regions
2000	4.11741	-1.30933	10.60155	15.12222		5.550681	3.456474	1.251333	0.262012	1	Tigray
2001			11.22128	15.14972		5.600092	3.636023	1.139754	0.272102	1	Tigray
2002			11.32041	15.17674		5.584686	3.675216	1.113501	0.286455	1	Tigray
2003			10.99407	15.2033	2.406945	5.532625	3.801799	1.111199	0.28793	1	Tigray
2004			11.13064	15.22966	1.504077	5.62995	3.9779	1.029262	0.299508	1	Tigray
2005	3.881564	-0.99425	11.20232	15.25606	2.186051	5.711999	4.007853	0.916291	0.277534	1	Tigray
2006			11.39711	15.28223	2.525729	5.785496	3.890081	0.837248	0.300988	1	Tigray
2007			11.58675	15.27748	2.272126	5.864655	3.881143	0.840273	0.308127	1	Tigray
2008			11.64244	15.30007	3.310543	5.938165	3.878952	0.83768	0.307941	1	Tigray
2009			11.73942	15.31981	3.706228	5.994133	3.649406	0.840705	0.300977	1	Tigray
2010	3.459466	-1.06711	11.81904	15.33939	0	6.084013	3.884382	0.826366	0.306044	1	Tigray
2011			11.86418	15.35902	2.272126	6.161543	4.00802	0.816249	0.306825	1	Tigray
2012			11.92576	15.37849	3.437208	6.216445	3.838726	0.808705	0.311223	1	Tigray
2013			12.0704	15.39778	2.85647	6.28985	3.755276	0.81093	0.312385	1	Tigray
2014			12.15298	15.41692	2.140066	6.360668	3.789087	0.853138	0.331255	1	Tigray
2015	3.295837	-0.98083	12.16635	15.43589	2.484907	6.432692	3.690127	0.879212	0.314381	1	Tigray
2016			12.26915	15.4547	2.509599	6.49576	3.551439	0.919884	0.306886	1	Tigray
2017			12.26583	15.47336	2.302585	6.559848	3.457356	0.957433	0.301632	1	Tigray
2018			12.31623	15.49167	1.871802	6.598819	3.487271	1.009781	0.332062	1	Tigray
2019			12.25203	15.50984	2.985682	6.652233	3.802627	1.047319	0.381724	1	Tigray
2020			12.28856	15.52787	3.190476	6.683956	3.612781	1.362514	0.328409	1	Tigray
2021	3.806663	-0.94161			3.100092	6.712112	3.757455	1.368639	0.303581	1	Tigray
2000	4.025352	-0.91629	7.868637	14.01108		5.550681	3.456474	1.251333	0.262012	2	Afar
2001			8.259717	14.03304		5.600092	3.636023	1.139754	0.272102	2	Afar
2002			8.234035	14.0561		5.584686	3.675216	1.113501	0.286455	2	Afar
2003			8.032685	14.07864	2.140066	5.532625	3.801799	1.111199	0.28793	2	Afar
2004			8.032685	14.10069	1.960095	5.62995	3.9779	1.029262	0.299508	2	Afar
2005	3.600048	-1.10866	8.049747	14.12226	1.064711	5.711999	4.007853	0.916291	0.277534	2	Afar
2006			8.401333	14.14409	2.04122	5.785496	3.890081	0.837248	0.300988	2	Afar
2007			8.609773	14.15987	2.667228	5.864655	3.881143	0.840273	0.308127	2	Afar
2008			8.685754	14.16546	3.058707	5.938165	3.878952	0.83768	0.307941	2	Afar
2009			8.779712	14.19532	3.310543	5.994133	3.649406	0.840705	0.300977	2	Afar
2010	3.586293	-1.18744	8.81626	14.22364	2.541602	6.084013	3.884382	0.826366	0.306044	2	Afar
2011			8.955061	14.25118	2.97553	6.161543	4.00802	0.816249	0.306825	2	Afar
2012			9.004422	14.27924	3.374169	6.216445	3.838726	0.808705	0.311223	2	Afar
2013			9.022081	14.30654	2.890372	6.28985	3.755276	0.81093	0.312385	2	Afar
2014			9.10019	14.33311	2.379546	6.360668	3.789087	0.853138	0.331255	2	Afar
2015	3.161247	-1.09961	10.01838	14.35958	0.993252	6.432692	3.690127	0.879212	0.314381	2	Afar
2016			9.489108	14.38536	2.923162	6.49576	3.551439	0.919884	0.306886	2	Afar
2017			9.816022	14.41049	2.054124	6.559848	3.457356	0.957433	0.301632	2	Afar
2018			9.694678	14.43447	2.433613	6.598819	3.487271	1.009781	0.332062	2	Afar
2019			9.658482	14.45842	2.24071	6.652233	3.802627	1.047319	0.381724	2	Afar
2020			9.914576	14.48129	3.00072	6.683956	3.612781	1.362514	0.328409	2	Afar
2021	3.401197	-0.79851	10.01673	14.50364	2.895912	6.712112	3.757455	1.368639	0.303581	2	Afar

2000	3.732896	-1.27297	11.61701	16.60637		5.550681	3.456474	1.251333	0.262012	3	Amhara
2001			11.79979	16.63379		5.600092	3.636023	1.139754	0.272102	3	Amhara
2002			11.78897	16.66071		5.584686	3.675216	1.113501	0.286455	3	Amhara
2003			11.62631	16.68732	2.76001	5.532625	3.801799	1.111199	0.28793	3	Amhara
2004			11.86602	16.71379	2.533697	5.62995	3.9779	1.029262	0.299508	3	Amhara
2005	3.691376	-1.30933	12.22483	16.74007	1.824549	5.711999	4.007853	0.916291	0.277534	3	Amhara
2006			12.55409	16.76624	2.587764	5.785496	3.890081	0.837248	0.300988	3	Amhara
2007			12.81048	16.66124	2.928524	5.864655	3.881143	0.840273	0.308127	3	Amhara
2008			12.86947	16.68483	3.238678	5.938165	3.878952	0.83768	0.307941	3	Amhara
2009			12.9208	16.70627	3.54674	5.994133	3.649406	0.840705	0.300977	3	Amhara
2010	3.417727	-1.2174	12.9452	16.72797	-0.35668	6.084013	3.884382	0.826366	0.306044	3	Amhara
2011			12.95943	16.74979	2.766319	6.161543	4.00802	0.816249	0.306825	3	Amhara
2012			12.95598	16.77151	3.520461	6.216445	3.838726	0.808705	0.311223	3	Amhara
2013			13.07636	16.79237	2.681021	6.28985	3.755276	0.81093	0.312385	3	Amhara
2014			13.12044	16.81224	2.04122	6.360668	3.789087	0.853138	0.331255	3	Amhara
2015	3.261935	-1.07003	13.12044	16.83105	1.648659	6.432692	3.690127	0.879212	0.314381	3	Amhara
2016			13.299	16.84907	2.332144	6.49576	3.551439	0.919884	0.306886	3	Amhara
2017			13.33529	16.86654	2.388763	6.559848	3.457356	0.957433	0.301632	3	Amhara
2018			13.41297	16.88319	2.721295	6.598819	3.487271	1.009781	0.332062	3	Amhara
2019			13.51946	16.89944	2.476538	6.652233	3.802627	1.047319	0.381724	3	Amhara
2020			13.70386	16.91524	2.727853	6.683956	3.612781	1.362514	0.328409	3	Amhara
2021	3.401197	-0.71335	13.79821	16.93067	2.99072	6.712112	3.757455	1.368639	0.303581	3	Amhara
2000	3.686376	-1.34707	12.06642	16.92252		5.550681	3.456474	1.251333	0.262012	4	Oromia
2001			12.28344	16.952		5.600092	3.636023	1.139754	0.272102	4	Oromia
2002			12.37928	16.98115		5.584686	3.675216	1.113501	0.286455	4	Oromia
2003			12.35093	17.00989	2.944439	5.532625	3.801799	1.111199	0.28793	4	Oromia
2004			12.55849	17.0383	2.116256	5.62995	3.9779	1.029262	0.299508	4	Oromia
2005	3.610918	-1.27297	12.77396	17.06654	1.916923	5.711999	4.007853	0.916291	0.277534	4	Oromia
2006			13.00987	17.09465	2.312536	5.785496	3.890081	0.837248	0.300988	4	Oromia
2007			13.11103	17.1172	2.95491	5.864655	3.881143	0.840273	0.308127	4	Oromia
2008			13.14833	17.14159	3.314186	5.938165	3.878952	0.83768	0.307941	4	Oromia
2009			13.2838	17.16955	3.666122	5.994133	3.649406	0.840705	0.300977	4	Oromia
2010	3.356897	-1.26231	13.33424	17.19742	0.09531	6.084013	3.884382	0.826366	0.306044	4	Oromia
2011			13.34138	17.22511	2.960105	6.161543	4.00802	0.816249	0.306825	4	Oromia
2012			13.32616	17.25253	3.594569	6.216445	3.838726	0.808705	0.311223	4	Oromia
2013			13.37278	17.27962	2.424803	6.28985	3.755276	0.81093	0.312385	4	Oromia
2014			13.3813	17.30643	2.066863	6.360668	3.789087	0.853138	0.331255	4	Oromia
2015	3.173878	-1.19073	13.42396	17.33277	2.484907	6.432692	3.690127	0.879212	0.314381	4	Oromia
2016			13.54585	17.35864	2.379546	6.49576	3.551439	0.919884	0.306886	4	Oromia
2017			13.60205	17.38411	1.193922	6.559848	3.457356	0.957433	0.301632	4	Oromia
2018			13.69153	17.40909	2.501436	6.598819	3.487271	1.009781	0.332062	4	Oromia
2019			13.83544	17.43362	2.525729	6.652233	3.802627	1.047319	0.381724	4	Oromia
2020			14.0694	17.45756	2.912351	6.683956	3.612781	1.362514	0.328409	4	Oromia
2021	3.218876	-0.8675	14.07077	17.48099	3.00072	6.712112	3.757455	1.368639	0.303581	4	Oromia

2000	3.634951	-1.17118	7.781973	15.1233		5.550681	3.456474	1.251333	0.262012	5	Somali
2001			7.830426	15.14972		5.600092	3.636023	1.139754	0.272102	5	Somali
2002			8.566555	15.17597		5.584686	3.675216	1.113501	0.286455	5	Somali
2003			8.815073	15.2023	2.208274	5.532625	3.801799	1.111199	0.28793	5	Somali
2004			8.815073	15.22869	0	5.62995	3.9779	1.029262	0.299508	5	Somali
2005	3.735286	-1.17118	9.01627	15.25487	2.302585	5.711999	4.007853	0.916291	0.277534	5	Somali
2006			9.3299	15.28085	2.747271	5.785496	3.890081	0.837248	0.300988	5	Somali
2007			9.588229	15.30597	2.054124	5.864655	3.881143	0.840273	0.308127	5	Somali
2008			9.588229	15.32292	2.862201	5.938165	3.878952	0.83768	0.307941	5	Somali
2009			9.681593	15.34915	3.78646	5.994133	3.649406	0.840705	0.300977	5	Somali
2010	3.490428	-1.25176	10.16789	15.37597	2.116256	6.084013	3.884382	0.826366	0.306044	5	Somali
2011			10.26416	15.40311	3.039749	6.161543	4.00802	0.816249	0.306825	5	Somali
2012			10.4761	15.43033	3.374169	6.216445	3.838726	0.808705	0.311223	5	Somali
2013			10.67904	15.45742	2.766319	6.28985	3.755276	0.81093	0.312385	5	Somali
2014			10.79179	15.48454	2.406945	6.360668	3.789087	0.853138	0.331255	5	Somali
2015	3.109061	-1.32803	10.93596	15.51149	2.292535	6.432692	3.690127	0.879212	0.314381	5	Somali
2016			10.84482	15.5381	2.00148	6.49576	3.551439	0.919884	0.306886	5	Somali
2017			10.86496	15.56436	2.351375	6.559848	3.457356	0.957433	0.301632	5	Somali
2018			11.09064	15.59029	2.639057	6.598819	3.487271	1.009781	0.332062	5	Somali
2019			11.16836	15.61573	2.525729	6.652233	3.802627	1.047319	0.381724	5	Somali
2020			11.3921	15.64054	3.010621	6.683956	3.612781	1.362514	0.328409	5	Somali
2021	3.433987	-0.96758	11.53607	15.66475	2.646175	6.712112	3.757455	1.368639	0.303581	5	Somali
2000	3.988984	-1.20397	8.297045	13.19375		5.550681	3.456474	1.251333	0.262012	6	Benishangul
2001			8.474703	13.21949		5.600092	3.636023	1.139754	0.272102	6	Benishangul
2002			8.695674	13.24458	0.641854	5.584686	3.675216	1.113501	0.286455	6	Benishangul
2003			8.652773	13.27078	2.734367	5.532625	3.801799	1.111199	0.28793	6	Benishangul
2004			9.053921	13.29463	2.747271	5.62995	3.9779	1.029262	0.299508	6	Benishangul
2005	3.795489	-1.13943	9.30783	13.32121	1.526056	5.711999	4.007853	0.916291	0.277534	6	Benishangul
2006			9.491828	13.34551	2.079442	5.785496	3.890081	0.837248	0.300988	6	Benishangul
2007			9.611463	13.4163	2.595255	5.864655	3.881143	0.840273	0.308127	6	Benishangul
2008			9.664786	13.60726	3.558201	5.938165	3.878952	0.83768	0.307941	6	Benishangul
2009			9.75956	13.63877	3.71113	5.994133	3.649406	0.840705	0.300977	6	Benishangul
2010	3.363842	-1.14256	9.876733	13.66933		6.084013	3.884382	0.826366	0.306044	6	Benishangul
2011			10.01279	13.69898	2.251292	6.161543	4.00802	0.816249	0.306825	6	Benishangul
2012			10.06607	13.72995	3.877432	6.216445	3.838726	0.808705	0.311223	6	Benishangul
2013			10.06173	13.76105	2.476538	6.28985	3.755276	0.81093	0.312385	6	Benishangul
2014			10.0613	13.79122	2.208274	6.360668	3.789087	0.853138	0.331255	6	Benishangul
2015	3.277145	-1.07587	10.15856	13.8205		6.432692	3.690127	0.879212	0.314381	6	Benishangul
2016			10.29739	13.84991	2.251292	6.49576	3.551439	0.919884	0.306886	6	Benishangul
2017			10.38764	13.87849	1.686399	6.559848	3.457356	0.957433	0.301632	6	Benishangul
2018			10.49222	13.90718	2.833213	6.598819	3.487271	1.009781	0.332062	6	Benishangul
2019			10.5325	13.93418	2.70805	6.652233	3.802627	1.047319	0.381724	6	Benishangul
2020			10.63823	13.96134	3.182212	6.683956	3.612781	1.362514	0.328409	6	Benishangul
2021	3.367296	-0.99425	10.66798	13.98778		6.712112	3.757455	1.368639	0.303581	6	Benishangul

2000	3.929863	-1.30933	11.45496	16.34244		5.550681	3.456474	1.251333	0.262012	7	SNNP
2001			11.57917	16.37297		5.600092	3.636023	1.139754	0.272102	7	SNNP
2002			11.69988	16.40275		5.584686	3.675216	1.113501	0.286455	7	SNNP
2003			11.68645	16.43188	1.774952	5.532625	3.801799	1.111199	0.28793	7	SNNP
2004			11.78081	16.46062	1.871802	5.62995	3.9779	1.029262	0.299508	7	SNNP
2005	3.642836	-1.23787	11.98554	16.48897	2.163323	5.711999	4.007853	0.916291	0.277534	7	SNNP
2006			12.20701	16.51701	2.727853	5.785496	3.890081	0.837248	0.300988	7	SNNP
2007			12.3607	16.52639	2.797281	5.864655	3.881143	0.840273	0.308127	7	SNNP
2008			12.4465	16.54656	3.234749	5.938165	3.878952	0.83768	0.307941	7	SNNP
2009			12.48244	16.57184	3.650658	5.994133	3.649406	0.840705	0.300977	7	SNNP
2010	3.387774	-1.19402	12.59848	16.59712	1.386294	6.084013	3.884382	0.826366	0.306044	7	SNNP
2011			12.67195	16.62238	2.980619	6.161543	4.00802	0.816249	0.306825	7	SNNP
2012			12.68719	16.64737	3.616309	6.216445	3.838726	0.808705	0.311223	7	SNNP
2013			12.79207	16.67215	2.766319	6.28985	3.755276	0.81093	0.312385	7	SNNP
2014			12.88463	16.69673	2.174752	6.360668	3.789087	0.853138	0.331255	7	SNNP
2015	3.030134	-1.1332	13.01407	16.7211	1.481605	6.432692	3.690127	0.879212	0.314381	7	SNNP
2016			13.21817	16.7451	1.856298	6.49576	3.551439	0.919884	0.306886	7	SNNP
2017			13.34079	16.76891	2.151762	6.559848	3.457356	0.957433	0.301632	7	SNNP
2018			13.26157	16.79237	2.660259	6.598819	3.487271	1.009781	0.332062	7	SNNP
2019			13.15685	16.81558	2.302585	6.652233	3.802627	1.047319	0.381724	7	SNNP
2020			13.42828	16.83847	3.169686	6.683956	3.612781	1.362514	0.328409	7	SNNP
2021	3.091043	-1.10866	13.36502	16.86103	3.342862	6.712112	3.757455	1.368639	0.303581	7	SNNP
2000	3.921973	-1.34707	8.010028	12.25961		5.550681	3.456474	1.251333	0.262012	8	Gambella
2001			8.161375	12.28303		5.600092	3.636023	1.139754	0.272102	8	Gambella
2002			7.802209	12.31043		5.584686	3.675216	1.113501	0.286455	8	Gambella
2003			8.197538	12.3371	2.541602	5.532625	3.801799	1.111199	0.28793	8	Gambella
2004			8.048469	12.36308	1.568616	5.62995	3.9779	1.029262	0.299508	8	Gambella
2005			8.262817	12.38839	2.066863	5.711999	4.007853	0.916291	0.277534	8	Gambella
2006			8.839711	12.41714	2.867899	5.785496	3.890081	0.837248	0.300988	8	Gambella
2007			8.656085	12.63433	2.694627	5.864655	3.881143	0.840273	0.308127	8	Gambella
2008			8.795885	12.67608	3.068053	5.938165	3.878952	0.83768	0.307941	8	Gambella
2009			8.894258	12.7159	4.028917	5.994133	3.649406	0.840705	0.300977	8	Gambella
2010	3.465736	-1.24133	9.218804	12.7513		6.084013	3.884382	0.826366	0.306044	8	Gambella
2011			9.420439	12.78549	2.424803	6.161543	4.00802	0.816249	0.306825	8	Gambella
2012			9.653037	12.82126	3.71113	6.216445	3.838726	0.808705	0.311223	8	Gambella
2013			9.697201	12.85579	2.459589	6.28985	3.755276	0.81093	0.312385	8	Gambella
2014			9.843472	12.88917	2.219203	6.360668	3.789087	0.853138	0.331255	8	Gambella
2015	3.135494	-1.06421	9.967916	12.92147	1.335001	6.432692	3.690127	0.879212	0.314381	8	Gambella
2016			10.19526	12.95276	2.163323	6.49576	3.551439	0.919884	0.306886	8	Gambella
2017			10.11666	12.9831	1.609438	6.559848	3.457356	0.957433	0.301632	8	Gambella
2018			10.0214	13.01478	2.433613	6.598819	3.487271	1.009781	0.332062	8	Gambella
2019			10.15401	13.04548	2.4681	6.652233	3.802627	1.047319	0.381724	8	Gambella
2020			10.34297	13.07737	3.015535	6.683956	3.612781	1.362514	0.328409	8	Gambella
2021	3.332205	-1.13943	10.51721	13.10826	3.100092	6.712112	3.757455	1.368639	0.303581	8	Gambella

2000	3.250375	-1.30933	8.673342	11.98293		5.550681	3.456474	1.251333	0.262012	9	Harari
2001			8.931949	12.01974		5.600092	3.636023	1.139754	0.272102	9	Harari
2002			8.930362	12.05525		5.584686	3.675216	1.113501	0.286455	9	Harari
2003			8.443332	12.08954	2.208274	5.532625	3.801799	1.111199	0.28793	9	Harari
2004			8.71062	12.12811	1.704748	5.62995	3.9779	1.029262	0.299508	9	Harari
2005	3.295837	-1.02165	8.71062	12.15478	1.774952	5.711999	4.007853	0.916291	0.277534	9	Harari
2006			7.36518	12.18587	2.525729	5.785496	3.890081	0.837248	0.300988	9	Harari
2007			8.919052	12.11912	2.681021	5.864655	3.881143	0.840273	0.308127	9	Harari
2008			8.826147	12.15478	2.970414	5.938165	3.878952	0.83768	0.307941	9	Harari
2009			8.469892	12.18587	3.747149	5.994133	3.649406	0.840705	0.300977	9	Harari
2010			8.860215	12.21602	1.916923	6.084013	3.884382	0.826366	0.306044	9	Harari
2011	2.406945	-1.32426	8.769197	12.24529	2.960105	6.161543	4.00802	0.816249	0.306825	9	Harari
2012			8.748305	12.27373	3.332205	6.216445	3.838726	0.808705	0.311223	9	Harari
2013			8.747988	12.30138	2.484907	6.28985	3.755276	0.81093	0.312385	9	Harari
2014			8.730368	12.32829	2.360854	6.360668	3.789087	0.853138	0.331255	9	Harari
2015	1.960095	-1.04129	8.845057	12.35449	2.079442	6.432692	3.690127	0.879212	0.314381	9	Harari
2016			8.886271	12.38003	2.397895	6.49576	3.551439	0.919884	0.306886	9	Harari
2017			8.878358	12.40901	1.88707	6.559848	3.457356	0.957433	0.301632	9	Harari
2018			8.917713	12.43321	2.292535	6.598819	3.487271	1.009781	0.332062	9	Harari
2019			9.006264	12.45683	2.433613	6.652233	3.802627	1.047319	0.381724	9	Harari
2020			9.101529	12.4837	3.178054	6.683956	3.612781	1.362514	0.328409	9	Harari
2021	2.197225	-1.23787	9.323758	12.50618	3.091043	6.712112	3.757455	1.368639	0.303581	9	Harari
2000	3.586293	-0.8675	11.7529	14.7298	1.308333	5.550681	3.456474	1.251333	0.262012	10	Addis Ababa
2001			12.06412	14.75942		5.600092	3.636023	1.139754	0.272102	10	Addis Ababa
2002			11.97099	14.78856		5.584686	3.675216	1.113501	0.286455	10	Addis Ababa
2003			11.61957	14.81798	1.458615	5.532625	3.801799	1.111199	0.28793	10	Addis Ababa
2004			11.68964	14.84691	1.757858	5.62995	3.9779	1.029262	0.299508	10	Addis Ababa
2005	3.48124	-0.77653	11.70244	14.87573	1.974081	5.711999	4.007853	0.916291	0.277534	10	Addis Ababa
2006			11.74637	14.90508	2.128232	5.785496	3.890081	0.837248	0.300988	10	Addis Ababa
2007			11.82893	14.82283	2.95491	5.864655	3.881143	0.840273	0.308127	10	Addis Ababa
2008			11.68802	14.84227	3.034953	5.938165	3.878952	0.83768	0.307941	10	Addis Ababa
2009			11.83444	14.86318	3.380995	5.994133	3.649406	0.840705	0.300977	10	Addis Ababa
2010	3.33577	-1.09064	11.88814	14.88435	2.312536	6.084013	3.884382	0.826366	0.306044	10	Addis Ababa
2011			11.93539	14.90643	2.965273	6.161543	4.00802	0.816249	0.306825	10	Addis Ababa
2012			11.94608	14.92934	3.210844	6.216445	3.838726	0.808705	0.311223	10	Addis Ababa
2013			11.82508	14.95302	2.533697	6.28985	3.755276	0.81093	0.312385	10	Addis Ababa
2014			11.92528	14.97678	2.140066	6.360668	3.789087	0.853138	0.331255	10	Addis Ababa
2015	2.821379	-1.03002	11.90303	15.00091	2.028148	6.432692	3.690127	0.879212	0.314381	10	Addis Ababa
2016			11.95414	15.02537	2.332144	6.49576	3.551439	0.919884	0.306886	10	Addis Ababa
2017			11.92087	15.04953	1.098612	6.559848	3.457356	0.957433	0.301632	10	Addis Ababa
2018			11.95924	15.07369	2.116256	6.598819	3.487271	1.009781	0.332062	10	Addis Ababa
2019			11.97319	15.09756	2.681021	6.652233	3.802627	1.047319	0.381724	10	Addis Ababa
2020			12.10663	15.12087	2.933857	6.683956	3.612781	1.362514	0.328409	10	Addis Ababa
2021	3.178054	-0.8916	12.17216	15.14365	2.970414	6.712112	3.757455	1.368639	0.303581	10	Addis Ababa

2000	3.499533	-1.20397	8.888895	12.66981		5.550681	3.456474	1.251333	0.262012	11	Dire Dawa
2001			9.16241	12.70685		5.600092	3.636023	1.139754	0.272102	11	Dire Dawa
2002			9.048292	12.74257		5.584686	3.675216	1.113501	0.286455	11	Dire Dawa
2003			9.076009	12.78549	1.757858	5.532625	3.801799	1.111199	0.28793	11	Dire Dawa
2004			8.980424	12.82126	1.280934	5.62995	3.9779	1.029262	0.299508	11	Dire Dawa
2005	3.561046	-0.94161	9.169726	12.8584	1.824549	5.711999	4.007853	0.916291	0.277534	11	Dire Dawa
2006			8.860925	12.89421	2.397895	5.785496	3.890081	0.837248	0.300988	11	Dire Dawa
2007			9.391244	12.74498	2.734367	5.864655	3.881143	0.840273	0.308127	11	Dire Dawa
2008			9.337766	12.77987	3.12676	5.938165	3.878952	0.83768	0.307941	11	Dire Dawa
2009			9.425451	12.81039	3.508556	5.994133	3.649406	0.840705	0.300977	11	Dire Dawa
2010	3.342862	-1.231	9.309552	12.84265	1.704748	6.084013	3.884382	0.826366	0.306044	11	Dire Dawa
2011			9.395409	12.8739	2.687847	6.161543	4.00802	0.816249	0.306825	11	Dire Dawa
2012			9.36999	12.90421	3.198673	6.216445	3.838726	0.808705	0.311223	11	Dire Dawa
2013			9.342772	12.93362	2.424803	6.28985	3.755276	0.81093	0.312385	11	Dire Dawa
2014			9.270306	12.96454	2.827314	6.360668	3.789087	0.853138	0.331255	11	Dire Dawa
2015	2.734367	-0.98618	9.374329	12.99453	2.397895	6.432692	3.690127	0.879212	0.314381	11	Dire Dawa
2016			9.548454	13.02365	2.028148	6.49576	3.551439	0.919884	0.306886	11	Dire Dawa
2017			9.471319	13.05194	2.014903	6.559848	3.457356	0.957433	0.301632	11	Dire Dawa
2018			9.450459	13.07946	2.186051	6.598819	3.487271	1.009781	0.332062	11	Dire Dawa
2019			9.471704	13.10826	2.549445	6.652233	3.802627	1.047319	0.381724	11	Dire Dawa
2020			9.670231	13.13627	3.025291	6.683956	3.612781	1.362514	0.328409	11	Dire Dawa
2021	3.135494	-1.23787	9.843419	13.16351	2.980619	6.712112	3.757455	1.368639	0.303581	11	Dire Dawa

Objective Two: Time series Data

Year	lnTO	lnREM	IQ	lnAGRIC	lnLR	lnINF	lnGDPPC	lnRGDP	lnGE	lnUNE	lnFDI	lnGCF
1990	2.705748	15.46751		4.420045	2.206598	1.639478	5.62679	0.955511	3.037772	1.134301		
1991	2.155362	16.09365		4.782479	2.634041	3.575783	5.509426		2.851922	1.20177		
1992	2.816767	16.52484		4.829113	2.499395	2.353986	5.376632		2.655728	1.251333	-1.77196	
1993	2.795062	16.72677		4.559126	2.382604	1.264992	5.464961	2.595255	2.622746	1.190584	1.252763	
1994	3.288201	17.0193		6.134048	2.347538	2.027342	5.461551	1.252763	2.869328	1.131402	2.84549	2.766319
1995	3.338426	17.12458		6.450628	2.350736	2.3048	5.486979	1.808289	2.855866	1.082822	2.649008	2.797281
1996	3.199005	16.58886	0.282033	6.396596	2.385123		5.571107	2.60269	2.93329	1.120048	3.087856	2.827314
1997	3.294955	16.03824	0.30365	6.642356	2.431736	0.873471	5.569913	1.029619	2.88705	1.1531	5.66466	2.833213
1998	3.541921	17.12288	0.286967	6.841188	2.476273	-0.11115	5.503315		3.050676	1.238664	5.563255	2.844909
1999	3.566833	17.33389	0.251021	6.47628	2.51891	2.072096	5.522404	1.84055	3.288732	1.311032	4.248209	2.827314
2000	3.456474	17.7888	0.262012	6.477803	2.605565	-0.4118	5.550681	2.282382	3.242526	1.251333	4.902605	2.766319
2001	3.636023	16.72316	0.272102	6.378273	2.799916		5.600092	2.00148	3.110759	1.139754	5.856217	2.879198
2002	3.675216	17.31162	0.286455	6.098501	2.930811	-0.39291	5.584686	0.470004	3.213644	1.113501	5.541264	3.161247
2003	3.801799	17.65432	0.28793	6.40044	2.981017	2.615499	5.532625		3.297372	1.111199	6.142037	3.12676
2004	3.9779	18.71143	0.299508	7.352569	3.100076	1.202182	5.62995	2.459589	3.141955	1.029262	6.300969	3.058707
2005	4.007853	18.9718	0.277534	7.691132	3.222995	2.299578	5.711999	2.533697	3.130702	0.916291	5.580151	3.044523
2006	3.890081	18.9639	0.300988	7.871296	3.375156	2.509557	5.785496	2.442347	3.094084	0.837248	6.301258	3.317816
2007	3.881143	19.69559	0.308127	8.58888	3.47504	2.847255	5.864655	2.4681	3.021469	0.840273	5.40268	3.186353
2008	3.878952	19.77315	0.307941	8.018774	3.508777	3.792264	5.938165	2.415914	2.931515	0.83768	4.687096	3.198673
2009	3.649406	19.38233	0.300977	8.397745	3.514405	2.13814	5.994133	2.302585	2.839825	0.840705	5.40024	3.214868
2010	3.884382	19.89348	0.306044	9.017724	3.550637	2.097928	6.084013	2.360854	2.916864	0.826366	5.663903	3.295837
2011	4.00802	20.104	0.306825	9.559266	3.583634	3.504054	6.161543	2.433613	2.902966	0.816249	6.443534	3.468856
2012	3.838726	20.25224	0.311223	9.180832	3.626396	3.161264	6.216445	2.163323	2.812304	0.808705	5.629643	3.613617
2013	3.755276	20.54058	0.312385	9.293536	3.51512	2.010094	6.28985	2.292535	2.876712	0.81093	7.203313	3.529297
2014	3.789087	21.30904	0.331255	9.47862	3.530731	1.930074	6.360668	2.332144	2.861269	0.853138	7.525668	3.637586
2015	3.690127	20.80667	0.314381	9.501197	3.553617	2.258518	6.432692	2.341806	2.852193	0.879212	7.873414	3.673766
2016	3.551439	20.4648	0.306886	9.482938	3.575991	1.891323	6.49576	2.079442	2.885525	0.919884	8.329161	3.650658
2017	3.457356	19.79029	0.301632	9.341532	3.597875	2.369039	6.559848	2.322388	2.889634	0.957433	8.29833	3.648057
2018	3.487271	19.8939	0.332062	9.795608	3.61929	2.62706	6.598819	2.04122	2.77878	1.009781	8.119822	3.529297
2019	3.802627	19.98851	0.381724	10.12272	3.640256	2.760619	6.652233	2.197225	2.731296	1.047319	7.843356	3.561046
2020	3.612781	19.81714	0.328409	10.33462	3.660792	3.013393	6.683956	1.808289	2.672026	1.362514	7.781472	3.421
2021	3.757455	19.91952	0.303581	9.969958	3.680914	3.289876	6.712112	1.84055	2.624494	1.368639	8.356894	3.332205

Objective Three: Panel Data

year	lnDV	lnCRR	lnROA	lnIRS	lnLQR	lnBB	lnINF	lnRGDP	lnCLC	CODE	Banks
2010	22.53253	21.23062	1.237254	0.978762	-0.41239	4.127134	2.097928	2.360854	3.15955	1	Awash
2011	22.77015	21.54365	1.384687	0.775559	-0.64864	4.127134	3.504054	2.433613	3.151025	1	Awash
2012	22.94294	20.85172	1.274559	1.08055	-1.06898	4.454347	3.161264	2.163323	3.159975	1	Awash
2013	23.25261	20.82112	1.331943	1.021119	-1.25632	4.718499	2.010094	2.292535	3.150597	1	Awash
2014	23.43396	21.60996	1.264925	1.089307	-1.08926	5.010635	1.930074	2.332144	3.15955	1	Awash
2015	23.64214	21.28761	1.07846	1.162193	-1.56253	5.308268	2.258518	2.341806	3.17722	1	Awash
2016	23.85143	21.89399	1.022994	1.369124	-1.37163	5.620401	1.891323	2.079442	3.182627	1	Awash
2017	24.14397	21.12873	1.030808	1.383667	-1.47472	5.627621	2.369039	2.322388	3.174297	1	Awash
2018	24.49491	21.51172	1.121508	1.600956	-1.31786	5.762052	2.62706	2.04122	3.154444	1	Awash
2019	24.81119	21.78798	1.323409	1.484561	-1.65689	5.783825	2.760619	2.197225	3.172204	1	Awash
2020	24.97998	21.97603	1.153657	1.684737	-1.58692	6.144186	3.013393	1.808289	3.169265	1	Awash
2021	25.40608	22.37193	0.949078	1.851449	-1.52153	6.163315	3.289876	1.84055	3.168424	1	Awash
2010	23.0402	21.52359	1.076487	0.774727	-0.65769	4.077538	2.097928	2.360854	3.15955	2	Dashen
2011	23.19485	21.80632	1.20494	0.746688	-0.6429	4.276666	3.504054	2.433613	3.151025	2	Dashen
2012	23.367	21.53268	1.39929	0.936093	-0.89026	4.718499	3.161264	2.163323	3.159975	2	Dashen
2013	23.48652	21.52795	1.180628	0.924259	-0.96139	4.890349	2.010094	2.292535	3.150597	2	Dashen
2014	23.59578	21.63234	1.228594	1.004302	-0.99414	5.049856	1.930074	2.332144	3.15955	2	Dashen
2015	23.70966	21.52432	1.138117	1.115142	-1.27622	5.393628	2.258518	2.341806	3.17722	2	Dashen
2016	23.8482	21.80828	1.002868	1.043804	-1.19768	5.393628	1.891323	2.079442	3.182627	2	Dashen
2017	24.04767	21.04172	0.872424	1.054312	-1.66528	5.940171	2.369039	2.322388	3.174297	2	Dashen
2018	24.30642	21.9595	0.84197	1.366092	-1.63139	5.921578	2.62706	2.04122	3.154444	2	Dashen
2019	24.52372	21.52122	0.693489	1.223776	-1.99382	6.023448	2.760619	2.197225	3.172204	2	Dashen
2020	24.70283	21.70908	0.904077	1.408545	-1.81152	6.047372	3.013393	1.808289	3.169265	2	Dashen
2021	25.03478	22.03967	1.07794	1.564441	-1.65739	6.514713	3.289876	1.84055	3.168424	2	Dashen
2010	24.72415	22.9506	1.080662	0	-1.2534	5.342334	2.097928	2.360854	3.15955	3	CBE
2011	25.16354	23.35931	1.111339	0	-1.03041	5.940171	3.504054	2.433613	3.151025	3	CBE
2012	25.48188	23.29497	1.381294	0.41871	-1.53573	6.543912	3.161264	2.163323	3.159975	3	CBE
2013	25.76306	23.38042	1.197509	0.542324	-1.4672	6.543912	2.010094	2.292535	3.150597	3	CBE
2014	25.99139	23.12212	1.142528	0.524729	-1.78637	6.663133	1.930074	2.332144	3.15955	3	CBE
2015	26.21425	23.43278	1.161198	0.815365	-2.26763	6.687109	2.258518	2.341806	3.17722	3	CBE
2016	26.38984	23.41301	0.883257	0.81978	-2.19965	7.048387	1.891323	2.079442	3.182627	3	CBE
2017	26.62344	23.64482	0.78464	0.536493	-1.91893	7.126087	2.369039	2.322388	3.174297	3	CBE
2018	26.83663	23.85964	0.00871	0.476234	-2.16205	7.126087	2.62706	2.04122	3.154444	3	CBE
2019	27.01658	23.9955	0.579641	0.165514	-1.8451	7.275172	2.760619	2.197225	3.172204	3	CBE
2020	27.10853	24.13893	0.218713	-0.4943	-1.80517	7.283448	3.013393	1.808289	3.169265	3	CBE
2021	27.32409	24.35391	-0.35162	-3.21886	-1.76676	7.534763	3.289876	1.84055	3.168424	3	CBE
2010	22.36009	21.19703	0.871976	1.297463	-0.55096	3.850147	2.097928	2.360854	3.15955	4	BOA
2011	22.52749	21.00287	0.981722	1.442202	-0.74093	3.871201	3.504054	2.433613	3.151025	4	BOA
2012	22.63598	20.60232	1.025336	1.388791	-0.98722	4.127134	3.161264	2.163323	3.159975	4	BOA
2013	22.86288	20.45483	1.05706	1.147403	-1.25577	4.465908	2.010094	2.292535	3.150597	4	BOA
2014	22.93115	20.73437	0.926504	1.444563	-1.19767	4.882802	1.930074	2.332144	3.15955	4	BOA
2015	23.13185	20.88548	0.849798	1.495149	-0.57227	5.204007	2.258518	2.341806	3.17722	4	BOA
2016	23.3359	21.20135	0.860663	1.521699	-1.48003	5.220356	1.891323	2.079442	3.182627	4	BOA
2017	23.75344	20.71181	0.995445	1.420696	-1.79491	5.451038	2.369039	2.322388	3.174297	4	BOA
2018	23.97343	20.98224	0.675049	1.91986	-1.74796	5.451038	2.62706	2.04122	3.154444	4	BOA
2019	24.19357	21.18297	0.779422	1.83737	-1.97242	6.22059	2.760619	2.197225	3.172204	4	BOA
2020	24.58668	21.58439	0.57381	1.941615	-2.01397	6.352629	3.013393	1.808289	3.169265	4	BOA
2021	25.21055	22.21617	0.314682	2.036011	-2.05732	6.410175	3.289876	1.84055	3.168424	4	BOA

2010	22.2761	21.28153	1.196271	1.481605	-0.3666	3.73767	2.097928	2.360854	3.15955	5	UB
2011	22.52594	21.04387	1.2249	1.609438	-0.53312	3.871201	3.504054	2.433613	3.151025	5	UB
2012	22.63392	20.56078	1.28307	1.94591	-0.8589	4.234107	3.161264	2.163323	3.159975	5	UB
2013	22.81061	19.95862	1.099912	2.079442	-1.36363	4.49981	2.010094	2.292535	3.150597	5	UB
2014	22.96424	20.37899	0.934028	2.079442	-1.02181	4.49981	1.930074	2.332144	3.15955	5	UB
2015	23.19173	20.232	0.762868	2.079442	-1.46658	4.488636	2.258518	2.341806	3.17722	5	UB
2016	23.29111	20.53457	0.76248	2.079442	-1.4967	4.49981	1.891323	2.079442	3.182627	5	UB
2017	23.52694	20.60673	0.667267	1.94591	-1.64474	5.332719	2.369039	2.322388	3.174297	5	UB
2018	23.86219	21.42006	0.831855	2.197225	-1.6289	5.433722	2.62706	2.04122	3.154444	5	UB
2019	24.09331	21.23251	0.858474	2.079442	-2.02726	5.429346	2.760619	2.197225	3.172204	5	UB
2020	24.27207	21.6406	0.819671	2.079442	-1.87716	5.429346	3.013393	1.808289	3.169265	5	UB
2021	24.4122	22.09035	0.7793	2.079442	-1.74667	5.948035	3.289876	1.84055	3.168424	5	UB
2010	22.09007	20.59	1.414154	1.105257	-0.25636	3.912023	2.097928	2.360854	3.15955	6	WB
2011	22.50791	21.37593	1.544197	1.081805	-0.36369	3.988984	3.504054	2.433613	3.151025	6	WB
2012	22.47389	20.17575	1.410633	1.085189	-0.72427	3.988984	3.161264	2.163323	3.159975	6	WB
2013	22.7449	20.73013	1.298506	1.23256	-1.00092	4.553877	2.010094	2.292535	3.150597	6	WB
2014	22.84972	21.21367	1.066477	1.255616	-1.02579	4.75359	1.930074	2.332144	3.15955	6	WB
2015	23.01286	21.03257	1.027031	1.061257	-1.39486	4.75359	2.258518	2.341806	3.17722	6	WB
2016	23.12828	20.82683	0.921236	1.040277	-1.27429	5.081404	1.891323	2.079442	3.182627	6	WB
2017	23.36362	20.44369	1.052848	1.018847	-1.27826	5.361292	2.369039	2.322388	3.174297	6	WB
2018	23.74399	21.74829	1.188824	1.386294	-1.62229	5.624018	2.62706	2.04122	3.154444	6	WB
2019	23.88219	21.6333	0.775962	1.56653	-1.70472	5.826	2.760619	2.197225	3.172204	6	WB
2020	24.12759	21.70481	0.895596	1.587192	-1.55374	5.996452	3.013393	1.808289	3.169265	6	WB
2021	24.17325	21.29996	1.002435	1.607436	-1.42259	6.035481	3.289876	1.84055	3.168424	6	WB
2010	22.14086	20.65313	1.315889	1.396245	-0.29655	3.871201	2.097928	2.360854	3.15955	7	NIB
2011	22.3637	21.24519	1.326417	1.386294	-0.3473	3.871201	3.504054	2.433613	3.151025	7	NIB
2012	22.48768	20.54287	1.313836	1.137833	-0.67226	4.007333	3.161264	2.163323	3.159975	7	NIB
2013	22.61867	20.03798	1.234607	1.396245	-1.08232	4.26268	2.010094	2.292535	3.150597	7	NIB
2014	22.79307	20.67935	1.095227	1.226712	-1.41958	4.276666	1.930074	2.332144	3.15955	7	NIB
2015	23.003	20.48398	1.032669	1.291984	-1.69324	4.574711	2.258518	2.341806	3.17722	7	NIB
2016	23.24282	20.84093	0.985883	1.427916	-1.42829	4.718499	1.891323	2.079442	3.182627	7	NIB
2017	23.52155	20.52138	0.878183	1.470176	-1.60986	4.762174	2.369039	2.322388	3.174297	7	NIB
2018	23.79685	21.40487	0.769329	1.637053	-1.71646	4.912655	2.62706	2.04122	3.154444	7	NIB
2019	24.04339	21.31366	0.869766	1.680828	-1.95119	5.743003	2.760619	2.197225	3.172204	7	NIB
2020	24.23931	21.44636	1.007909	1.735189	-1.84146	5.948035	3.013393	1.808289	3.169265	7	NIB
2021	24.4969	21.29996	1.129264	1.786747	-1.74259	6.066108	3.289876	1.84055	3.168424	7	NIB
2010	20.74069	19.26951	1.238569	1.244155	-0.31784	3.091043	2.097928	2.360854	3.15955	8	LIB
2011	20.98361	20.01248	1.014758	1.386294	-0.35171	3.663562	3.504054	2.433613	3.151025	8	LIB
2012	21.27523	19.50618	1.261582	1.098612	-0.51362	3.951244	3.161264	2.163323	3.159975	8	LIB
2013	21.46799	19.11975	1.416352	1.386294	-0.76133	4.143135	2.010094	2.292535	3.150597	8	LIB
2014	21.71169	18.70586	1.0806	1.609438	-0.86629	4.143135	1.930074	2.332144	3.15955	8	LIB
2015	22.21783	19.27586	1.156611	1.386294	-1.06575	4.795791	2.258518	2.341806	3.17722	8	LIB
2016	22.56913	20.44064	1.031941	1.536867	-1.23947	4.795791	1.891323	2.079442	3.182627	8	LIB
2017	22.89515	19.90456	1.033819	1.754404	-1.18932	4.787492	2.369039	2.322388	3.174297	8	LIB
2018	23.17768	20.17162	1.128044	1.818077	-1.34957	5.433722	2.62706	2.04122	3.154444	8	LIB
2019	23.52034	20.53089	1.133292	1.809927	-1.51372	5.493062	2.760619	2.197225	3.172204	8	LIB
2020	23.98642	20.98704	0.902291	1.953028	-1.33261	5.568345	3.013393	1.808289	3.169265	8	LIB
2021	23.98105	20.98165	0.601372	2.079442	-1.17934	5.568345	3.289876	1.84055	3.168424	8	LIB

2010	21.0394	19.88465	0.58688	1.589235	-0.47687	3.610918	2.097928	2.360854	3.15955	9	COOP
2011	21.40657	20.00914	0.795143	1.386294	-0.48684	3.970292	3.504054	2.433613	3.151025	9	COOP
2012	21.75201	20.02016	1.195809	1.098612	-0.81681	4.158883	3.161264	2.163323	3.159975	9	COOP
2013	22.21954	19.86046	1.308621	0.693147	-0.26474	4.394449	2.010094	2.292535	3.150597	9	COOP
2014	22.4189	19.94596	1.597748	1.609438	-1.13179	4.663439	1.930074	2.332144	3.15955	9	COOP
2015	22.7204	19.97742	1.200454	1.609438	-1.10639	4.94876	2.258518	2.341806	3.17722	9	COOP
2016	22.86196	20.16973	-1.04288	1.791759	-1.38076	4.94876	1.891323	2.079442	3.182627	9	COOP
2017	23.3819	20.40856	0.380446	1.386294	-1.4096	5.697093	2.369039	2.322388	3.174297	9	COOP
2018	23.97393	20.97013	0.612454	1.386294	-1.15755	5.963579	2.62706	2.04122	3.154444	9	COOP
2019	24.31145	21.34653	0.607231	1.386294	-1.35047	6.040255	2.760619	2.197225	3.172204	9	COOP
2020	24.54122	21.55745	0.919786	1.386294	-1.89759	6.173786	3.013393	1.808289	3.169265	9	COOP
2021	24.98763	22.07197	1.157561	1.386294	-3.20052	6.385194	3.289876	1.84055	3.168424	9	COOP
2010	19.29724	17.90723	-4.22811	0.182322	0.041877	1.098612	2.097928	2.360854	3.15955	10	Buna
2011	20.0126	19.06374	1.127599	1.280934	-0.26177	2.397895	3.504054	2.433613	3.151025	10	Buna
2012	20.62157	18.67979	0.953564	0.832909	-0.80578	3.218876	3.161264	2.163323	3.159975	10	Buna
2013	21.15998	19.15963	0.973164	1.280934	-0.97986	3.496508	2.010094	2.292535	3.150597	10	Buna
2014	21.48947	19.61856	1.134909	1.504077	-0.87886	4.143135	1.930074	2.332144	3.15955	10	Buna
2015	21.97633	19.12769	1.27571	1.568616	-1.45214	4.406719	2.258518	2.341806	3.17722	10	Buna
2016	22.40681	19.80889	1.197515	1.481605	-1.45808	4.65396	1.891323	2.079442	3.182627	10	Buna
2017	22.73544	19.72901	0.883869	1.252763	-1.28806	4.962845	2.369039	2.322388	3.174297	10	Buna
2018	23.02057	20.83759	1.015408	1.686399	-1.31529	4.962845	2.62706	2.04122	3.154444	10	Buna
2019	23.08286	20.20582	1.209995	1.648659	-1.53331	5.342334	2.760619	2.197225	3.172204	10	Buna
2020	23.33706	20.972	0.971887	1.648659	-1.50423	5.497168	3.013393	1.808289	3.169265	10	Buna
2021	23.72697	21.18422	0.658756	1.648659	-1.47598	5.723585	3.289876	1.84055	3.168424	10	Buna
2010	20.34933	19.44388	1.904677	-1.46968	-0.1185	1.098612	2.097928	2.360854	3.15955	11	Zemen
2011	20.87389	19.6475	1.8481	-1.13943	-0.49732	1.098612	3.504054	2.433613	3.151025	11	Zemen
2012	21.30709	19.3166	1.46103	-0.40048	-0.68907	1.94591	3.161264	2.163323	3.159975	11	Zemen
2013	21.64176	19.53975	1.205076	-0.61619	-0.80226	2.079442	2.010094	2.292535	3.150597	11	Zemen
2014	21.83212	20.12393	1.634504	-1.77196	-0.70755	2.197225	1.930074	2.332144	3.15955	11	Zemen
2015	22.06437	20.05262	1.248146	0.553885	-1.19759	2.397895	2.258518	2.341806	3.17722	11	Zemen
2016	22.42563	20.66749	1.197233	0.41871	-0.91009	2.564949	1.891323	2.079442	3.182627	11	Zemen
2017	22.71432	19.72901	1.073851	-0.30111	-0.86724	3.091043	2.369039	2.322388	3.174297	11	Zemen
2018	23.0497	20.06934	0.894542	0.058269	-0.92675	3.091043	2.62706	2.04122	3.154444	11	Zemen
2019	23.17644	20.18883	1.26976	0.576613	-1.52619	3.044523	2.760619	2.197225	3.172204	11	Zemen
2020	23.3917	20.34602	1.493938	-0.09431	-1.1944	3.951244	3.013393	1.808289	3.169265	11	Zemen
2021	23.66243	20.36899	1.676948	1.128171	-0.1185	4.204693	3.289876	1.84055	3.168424	11	Zemen
2010	20.52595	19.1284	0.982429	0.741937	-0.26687	3.295837	2.097928	2.360854	3.15955	12	OIB
2011	21.14612	19.77712	1.060148	0.470004	-0.58559	3.89182	3.504054	2.433613	3.151025	12	OIB
2012	21.47341	19.33746	0.734855	0.470004	-0.64826	3.89182	3.161264	2.163323	3.159975	12	OIB
2013	21.83855	19.38776	0.692249	1.098612	-0.9318	4.718499	2.010094	2.292535	3.150597	12	OIB
2014	22.3335	20.35502	1.117823	1.547562	-0.9873	4.919981	1.930074	2.332144	3.15955	12	OIB
2015	22.80346	19.96664	1.039447	1.410987	-1.56446	4.983607	2.258518	2.341806	3.17722	12	OIB
2016	22.95844	20.59242	0.39941	1.774952	-1.47052	5.327876	1.891323	2.079442	3.182627	12	OIB
2017	23.31957	20.3376	0.737929	1.481605	-1.39655	5.433722	2.369039	2.322388	3.174297	12	OIB
2018	23.71534	21.33566	1.28934	1.667707	-1.23265	5.513429	2.62706	2.04122	3.154444	12	OIB
2019	24.00377	21.32418	0.98736	1.589235	-1.64717	5.57973	2.760619	2.197225	3.172204	12	OIB
2020	24.04581	21.43294	0.964388	1.791759	-1.65122	5.703783	3.013393	1.808289	3.169265	12	OIB
2021	24.25975	22.01793	0.940876	1.960095	-1.65529	5.755742	3.289876	1.84055	3.168424	12	OIB

Source: National Bank of Ethiopia, Ministry of Planning and Development Commission, Global Data Lab, UNDP, Ethiopian Statistical Service (ESS), World Bank and Commercial Banks.