

GLOBALIZATION, ECONOMIC GROWTH AND POVERTY THE CASE OF ETHIOPIA

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List of Acronyms

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
ARDL.....	Autoregressive Distributed Lag
COMESA.....	Common Market for Eastern and Southern Africa
CSA.....	Central Statistical Agency
ECM.....	Error Correction Model
ECT.....	Error Correction Term
FDI.....	Foreign Direct Investment
GCIP	Global Consumption and Income Project
GDP	Gross Domestic Product
HDI.....	Human Development Index
IFIs	International Financial Institutions
IGAD	Inter-Governmental Authority on Development
IMF.....	International Monetary Funds
KOF	Konjunkturforschungsstelle
LDCs	Least Developing countries
MPI	Multidimensional Poverty Index
MOFEC.....	Ministry of Finance and Economic Commission
NBE.....	National Bank of Ethiopia
NAS.....	National Accounts Statistics
NPC.....	National Planning Commission
OECD	Organization for Economic Co-operation and Development
OLS.....	Ordinary Least Square
PP.....	Phillips Perron
RGDP.....	Real Gross Domestic Product
SSA	Sub-Saharan Africa
SAP.....	Structural Adjustment Program
UN	United Nations

UNDP United Nations Development program
VAR.....Vector Auto Regressive
VECM.....Vector Error Correction Model
WDI.....World Development Indicator

Abstract

The objective of this study is to investigate the relationship between economic globalization, economic growth and Poverty and in addition to examine the interrelationship between economic growth, income inequality and Poverty in Ethiopia, using the time series data from 1980-2017 and employed Auto Regressive Distributed Lag model and Vector Error Correction Model in a time series economic framework. In the long-run the trade openness has significant granger causality in income inequality & growth rate RGDP and income inequality and economic growth has granger causality on poverty. In the short-run, poverty is strongly predicted by the first lag of growth rate of RGDP and FDI at five **per cent**, level of significance. In the short-run, error correction model was found to be negative and statistically significant at one **per cent**, level of significance this implies that the error correction term converged monotonically to the equilibrium path relatively quickly and high significance of ECM(-1) is evidence to the existence of established stable long run relation among the variables. This result indicates almost faster an adjustment around of disequilibrium of previous year's shocks back to the long-run equilibrium in the current year.

Key words: Economic Globalization, economic growth, income inequality, poverty, ARDL-ECM, VECM, and Ethiopia

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the study

Globalization, an integration of economic activities in the world through the development of international trade and investment, is certainly one of the most important trends in the current global economy. International organizations and economists suggest that globalization has been a force for growth and poverty reduction in a diverse group of countries. Globalization is growing integration of economies and societies around the world as the result of flows of goods and services, capital, people and ideas through trade of goods, foreign investment, international communications, and migration reduces these gaps by raising productivity in developing world (Dollar, 2001). Globalization generally reduces poverty because more integration economies tend to grow faster. The global integration is already a powerful force in reducing poverty for significant part of developing world, but not universally effective. It focuses on the impact of growing economic integration on developing country, especially with regard to inequality and poverty policy (World Bank, 2001). It is Multi-dimensional process that affects many lives and above all, increased economic interdependence among countries.

The International Monetary Fund (IMF) considers four aspects of globalization trade, capital movements, movement of people, and spread of knowledge and technology (international monetary fund, 2000). The processes of globalization has impact directly or indirectly on economic growth, income inequality and poverty and are affected by economic, political, social, cultural, legal, and natural factors. Globalization has different ways been linked to development across the global, the main goals of development is poverty reduction. With the unprecedented entry of developing countries into the global economic integration the discussion on globalization and poverty has heightened. Scholars and economists debate on whether globalization can alleviate or increase poverty in the world.

Currently, the effect of globalization on income inequality and poverty alleviation has caught attention of many researchers. There is a growing concern that globalization may increase income distribution and poverty. Given the debates, it is crucial to develop more extensive and comprehensive analysis about the effects of globalization on poverty. Todaro and Smith (2015) have stated that globalization carries benefits and opportunities as well as costs and risks for all peoples in all countries but especially for poor families in low-income countries. Globalization does present new possibilities for broad-based economic development and globalization can potentially benefit developing countries directly and indirectly through cultural, social, scientific, and technological exchanges, as well as through conventional trade and finance.

Trade, investment, and capital flows are the key drivers of globalization (Obadan, 2008; Bang & Markeset, 2012; World Bank, 2002 and Elena, 2013) with involving in the activities of lower transportation and communication cost, spread industry, ICT development, reduction in trade barriers, increasing worldwide corporations, trade liberalization, and increase inflows of foreign direct investment (FDI). Stepping interdependence of the world economy in the last three decades has been driven mainly by developments in FDI. Recently, FDI makes to increasing globalization with disseminating technologies and transfer new knowledge being diffused by corresponding countries which increase the domestically productivity of host country. FDI foreign direct investments represent “the peak” globalization and hence of the entire world economy (Elena, 2013). According to UNCTAD in 2019 the global FDI flows remained flat which one **per cent**, decline from 2018 because of weak macroeconomic performance and policy uncertainty for investors, including trade tensions. The flows in developing economies are remained stable while in Africa continued to register a modest (+3 **per cent**,) increment in FDI flows. Flow to Ethiopia, Africa fastest growing economy, showdown by quarter to 2.5 billion. China has the largest investors in Ethiopia in 2019. Accounting for 60 **per cent**, newly approved FDI approved FDI projects. Currently covid-19 will negatively affect global Economic growth, trade, and FDI flows even more than of 2008 financial crisis trade. With scenarios of the spread of the epidemic ranging from short-term stabilization to continuation throughout the year, the Global trade could also fall by 13 **per cent**, to 32 **per cent**, depending on the depth and extent of the global economic downturn and the downward pressure on FDI will be -5 **per cent**, to -15 **per cent**, when compared to previous forecasts projecting marginal growth in the trade and FDI trend for 2020-2021(UNCTAD, 2020 and global economic & IMF, 2020).

The regional integration in Africa aims to achieve in 2030 the agenda sustainable development goals (Economic Commission Africa, 2017). Globally, regional integration has shown great potential for accelerating growth and development. The African continent, however, has not shared positively experience in the regional integration. Most African countries involve in market integration, which is poor under-developed countries (Mukamunana and Moeti, 2005). The countries are implement domestic policies and build domestic institutions aimed to promote growth, macroeconomic stability, and poverty reduction with integration and developments in their economic, political, social, and cultural aspects (Economic Commission Africa, 2004). In Africa, regional integration ideological began early since 1960s. Ethiopia has regional integration and cooperation agreements in the common market for eastern and southern Africa (COMESA) since 1994 (start free trade among members in 2000) and inter-governmental authority on development (IGAD) since 1996 which operates multilateral programs elaborated agricultural and environmental, political and humanitarian affairs and regional economic cooperation. Generally, Africa (sub-Saharan) is not only least integrated with the world economy (poor share of world trade) but also derived least benefits from globalization in terms of trade and financial flows on promotes growth and poverty reduction (World Bank, 2005; Obadan, 2001, 2004, 2008; Dupasquier & osakew, 2003 and Fischer, 2001).

Generally, the overall human development trends in Ethiopia have shown improvement in recent years. Between 2000 and 2018, Ethiopia's human development index (HDI) value increased from 0.283 to 0.470, from an increase of 65.8 **per cent**, (UNDP, HDI, 2019). The multidimensional poverty index (MPI) is significant higher than monetary (income) poverty in Ethiopia; the most recent survey data available for Ethiopia's MPI estimation refer to 2016. In Ethiopia, 83.5 **per cent**, of the population (87,643 thousand people) are multidimensional poor. The breadth of deprivation (intensity) in Ethiopia, which is the average deprivation score experienced by people in multidimensional poverty, is 58.5 **per cent**. The MPI, which is the share of the population that is multidimensional poor, adjusted by the intensity of the deprivations, is 0.489. When compare multidimensional poverty with income poverty, measured by the percentage of the population living below PPP US\$1.90 per day. The multidimensional poverty headcount is 56.2 percentage points higher than income poverty. (Human Development Report, 2019)

Recently, researchers have claimed that the growth effects of globalization depend on the economic structure of the countries during the process of globalization. The impact of globalization on economic growth of countries also could be changed by the set of complementary policies such as improvement in human capital and financial system. In fact, globalization by itself does not increase or decrease economic growth. The effect of complementary policies is very important as it helps countries to be successful in globalization process (Rodrik, 2008; Dauth & Suedekum, 2014 and Mundlak *et al.*, 2008).

1.2.Statement of the problem

Currently, there are a lot of debates in the effect of economic globalization on the macroeconomic indicators such that economic growth, poverty and income inequality. According the pro-globalists (optimists) globalization (trade openness) has led to promote economic growth which gives opportunity for the poor in terms of poverty reduction and job creation (Dallor & Kraay, 2001; Bhagwati, 2002; Round & Whalley, 2002; Abid & Anila, 2005 and Atif *et al.*, 2012). In contrast, the anti-globalists (pessimists) claims that globalization adversely affect the poor countries with possible increasing income inequality of within and between countries of the world (Stiglitz, 2003 and Salvatore & Campano, 2012). the pro-globalists (optimists) globalization underline the fact that worldwide absolute poverty has decreased over the last two decades, while critics of globalization show that this result is almost entirely due to statistical artefacts and to the fast growth of China, while absolute poverty has increased in many DCs and relative poverty has increased in the majority of countries.

Generally, the impacts of globalization on economic growth across countries are different because of their difference in population growth rate, governmental policy, and different institutional factors across countries (Almas, 2003; Greenways *et al.*, 2002 and Kemal *et al.*, 2002).

The following are the central questions raised and addressed in this study:

- Has globalization promoted economic growth in Ethiopia?
- Can the level of openness have led to inflow of capital/industrialization, which consequently, reduces poverty?
- What is likely to happen to economic growth and poverty when Ethiopia chooses to open (or becomes exposed) to globalization? and
- What are the channels through which trade and FDI affect economic growth and poverty, within-country?

1.3.Objectives of the Study

1.3.1. General objective

This study is designed with main objective of measuring and analyzing relationship between the inflow of capital, globalization (as proxies by the degree of openness), poverty, and economic growth in Ethiopia.

1.3.2. Specific objectives

The study has the following specific objectives,

- ✓ To examine the relationship between economic globalization and economic growth in Ethiopia using the Revised KOF Globalization Index (2018) and previous KOF Globalization Index (2007);
- ✓ To analyze the relationship between economic globalization, economic growth and poverty in Ethiopia; and
- ✓ To analyze the interrelationship between economic growth, income inequality and poverty in Ethiopia.

1.4.Hypothesis of the Study

Globalization provides a strong potential for poverty alleviation in developing world. With structural adjustment program (SAP) in the mid of 1980s the SSA economies significantly liberalized their trade and investment policy, but their share of world trade are fallen over these two decades (UNCAT 2003 and Round, 2007). The degree of inequality in Africa has increased sharply between 1980s and the 1990s. According to Round (2007) globalization in SSA are associated with increasing inequality and increasing in poverty. While globalization has made some contribution to economic growth, it has not yet facilitated the process of structural transformation required to reach the take-off stage and accelerate economic development and poverty reduction in SSA, but it has increased intra-country inequality and done very little to reduce poverty (Nissanke & Thorbecke, 2008).

There are a lot of organizations and researchers conducted studies to investigate the relationship between globalization and economic growth of different nations where some of the studies are (Dreher, 2006; Rao, 2011; Kilic, 2015; Ray, 2012; Grossman and Helpman, 2015; Samini and Jenatabadi, 2014 and Feridun et al., 2016) show the effect of globalization on economic growth positively. In contrast, other argues that globalization negatively affects growth of a country with weak institution and political instability. In fact, most studies on the economic impacts of globalization measures are commonly used proxies of trade liberalization, foreign direct investment, foreign aid and others. Therefore, the main hypothesis is “there is a positive long-run association between economic globalization and economic growth in Ethiopia.”

In studying the poverty effects of globalization, it is important to understand the effects of globalization on both growth and inequality, and the effect of inequality on growth or vase versa (Kuznets, 1955; R. Barro, 2000; Alesina & Perotti, 1996; Forbes, 2000; Alesina & Rodrik, 1994; Persson & Tobellini, 1994 and Mandel *et al.*, 2018)). Most of arguments demonstrate possibilities that the globalization could increase income inequality in developing countries. But the effects of globalization on income distribution could be conditional since the negative effects may vary depending on several conditions and absorptive capacity (Lee, 2014).

In fact, the effect of globalization on poverty alleviation in developing countries is not strong. Poverty is still rampant in many developing countries after the development of globalization though the number of people under the absolute poverty continuously fell (Chen and Ravallion, 2007). Since 2000, Ethiopia has experienced progress in poverty alleviation but the income inequality has shown a slight increase (World Bank, 2014; NPC, 2017). Poverty reflects growth and distribution so; globalization did not just lead to poverty reduction because of the complex globalization- growth-inequality-poverty nexus. Globalization does not simply solve poverty problem, but it has high possibility that could alleviate poverty only if complementary policies including the development of human capital and infrastructure, and macroeconomic stability were implemented (Harrison, 2006). Therefore, the hypothesis is that “there is insignificant association between economic globalization and poverty in Ethiopia.”

1.5. Significance of the Study

This research intended to assess the Economic Globalization, Economic Growth and Poverty aspects of Ethiopia, focusing on the incidence of Economic Globalization on Economic Growth and Poverty. This is, important in the development policy evaluation that can help to fill observed gaps of Economic Globalization from various social and economic perspectives. In this work involved the systematic analysis of panel data of Ethiopia, it provides a golden opportunity for policymakers and practitioners to address identified failings and to design new interventions and adjust policy in order to improve the status of globalization in Ethiopia and to promote economic growth and alleviation of poverty in Ethiopia. The study is fundamentally supportive of the efforts of governmental administrations at different levels, and of non-governmental organizations to promote Economic Growth and to reduce the poverty level in the country. However, as aforementioned, globalization is also associated with high risk of volatility, which creates profound implications for domestic macroeconomic policies and management. Thus, it is apt to contend that while opening up numerous economic opportunities, globalization also constitutes formidable challenges to relatively weak states, their economies and peoples (Ihonvbere, 1999 & Lipalile, 2000).

1.6.Scope and limitation of the study

The study also focused on a lot of indicators of economic globalization, economic growth and as well as basic measures of poverty. Poverty was analyzed using the human development index. The limitations of the study should be the quality of the data according to International Financial Institutions (IFIs) such as the World Bank and IMF have reported a significant discrepancy with the growth figures of the government. This obviously leads to doubts regarding both the official growth figures as well as official measure of income poverty. There is big gap between the IMF growth forecast and the official government growth figures. The politics of growth and related statistics in Africa should not be a surprise the poverty line trend is almost changed it make questioned in the quality of data because almost in developing country especially like Ethiopia the political interference is large and the challenge in the developing countries do not accept some investigation if it is different with their political authority expectation. So, the time series data of Ethiopia was problematic in the econometric analysis.

CHAPTER TWO

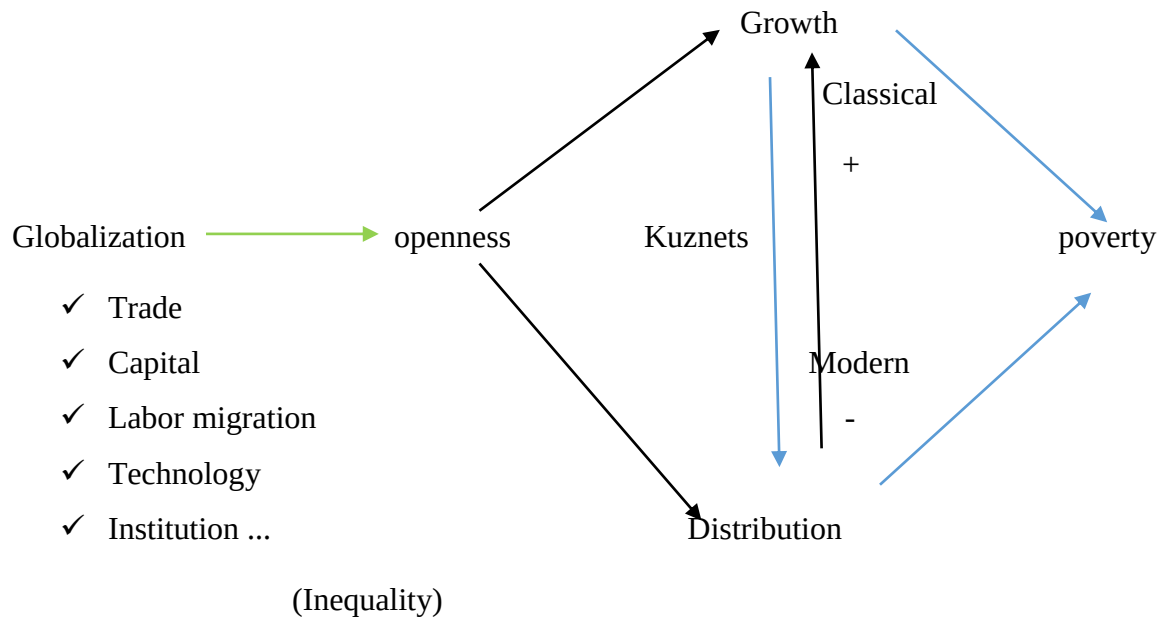
2. LITRATURE REVIEW

2.1 Theoretical Review

2.1.1 Channels Linking Globalization to Poverty

The globalization-poverty nexus is complex, involving many different channels. The link between globalization (openness) and poverty can be visualized as a large river fed by a variety of economic tributaries. Figure 2.1 illustrates schematically the various critical links of the causal chain running from globalization (openness) to poverty, focusing on the most critical tributaries and abstracting from several feedback effects among the constituting elements. Increased openness is the primary manifestation of globalization. The major transmission mechanisms from globalization to openness are include changes in the relative prices of factors of production (labor and capital) and commodities; movements of capital and labor across borders and within countries; the nature of technological change and technological diffusion; the impact of globalization on volatility and vulnerability; the worldwide flow of information; global disinflation; and institutions. These mechanisms affect poverty through two different paths: first, through their contributions to the growth channel and, second, through their impact on income distribution, since globalization creates winners and losers directly and affects vertical and horizontal inequalities (Ravallion, 2004).

Figure 2.1 the globalization–openness–growth–inequality–poverty link



Source: Thorbecke .E & Nissanke .M (2008)

The links shown in figure 2.1 are the two main channels of globalization - the growth and distribution channels and further interact dynamically over time to produce a growth-inequality-poverty triangular relationship (Bourguignon, 2004).

2.1.1.1 The Globalization–Growth–Inequality–Poverty Causal Chain

To analyze the impact of openness through the growth channel on poverty, the globalization-openness-growth-inequality-poverty nexus has to be scrutinized carefully.

The openness-growth link

Policies of openness through the liberalization of trade and investment regimes and capital movements have been advocated worldwide for their growth and welfare-enhancing effects on the basis of the propositions embedded in the well-known economic theories of international trade, investment, and finance. Indeed, openness through trade, foreign direct investment (FDI), and financial markets typically increases the flow of goods and capital across national borders and can contribute significantly to economic growth. The direction of causality in this link, however, is still under debate (the present consensus is that trade contributes to growth rather

than vice versa), as is how trade and capital flows could be interlinked in a virtuous circle. Furthermore, the positive openness-growth link is neither automatically guaranteed nor universally observable. The growth-enhancing effects of trade openness depend critically on the way and extent to which a country is integrated in the global economy (Sanchez (2003).

Similarly, the transfer of technology, skills, and management know-how that is assumed to accompany FDI often does not occur. The postulated positive effects of portfolio and other capital flows (hot money) on growth have been increasingly challenged in recent years. Even some studies by the International Monetary Fund (IMF) acknowledge that it is difficult to establish a strong positive causal relationship between financial globalization and economic growth (Nissanke and Stein, 2003; Prasad *et al.*, 2003 and Kose *et al.*, 2006).

The Interrelationship of Growth Inequality and Poverty

The second link in the causal chain from openness to poverty through the growth effect is the interrelationship between growth and inequality. There is as yet no consensus throughout the economics profession on the relationship between income inequality and growth. There are two conflicting theoretical approaches to relating the causal chain from income and wealth inequality to growth (the inequality-growth link).

Firstly, the classical approach suggest that the marginal propensity to save of the rich is higher than that of the poor, implying that a higher degree of initial inequality will yield higher aggregate savings, capital accumulation, and growth (Kaldor, 1957; Bourguignonmm 1981; and Aghion, Caroli, and Garcia-Penalosa, 1999). From this theoretical perspective, the desirability of an unequal income distribution is rationalized on economic grounds, that is, on the basis of the claim that more poverty today is a precondition to more economic growth and less poverty in the future (Thornback, 2006).

Secondly, the modern approaches emphasize the main four channels through which income inequality lowers growth: (a) the impact of inequality on encouraging rent-seeking activities that reduce the security of property rights(credit market imperfection (Galor-zeira, 1983,1993); (b) unequal societies are more prone to difficulties in collective action—possibly reflected in political instability, a propensity for populist redistributive policies, or greater volatility in policies all of which can lower growth(Social political instability theory (Alesina & Perotti, 1996) and Benhabib & Rustihini,1996)); (c) the median voter in a more unequal society is

relatively poorer and favors a higher (and thus more inefficient) tax burden (the political economy theory (Alesina & Rodrik, 1994; Bertola, 1993 and Persson & Tobellini, 1994); and (d) to the extent that inequality in income or assets coexists with imperfect credit markets, poorer people may be unable to invest in their human and physical capital, with adverse consequences for long-run growth (Differential fertility (De Le Croix and Doepke, 2003).

According to Kuznets' law, the relationship between income inequality and per capita income may be described by a curve in the shape of an inverted U, with an upward phase in which income inequality increases with rising per capita income, and a downward phase in which inequality declines with increases in per capita income. The rejection of the Kuznets hypothesis of the inverted-U-shaped relationship between growth and inequality by a number of empirical studies spurred the reexamination of the opposite causal flow in the link, that is, the growth inequality link (Thorbecke and Charumilind, 2002). Many early development economists noted that economic growth, if left to market forces alone, tends to be accompanied by increased inequality. They considered growth to be inherently dis-equalizing (Myrdal, 1957; Rosenstein-Rodan, 1943; Hirschman, 1958 and Milanovic, 2005). According to the new political economy of development approach, growth patterns yielding more inequality in the income distribution would, in turn, engender lower future growth paths, resulting in less of a growth-induced poverty reduction (Thorbecke and Charumilind, 2002).

Thus, while growth may benefit the poor, the ultimate poverty-reduction effects will depend on how the growth pattern affects income distribution. Inequality is the filter between growth and poverty reduction (Naschold, 2004). If growth leads to a significant increase in income inequality, the poor may benefit only slightly or even be hurt by the globalization-induced economic growth. He argue specifically that the pattern of economic growth and development, rather than the growth rate per se, may have significant effects on a country's income distribution and poverty profile, since growth can be pro-poor, distribution neutral, or even poverty increasing at the limit. The poverty reduction would require some combination of higher growth and a more pro-poor distribution of the gains from growth (Woodward and Simms, 2006). Hence what is relevant for poverty reduction is a distribution-corrected rate of growth (Ravallion, 2004). He considers growth to be truly pro poor if in addition to reducing poverty; it decreases inequality consistent with the strong definition of pro-poor growth. Economic growth can be

considered genuinely pro-poor only if that growth is accompanied by a decline in inequality such that the poor benefit relatively more than the non-poor (Kakwani and Pernia, 2000).

2.1.1.2 Direct Distribution Channels in the Globalization-Poverty Nexus

The current phase of globalization has contributed to possible adverse effects on the poor through technology and factor mobility and vulnerability, information diffusion and institution change tends to increase inequalities in both developed and developing countries are including:-

- I. The nature of technical changes biased in favor of capital and against unskilled labour, the asymmetrical access to new technology and knowledge, and the uneven process of technology diffusion (Culpeper, 2005); the initial knowledge gap and unequal, skewed access to technology and knowledge have adverse implications for the world income distribution. This is critical because the current wave of globalization is characterized more by trade in knowledge and information than by trade in goods, which was the case with the earlier wave of globalization (Baldwin and Martin, 1999).
- II. the perverse pattern of international migration which yields a greater migration of skilled labour from developing countries to developed countries, while unskilled labour migration tends to be strictly controlled;
- III. the perverse movements of capital, such as in the form of capital flight from developing or emerging market economies or diversification finance characterizing portfolio capital flows conducted through asset swapping for risk hedging and shedding, which results in global macro imbalance and periodical financial crises (Obstfeld and Taylor, 2002); and
- IV. Uneven, skewed foreign direct investment (FDI) flows, which have not necessarily guaranteed host developing countries access to potential benefits of management and knowledge transfer. These features have affected, in a number of instances, the functional income distribution between labour and capital against the former.

Concerns are particularly strong about the increased vulnerability of the poor to globalization forces that generate greater fluctuations in income and expenditure caused by global shocks, such as the various financial crises that have hit Latin America and Asia in the last two decades or the ongoing global financial crisis and earlier food crisis hurting disproportionately the poor. Thus, while globalization can be a major engine for growth in aggregate, it is critical to put in place

strong institutions that mediate the various channels and mechanisms through which the globalization process influences poverty. Indeed, institutions act as a filter intensifying or hindering the positive and negative pass through between globalization and poverty and can help explain the diversity, heterogeneity, and non-linearity of outcomes (Sindzingre, 2006).

2.1.2. Globalization theories and Index

Globalization describes the process of creating networks of connections among actors at intra- or multi-continental distances, mediated through a variety of flows including people, information and ideas, capital, and goods. Globalization is a process that erodes national boundaries, integrates national economies, cultures, technologies and governance, and produces complex relations of mutual interdependence (Dreher, 2006; Clark, 2000 and Norris, 2000).

Pro Globalization (Optimist)

Globalization proponents advocate that poverty is on the decline, due principally to the powers of globalization and development it causes. In other words, these proponents accord great importance to globalization as a main and pertinent engine of the growth and in the battle against poverty. In considering the effect of globalization on world poverty, there has been a general argument in favor of endogenous growth theory, which suggests that the link between globalization and growth can be attributed to aspects of globalization, such as trade liberalization, which leads to faster integration and thus growth (Dollar and Kraay, 2001). Thus Dollar and Kraay (2001) concluded that liberalization of economic policies had been responsible for the vast improvement in the alleviation of world poverty through growth. Collier and Dollar (2002) ascertained that globalization helped to poverty, but also postulated that supporting policies could help better to harness these benefits.

Anti-Globalization (Pessimist)

Conversely, proponents of pro-poor, while recognizing the mandatory role played by openness and growth, contends that it does not represent sufficient conditions for poverty reduction. To determine the impact of globalization on poverty over the period 1980-2005, Salvatore and Campano (2012) adopted the macroeconomic perspective to examine the income distribution of

the people living in developing countries, as one group, and the people living in the developed countries as another group. They also further subdivided the developing countries in to two groups: those that globalized and those that did not globalized, as not all developing countries have globalized during this period of study. Their study found that real personal income grew and flourished in both developing and developed countries, but more rapidly in the developing countries, such as in China and India. However, when looking at the estimates of real personal income in terms of the three major measures of central tendency, they found that the ratios between developing and developed have been substantially reduced in the period, especially at the mode where the most severe poverty lies.

According to Dreher (2006) a globalization index is calculated and upgraded by Dreher (2008) himself again to make it to its final status. General globalization index, which is prepared by Dreher (2006) and Dreher (2008), includes three sub globalization indexes.

Economic Globalization Index: This index includes two sub-indexes which are actual flows and restrictions. Actual flows are calculated with GDP percentages of trade, foreign trade investments and stocks, portfolio investments, income payment to foreign nationals. Restrictions are calculated with hidden import barriers; mean tariff rate, current revenue percentages of taxes on international trade and capital account restrictions. Both actual flows' and restrictions' immensity in economic globalization index is 50 **per cent**.

Social Globalization Index: This index includes three sub-indexes which are personal contact, information flows and cultural proximity. Personal contact is calculated with telephone traffic, GDP percentages of transfers, international tourism, the foreign population according to the total population and international letters per capita. Information flows is calculated with internet usage per 1000 people, television per 1000 people and GDP percentages of trades in newspapers. Cultural proximity is calculated with number of McDonald's restaurants per capita, number of Ikea per capita and GDP percentages of trades in books. By order of, the percentages of personal contact, information flows and cultural proximity are 33 **per cent**, 35 **per cent**, and 32 **per cent**.

Political Globalization Index: This index is calculated with four sub-indexes which are number of embassies in country, membership in international organizations, participation in United Nations (UN) Security Council mission and international treaties.

With the latest update by Dreher (2008), it is assessed that, by order of the portions of economic, social and political globalizations in general index of globalization of 2014 are 36 **per cent**, 38 **per cent**, and 26 **per cent** (KOF Index of Globalization, 2014).

The KOF Globalization Index revisited (2018)

Generally, this new KOF globalization index classified in to two major class of globalization De facto and De jure globalizations, which consider the three Dreher (2006) dimensions of globalization (economic, social and political). The de facto globalization are measures actual flows and activities, while de jure globalization are measures policies, resources, conditions and institutions that, in principle, enable or facilitate actual flows and activities.

Economic Globalization

Classified into de facto economic globalization and de jure economic globalization, each sub-dimension includes trade and financial globalization.

The de facto trade globalization refers to the exchange of goods and services over long distances. This is measured using the variables exports and imports of goods and exports and imports of services, both measured as a share of GDP. However, the de jure trade globalization relates closely to the sub-dimension economic restriction in the 2007 version of the KOF Globalization Index (Dreher *et al.*, 2008). It refers to policies that facilitate and promote trade flows between countries. It is measured using variables on trade regulation, trade taxes, tariff rates and free trade agreements

The de facto financial globalization is measured by capital flows and stocks of foreign assets and liabilities. While the de jure financial globalization measures the openness of a country to international financial flows and investments.

Social Globalization

This has two dimensions of globalization, which are de facto and de jure social globalization, while each social sub-dimension of globalization includes interpersonal, informational and cultural globalization.

The De facto interpersonal globalization captures direct interactions among citizens living in different countries. The interaction can occur by the means of personal calls across borders. Personal calls are measured as international voice traffic in minutes per capita using fixed or mobile telephones. Personal contact with foreign citizens is the most likely form of direct interactions, which we measure using three variables. Migration, measured as the stock of foreign-born persons in a country, is the most persistent form, while tourism and foreign students (both counted as inbound and outbound) can be regarded as some form of temporary migration. Finally, international transfers paid and received always include some sort of personal interactions. All variables are normalized by domestic population.

The de jure interpersonal globalization refers to policies and resources that enable direct interactions among people living in different countries.

The informational globalization is meant to measure the actual flow of ideas, knowledge and images. De facto informational globalization is measured using three variables. Internet bandwidth measures the used capacity of international internet bandwidth and serves as a proxy for international digital information in- and outflows. International patents, measured as the stock of patent applications made by non-residents, describe international flows of technology, scientific knowledge and related information (OECD, 2010). High technology exports describe flows of technological and scientific information. While international patents mainly describe an inflow of information, high technology exports mainly represent the outflow of information. All variables are normalized by domestic population.

The De jure informational globalization refers to the ability to share information across countries. It is measured by the number of television sets per capita. It is also measured by the number of people having access to the internet.

Cultural globalization is the most difficult dimension to measure. De-jure cultural globalization refers to openness towards and the ability to understand and adopt foreign cultural influences.

Political Globalization

This has two dimension of globalization, which de facto and de jure political globalization. The De facto political globalization captures the diffusion of government policies, while de jure political globalization refers to the ability to engage in international political cooperation. It is measured using the number of multilateral treaties signed since 1945, the number of memberships in international organizations and a measure for the treaty partner diversity.

2.2 Empirical Literature Review

3 Table 2.2: Some Empirical Studies on Globalization-Growth-poverty

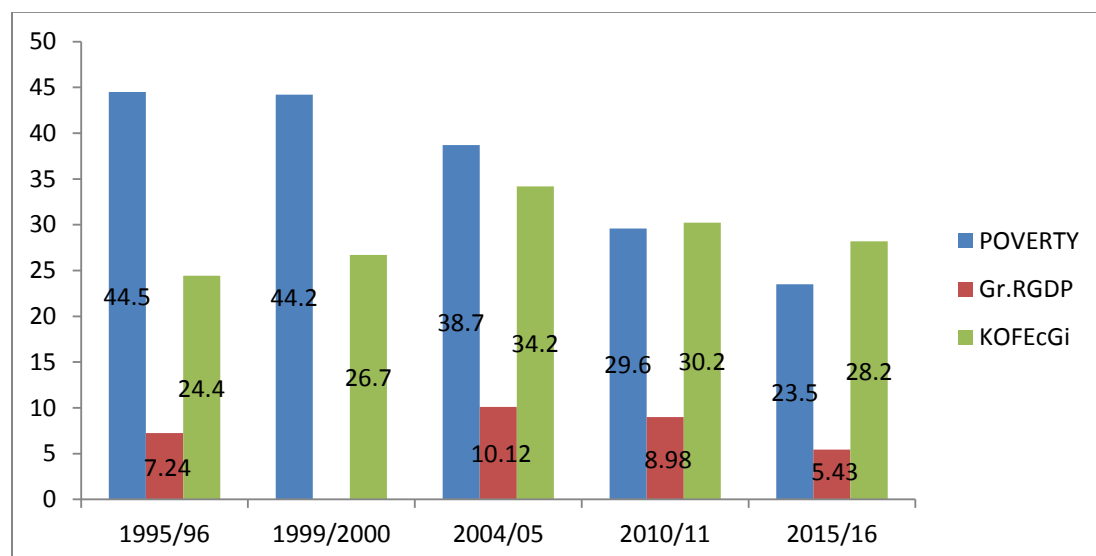
Authors	Study Area	Method/ estimation technique	Conclusion
Globalization Economic Growth			
Adesoye, Ajike, and Maku (2015)	Nigeria	Multiple regression / time series	Globalization and all macroeconomic variables have significantly enhanced economic growth
Kilic (2015)	74 developing countries	Fixed effects least squares method and Granger causality test	Economic and political globalization affected economic growth positively while social globalization affected economic growth negatively and bidirectional relationship between economic globalization and economic growth and a one-way relationship between social globalization and economic growth.
Barry (2010)	Sub-Saharan Africa (41-counries)	Ordinary Least Squares (OLS) model	Globalization is not statistically significant to economic growth in Sub Saharan Africa; it can have a positive influence on its economic growth.
Dreher (2006)	123 countries	Panel data analysis	Globalization affects positively economic growth.
Sulaiman and Aluko (2014)	Nigeria	Ordinary Least Square (OLS) method	Globalization has a significant positive impact on the economic performance/growth of Nigeria.
LEITÃO (2012)		GMM system estimator	Foreign direct investment and globalization promotes the economic growth.

Meraj (2013)	Bangladesh	ARDL model and the Granger causality test.	Positive impact for globalization over trade and economic growth. The empirical findings suggest bidirectional causality between exports and GDP, with impacts of globalization in terms of exports affecting economic growth (GDP).
Globalization & poverty			
Kaldor(1957)			Tradeoff between equity and growth.
Agénor (2002)	30 developing countries.	cross-country regression framework	Inverted U-shape relationship between poverty and globalization. At low degrees of globalization, globalization does hurt the poor. However, at higher levels, globalization leads to a decline in poverty.
Barro (2000)		Three stages least square method.	Positive relationship between income inequality and Growth in developed countries, negative relationship between income inequality and Growth in developing countries.
World Bank 2002			Globalization generally reduces poverty because more integrated economies tend to grow faster and this growth is usually widely diffused.
Alesina and Rodrik, 1993; Persson and Tabellini, 1994; Perotti, 1996; and Easterly, 2001.			There was a negative relationship between income inequality and Growth.

3.1 Trends in Economic Growth and Poverty in Ethiopia

Ethiopia's economy experienced strong, broad-based growth averaging 9.9 **per cent**, a year from 2007/08 to 2017/18, compared to a regional average of 5.4 **per cent**. Ethiopian economy registered 7.7 **per cent**, growth in 2017/18, slower than the 10.9 **per cent**, expansion recorded in the previous year. Industry, mainly construction, and services accounted for most of the growth. Agriculture and manufacturing made lower contribution to growth in 2017/18 compared to the previous year. Higher economic growth brought with its positive trends in poverty reduction in both urban and rural areas. The share of the population living below the national poverty line decreased from 30 **per cent**, in 2011 to 24 **per cent**, in 2016 (Planning and Development Commission, 2017/18). In 2000 Ethiopia had one of the highest poverty rates in the world, with 56 **per cent**, of the population living below US\$1.25 PPP a day and 44 **per cent**, of its population below the national poverty line. In 2011 less than 30 **per cent**, of the population lived below the national poverty line and 31 **per cent**, lived on less than US\$1.25 PPP a day (World Bank, 2015). In 2015, less than 23.5 **per cent**, of the population lived below the national poverty line and 24 **per cent**, lived on less than US\$1.25 PPP a day. However, the income inequality has shown a slight increase from 0.28 in 2000 to 0.328 in 2015/16 (World Bank, 2014).

Figure 2.3.1: Trends in Poverty, Economic Growth and KOF.Econ.Global. (1995-2015/16)



Source: National Planning Commission (2017)

This trend indicates that the head count ratio of poverty has declined from 45 **per cent**, in 1994/95 in to 24 **per cent**, of population lives below the national poverty line in 2015/16, the KOF economic globalization was decreased in the last 15 years and also the growth rate of RGDP trend in the above graph was decreased. According the united nation development program in 2018 Ethiopia is classified as a country with low human development (0.470) and ranks as 173th out of 188 countries (UNDP, 2019). Most of the time globally poverty, income inequality, and high unemployment rate are most countries in the world initiatives and take policy steps towards reduction.

Recently the economic definition of poverty is more multidimensional way (Subramanian, 1997). These approaches include: - the basic needs approach (Streeton *et al.*, 1981), the capabilities approach (Sen, 1999) and the human development approach (UNDP, 1990).

According to United Nations Development Program (UNDP, 2006) the Human Development Index (HDI), which is composite measure of three dimensions these are living long and healthy life (measured by life expectancy), being educated (measured by adult literacy and enrollment at primary, secondary, and tertiary level) and Having a decent standard of living (measured by income in terms of its purchasing power parity).The Human Development index misses the important indicators such as inequality and human rights and political freedom which are difficult to measure. HDI and levels of unemployment are good and standard indicators of poverty.

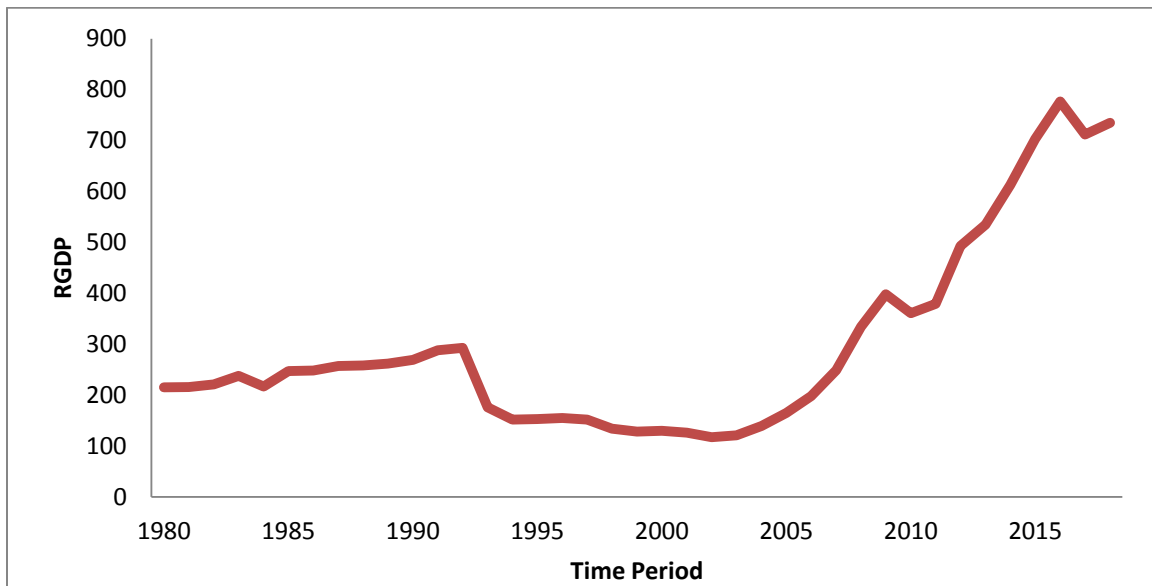
Recently, Poverty is the main worldwide agenda; in 2015 the United Nations (UN) takes the agenda 2030 of SDGs end poverty in all its forms everywhere. Globally the number of people living in extreme poverty has declined from 36 **per cent**, in 1990 in to 8.6 **per cent**, in 2018. Most of the time in the small, fragile and conflict affected countries are found high poverty rate. The majority of people living in the extreme poverty are in the Southern Asia and sub-Saharan Africa. Sub-Saharan Africa's poverty rate did not fall below its 1990 level until after 2002. The poverty rate in sub-Saharan Africa has fallen only by 16 per cent since 1990, from 57 **per cent**, to 41 **per cent**, of population living on less than \$1.25 a day between 1990 and 2015. (UN report, 2015, 2018).

According the official government reports on growth show that Ethiopia has registered a two-digit rate of growth in the last decade. Ethiopia saw one of the best economic performances since the early 1990s. From the year 2000 up to 2002 the annual average growth rate is abnormal because of Ethio-Eritrea war and during 2004 - 2019 years the economy has registered rapid and sustainable growth and the annual average growth rate was 10.4 **per cent**, (National accounts Statistics (NAS, 2019). In general, growth is central for poverty reduction, and macroeconomic stability is a necessary condition for growth. But the country is still one of the poorest in the world (HDI, 2013; MPI, 2015).

International Financial Institutions (IFIs) such as the World Bank and IMF have reported a significant discrepancy with the growth figures of the government. This obviously leads to doubts regarding both the official growth figures as well as official measure of income poverty. There is big gap between the IMF growth forecast and the official government growth figures. The politics of growth and related statistics in Africa should not be a surprise. Ethiopia is no different in this respect.

Growth is a necessary but not sufficient condition for poverty reduction. The distribution of income associated with growth may have a negative bearing on poverty reduction. According White and Anderson (2001) demonstrate, a small change in income distribution can have a large effect on poverty reduction. Tassew *et al.* (2008) and Alemayehu *et al.* (2008) have confirmed the significance of distribution of income in alleviating poverty, particularly for poor countries like Ethiopia. Tassew *et al.* (2008) reported that the prevalence of higher inequality in urban areas increases the incidence of poverty. Using a household panel data, Alemayehu *et al.* (2008) showed the existence of a strong positive relationship between growth and inequality. However, the current study used different methodology (ARDL bound test, multivariate Johansen co-integration test, and Granger causality test) with latest data to examine the relationship between economic globalization, economic growth, and poverty of Ethiopia.

Figure 2.3.2: Trends GDP per capita in USD between 200/00-2015/16



Source: NBE and World Bank (2018/19)

Figure 2.3.3: Trends growth rate GDP per capita from 1980-2015/16

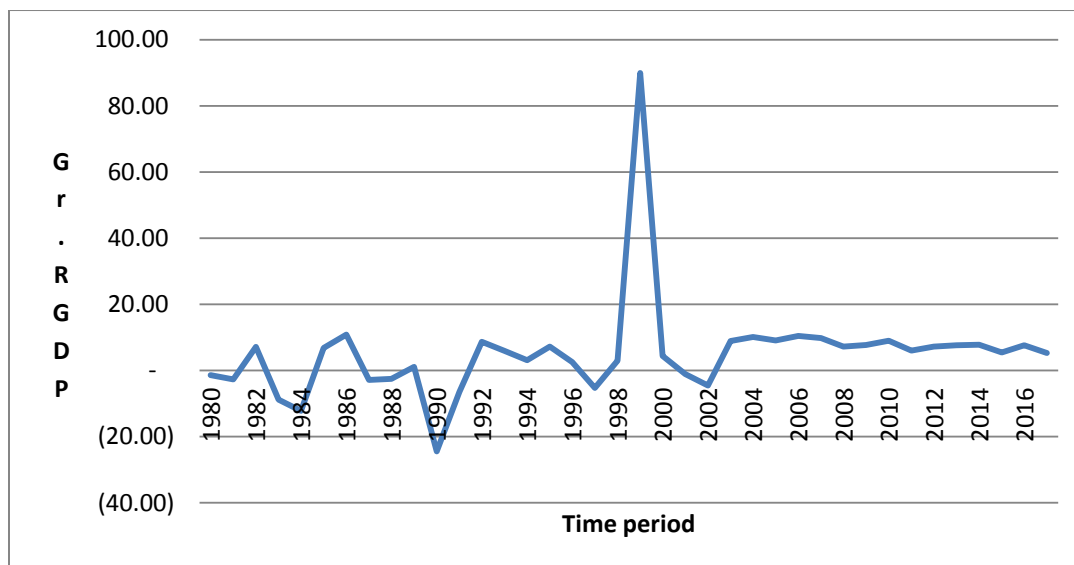
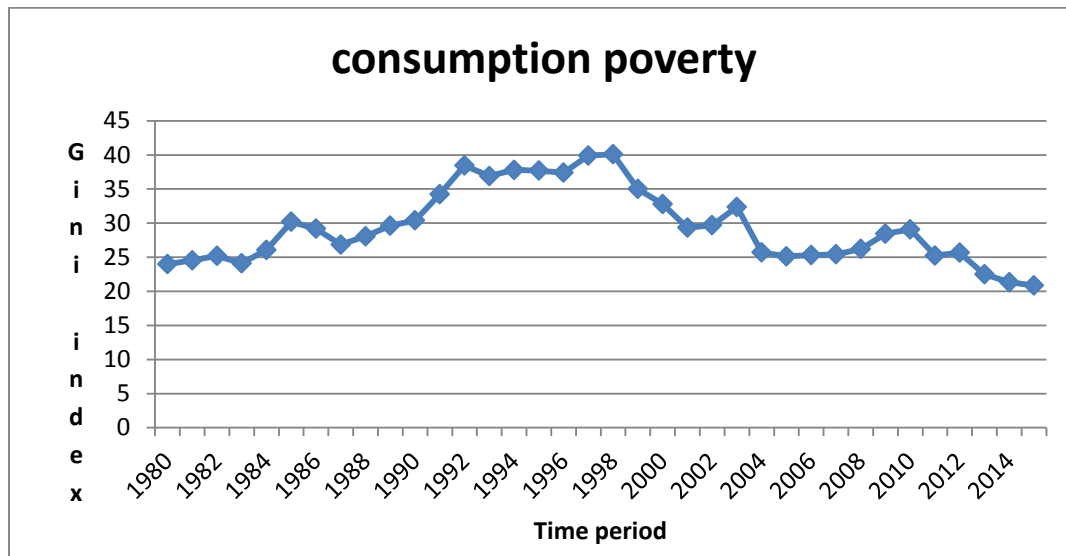


Figure 2.3.4: Trends poverty in head count index from 1980/00-2015/16



According to the global consumption data the share of the population living below the national poverty line decreased since 1998 40.08 in to 20.8 in 2015. This is supported by the official government data the poverty decrease from 44.5 in 1995/96 in to 23.5 in 2015/16.

Figure 2.3.5: Trends in share of trade openness from 1980-2015/16

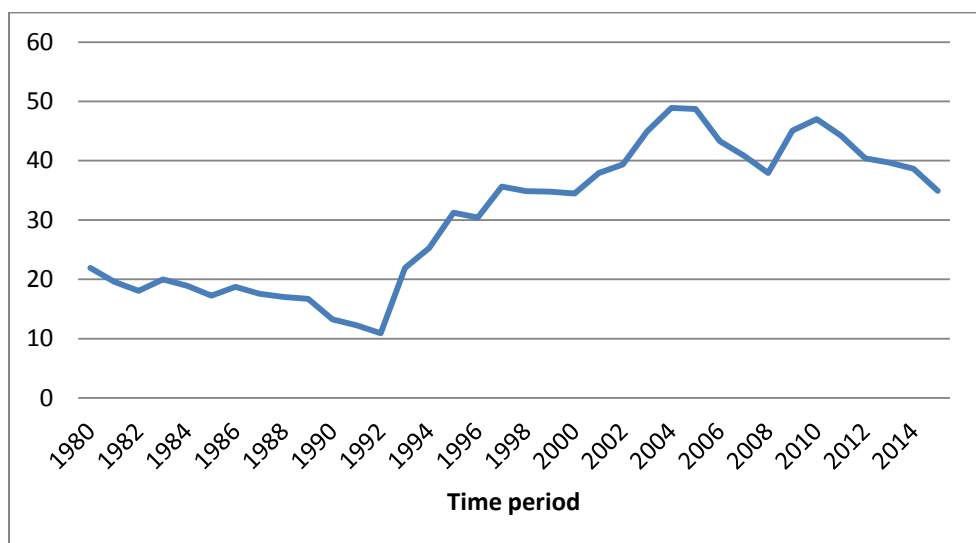
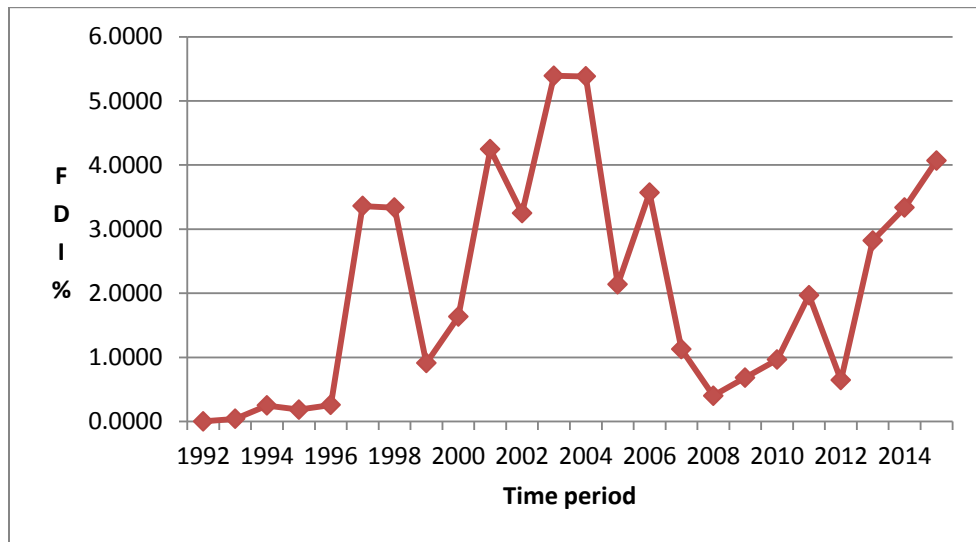


Figure 2.3.6: Trends FDI as **per cent**, GDP in USD between 1992-2015/16



Finally, the average share of trade/ GDP ratio measuring the degree of trade liberalization is found to be very low which indicates that Ethiopia's overall policy is not opened to international and economically and financially integrated with the rest of the world.

Thesis contribution

The contribution of this thesis is gives guide line on the literature, method of estimation technique that is more appropriate for the analysis than what is mostly used in the literature to the students which study in under graduate and graduate program in Ethiopia in the area of globalization, economic growth and poverty in Ethiopia. Because the study was doesn't done before this in Ethiopia. This thesis examines the relationship between economic globalization, economic growth and poverty and the interrelationship between economic growth, poverty and income inequality in Ethiopia. Most of studies use OLS, fixed effects or random effects estimation procedures (for examples Adam, 2004; Lee 2014 and Santarelli & Figini, 2006). One weakness in using these estimation techniques is that they fail to address the variable endogeneity problem associated with time series data analysis. The problem of endogeneity arises when there is a correlation between one or more of the explanatory variables and the error term. This thesis investigates the relationship between economic globalization, economic growth and poverty and the interrelationship between economic growth, poverty and income inequality in Ethiopia by specifying an ARDL model that employs a time series data estimator. We employ that was developed by Pesaran et al. (2001), to address the endogeneity problem, country specific heterogeneity, and the possibility of serial correlation in the data generating process.

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. DATA DESCRIPTION AND MODEL SPECIFICATION

3.1.1. Definition and Measurement of Variables

The study examines the correlation among economic globalization, economic growth and poverty and the interrelationship between economic growth, income inequality and poverty in Ethiopia using globalization-growth-inequality-poverty nexus based on annual time series data over the period 1980 – 2017. The data are obtained from different sources. They were retrieved from the World Development Indicators of the World Bank (2019), taken from the Global consumption and income project (GCIP) and KOF Swiss Institution of Economics (2019) database and National Bank of Ethiopia. Detailed information on the definition of variables used in the analysis is presented below:

- Globalization (GLO): Two measures of economic globalization can be used. , These are the KOF economic globalization and degree of trade openness (sum of import and export per GDP), foreign direct investment and foreign aid. The trade openness measure is premised on the argument that the more a country opens, the higher the level of its integration with the global economy and, consequently, a resultant increase in economic growth this is true in developed countries and OECD countries. Measures of trade openness include ratio of trade (exports + imports) to GDP; increase in export, Sach Warner index, and export-import ratio. It is anticipated that globalization will boost economic growth and equally and positively impact poverty reduction of these economies.
- Economic Growth is defined as the rate of growth of GDP and is used as a measure of the attractiveness of the host country's market. In this study Real GDP per capita (RGDP) and Growth rate of RGDP to measure the economic growth. Theoretically, investment will go primarily to markets that are large enough to support the scale economies needed for production. This simply means the higher the rate of growth of the GDP, the greater the possibility of increased inwards capital flow; however, considering the lack-luster performance of African economies in the last three decades, GDP growth might not have a significant effect on inward capital flows.

- Poverty index (HCI): I used the already computed GCIP statistics of head count index. primarily I decide to use the HDI UNDP statistics which having three components: living long and healthy life (measured by life expectancy), being educated (measured by adult literacy and enrolment at primary, secondary, and tertiary level) and having a decent standard of living (measured by purchasing power parity, PPP, income) but, the time series available data is small size.
- Income inequality: it can be measured using the GINI coefficient or the quintile ratio. It varies from a value of zero to a value of one, where zero indicates perfect equality (that all households had the same income), and one indicates perfect inequality (one household holds all income in the society). According to Deaton (2013), Gini coefficient is “the average difference in income between all pairs of people divided by the average income”. This coefficient is obtained by the Lorenz curve, which represents the cumulative percentage of income earned by each cumulative share of the population. For the purpose of this study the researcher used GINI coefficients that have already been computed from the Global Consumption Income Project Database.
- Control Variables (CV): are variables which affect economic growth such that Human capital (education and health expenditure) Physical capital (investment or gross capital formation), Government consumption and inflation rate.

3.1.2. Data Sources

Generally method employed in the study is based on recent advancements in the theoretical and empirical globalization-growth-poverty nexus which examine the causal nexus between economic globalization, economic growth, income inequality, and poverty, the relationship between economic globalization and economic growth, and the interrelationship between economic growth, income inequality, and poverty are examined using Auto regressive distributed lag (ARDL) bounds testing approach and multivariate Johansen co-integration test the long ran causality and the Granger causality test examine the short run and long run causality. The model is estimated by using Ordinary least Square (OLS) using annual data for 1980-2017.

1.1 The variables included in the model are: trade openness (TO), foreign direct investment (FDI), foreign aid (FA), real GDP per capita (RGDP), income inequality proxy, and poverty proxy (HCI) and KOF Economic Globalization Index and control variable (human capital, physical capital inflation rate and government expenditure). The data for all of the variables are obtained from the national bank of Ethiopia (NBE), World development indicators (WDI), ministry of finance and economic cooperation, planning and development commission, International Financial Statistics (IFS), and United Nations Development program (UNDP, IMF). Before determine the relationships of the variables first show the unit root tests using augmented Dickey-Fuller tests, pp test and DF-GLS test were employed to check for the first-order unit roots. These tests suggested that the first differences of the logarithm of TO, RGDP, GINI, and HCI, should be used in specifying and estimating the model. Based upon the arguments of Engle and Granger (1987), co integration tests have also been performed for the all variables that required differencing to achieve their stationary. Since no evidence of co integration was found, the system was estimated with differences of all system variables.

Limitation on data of poverty and income inequality

The poverty and income inequality data taken from the Global consumption and income project (GCIP) since there is limitation in the availability of time series data on those indicators in Ethiopia the most known official data of poverty and income inequality is not time series data. Poverty and income inequality projections, like some other types of projections, may indicate that existing trends and policies are likely to lead to outcomes which are judged undesirable. If new policies are then introduced, they may result in the original projections not being realized. However, this means the projections will have fulfilled one of their prime functions, to show the consequences of present demographic trends with sufficient notice for any necessary action to be taken. The projection data have its own limitation on the accuracy and there is also information on the change between the most recent projection and the previous set in the publications themselves.

3.1.3. Model specification

In this investigation I examine the relationship between economic globalization, economic growth and poverty using the globalization-growth-inequality-poverty nexus in addition to this we incorporate the globalization-growth links and the interrelationship between economic growth, inequality and poverty

The model to examine the economic globalization and economic growth link is derived from neoclassical growth model (Solow, 1957):

$$Y_t = F(K_t, A_t, L_t) \dots \dots 1$$

And its Cobb-Douglas functions:

$$F(K, AL) = K^\alpha AL^{1-\alpha}, 0 < \alpha < 1$$

$$Y_t = F \left(\begin{matrix} KOF \text{ De facto econo. Globa } t, \\ KOF \text{ De jure econo. Globa } t \end{matrix} \right) \dots \dots 2 \text{ 2018 KOF index}$$

$$\ln RGDP_t = \beta_0 + \beta_1 \ln KOFecGidf_t + \beta_2 \ln KOFecGidj_t + \epsilon_t \dots \dots 3$$

Where

- ✓ Y is economic growth at time , $t = 1, 2, 3, 4, 5 \dots \dots T$
- ✓ De facto economic globalization
- ✓ De jure economic globalization

The model to identify the relationship between globalization, growth and poverty is specified in to two ways the first, is economic globalization, economic growth and income inequality variables consider as exogenous variable i.e. real GDP per capita (proxy of economic growth, inequality (gini-coeff), KOF trade globalization and KOF financial globalization while the endogenous variable is poverty. Secondly, we change the measures of growth and economic globalization of exogenous variables i.e. growth rate of RGDP (proxy for economic growth), trade openness, foreign direct investment and foreign aid, while poverty is endogenous variable. The general forms of the estimated models are specified as follow:

Poverty1: in this model globalization measured in KOF index and economic growth measured in real GDP per capita.

$$Poverty_t = F(RGDP_t, II_t, KOFTrGi_t, KOFFiGi_t) \dots \dots 5$$

I specified the model in the log-linear form in order to incorporate the error term then the model is formulated (Lee, 2014) as:

$$\ln Poverty_t = \beta_0 + \beta_1 \ln RGDP_t + \beta_2 \ln II_t + \beta_3 \ln KOFTrGi_t + \beta_4 \ln KOFFiGi_t + \epsilon_t \dots \dots 6$$

Poverty2: in this model globalization measured in economic variable proxy i.e. trade openness, FDI & foreign aid and also economic growth is measured in growth rate of real GDP per capita.

$$Poverty_t = F(Gr.RGDP_t, II_t, Top_t, FDI_t, FA_t) \dots \dots 7$$

The model is re-specifying as follow:

$$\ln Poverty_t = \beta_0 + \beta_1 Gr.RGDP_t + \beta_2 \ln II_t + \beta_3 \ln Top_t + \beta_4 FDI_t + \beta_5 FA_t + \epsilon_t \dots \dots 8$$

The model to identify the interrelationship between economic growth, income inequality and poverty is specified as economic growth and income inequality variables consider as exogenous variable i.e. growth rate real GDP per capita (proxy of economic growth, inequality (gini-coeff), while the endogenous variable is poverty.

The general form of the estimated model is specified as follow:

$$Poverty_t = F(Gr.RGDP_t, II_t) \dots \dots 9$$

I specified the model in the log-level-log form in order to incorporate the error term then the model is formulated as:

$$\ln Poverty_t = \beta_0 + \beta_1 Gr.RGDP_t + \beta_2 \ln II_t + \epsilon_t \dots \dots 10$$

Where

- ✓ $\ln RGDP_t$ is the natural logarithm real gross domestic product per capita (a proxy for economic growth)
- ✓ $Gr.RGDP_t$ is growth rate of real gross domestic product per capita (a proxy for economic growth)
- ✓ $\ln Pov_t$ is the natural logarithm Poverty index
- ✓ $\ln II_t$ is the natural logarithm income inequality
- ✓ $\ln OP_t$ is the natural logarithm trade openness
- ✓ FDI_t is the flow of direct investment per GDP.
- ✓ FA_t is the foreign aid per GDP.
- ✓ $\ln KOFTrGi_t$ is the natural logarithm KOF trade globalization

- ✓ $\ln KOFFiGi_t$ is the natural logarithm KOF financial globalization
- ✓ β_0 is contains constants
- ✓ β_i are coefficients $i = 1, 2, 3, \dots, 5$

3.2. Method of Data Analysis and Estimation Technique

The method of data analysis and estimation technique of this paper includes the following steps: first it needs to check for the presence of a unit root in all variables in levels (see appendix 1). Second, for confirming the validity of the fitted model diagnostic tests are employed, i.e., Breusch and Godfrey LM test to check for serial correlation problem and Breusch-Pagan Godfrey heteroscedasticity test for constancy of the residuals of the residuals. Thirdly, it needs to test the presence of co integration among the variables and selection of the approach that should be used to analysis the impact of economic globalization on economic growth & poverty (see appendix 1). Finally, Granger causality will be tested by employing the Granger causality tests. In addition to the econometrics analysis and estimation technique, the study employed descriptive statistics in order to analyze the data.

3.2.1. ARDL (autoregressive distributed lag) bounds testing approach

In the last two decades, several econometric procedures were employed to investigate the co-integration relationships between macroeconomic variables. With regards to multivariate co-integration procedures of Johansen (1988), Johansen and Juselius (1990), and Johansen's (1996) full information maximum likelihood technique. A recent single co-integration approach, known as autoregressive-distributed lag (ARDL) of Pesaran et al. (2001), has become popular amongst the researchers. Pesaran et al. Co-integration approach, also known as bounds testing, has certain econometric advantages in comparison to other single co-integration procedures. They are as follows:

- ✓ endogeneity problems and inability to test hypotheses on the estimated coefficients in the long-run associated with the Engle-Granger method are avoided;
- ✓ the long and short-run parameters of the model in question are estimated simultaneously;

- ✓ the ARDL approach to testing for the existence of a long-run relationship between the variables in levels is applicable irrespective of whether the underlying variables are purely I(0), purely I(1), or fractionally integrated; and
- ✓ The small sample properties of the bounds testing approach are far superior to that of multivariate co-integration.

Mathematically, the model is presented below.

The ARDL ($p, q_1, q_2, \dots, q_k$) model specification is given as;

$$\Phi L, p y_t = \sum_{i=1}^k \beta_i L, q_i x_{it} + \delta w_t + u_t \dots \dots \dots (1)$$

Where:

$$\Phi L, p = 1 - \Phi_1 L - \Phi_2 L^2 - \dots - \Phi_P L^P$$

$$\beta L, q = 1 - \beta_1 L - \beta_2 L^2 - \dots - \beta_P L^P, \text{ for } i=1, 2, 3, \dots, k, u_t \sim \text{IID } (0; \sigma^2).$$

L is a lag operator such that $L^0 y_t = X_t, L^1 y_t = y_{t-1}$, and w_t is as x_1 vector of deterministic variables such as the intercept term, time trends, seasonal dummies, or exogenous variables with the fixed lags. $P=0,1,2,\dots,m$, $q = 0,1,2,\dots,m$, $i=1,2,\dots,k$: namely a total of $m+1$ $k+1$ different ARDL models. The maximum lag order, m , is chosen by the user. Sample period, $t = m+1, m+2, \dots, n$.

OR

The ADRL (p, q) model specification:

$$\Phi L y_t = \varphi + \theta L x_t + u_t \dots \dots \dots (2)$$

$$\text{With } \Phi L = 1 - \Phi_1 L - \Phi_2 L^2 - \dots - \Phi_P L^P,$$

$$\theta L = \beta_o - \beta_1 L - \beta_2 L^2 - \dots - \beta_P L^P$$

Hence, the general ARDL ($p, q_1, q_2, \dots, q_k$) model;

$$\Phi L y_t = \varphi + \theta_1 L x_{1t} + \theta_2 L x_{2t} + \theta_k L x_{kt} + u_t \dots \dots \dots (3)$$

Using the lag operator L applied to each component of a vector, $L^k y_t = y_{t-k}$ $Lx_t = x_{t-k}$, is convenient to define the lag polynomial $\Phi L, p$ and the vector polynomial $\beta L, p$. As long as it

can be assumed that the error term u_t is a white noise process, or more generally, is stationary and independent of $x_t, x_{t-1}, \dots$, and $y_t, y_{t-1}, \dots$, the ARDL models can be estimated consistently by ordinary least squares.

poverty2

$$Poverty_t = \beta_0 + \beta_1 Gr.RGDP_t + \beta_2 II_t + \beta_3 Top_t + \beta_4 FDI_t + \beta_5 FA_t + \dots \dots 7$$

The model is re-specifying as follow:

$$\ln Poverty_t = \beta_0 + \beta_1 Gr.RGDP_t + \beta_2 \ln II_t + \beta_3 \ln Top_t + \beta_4 FDI_t + \beta_5 FA_t + \epsilon_t \dots \dots 8$$

$$\begin{aligned} \Delta \ln Pov_t = D_1 + & \sum_{i=1}^p \theta_i \Delta \ln Pov_{t-i} + \sum_{i=1}^{q_1} \beta_i \Delta GrRGDP_{t-i} + \sum_{i=1}^{q_2} \varphi_i \Delta \ln II_{t-i} \\ & + \sum_{i=1}^{q_3} \omega_i \Delta \ln TOP_{t-i} + \sum_{i=1}^{q_4} \psi_i \Delta FDI_{t-i} + \sum_{i=1}^{q_5} \rho_i \Delta NetODA_{t-i} + \alpha_1 \ln Pov_{t-i} \\ & + \alpha_2 \ln RGDP_{t-i} + \alpha_3 \ln II_{t-i} + \alpha_4 \ln Top_{t-i} + \alpha_5 FDI_{t-i} \\ & + \alpha_6 NetODA_{t-i} + e_{1t} \end{aligned}$$

$$\begin{aligned} \Delta \ln RGDP_t = D_2 + & \sum_{i=1}^p \beta_i \Delta GrRGDP_{t-i} + \sum_{i=1}^{q_1} \theta_i \Delta \ln Pov_{t-i} + \sum_{i=1}^{q_2} \varphi_i \Delta \ln II_{t-i} \\ & + \sum_{i=1}^{q_3} \omega_i \Delta \ln TOP_{t-i} + \sum_{i=1}^{q_4} \psi_i \Delta FDI_{t-i} + \sum_{i=1}^{q_5} \rho_i \Delta NetODA_{t-i} \\ & + \alpha_2 \ln RGDP_{t-i} + \alpha_3 \ln Pov_{t-i} + \alpha_1 \ln II_{t-i} + \alpha_1 \ln Top_{t-i} + \alpha_2 FDI_{t-i} \\ & + \alpha_3 NetODA_{t-i} + e_{1t} \end{aligned}$$

$$\begin{aligned} \Delta \ln II_t = D_3 + & \sum_{i=1}^p \varphi_i \Delta \ln II_{t-i} + \sum_{i=1}^{q_1} \theta_i \Delta \ln Pov_{t-i} + \sum_{i=1}^{q_2} \beta_i \Delta GrRGDP_{t-i} \\ & + \sum_{i=1}^{q_3} \omega_i \Delta \ln TOP_{t-i} + \sum_{i=1}^{q_4} \psi_i \Delta FDI_{t-i} + \sum_{i=1}^{q_5} \rho_i \Delta NetODA_{t-i} + \alpha_1 \ln II_{t-i} \\ & + \alpha_3 \ln Pov_{t-i} + \alpha_2 \ln RGDP_{t-i} + \alpha_1 \ln Top_{t-i} + \alpha_2 FDI_{t-i} \\ & + \alpha_3 NetODA_{t-i} + e_{1t} \end{aligned}$$

$$\begin{aligned}
\Delta \ln Top_t &= D_4 + \sum_{i=1}^P \omega_i \Delta \ln TOP_{t-i} + \sum_{i=1}^{q_1} \theta_i \Delta \ln Pov_{t-i} + \sum_{i=1}^{q_2} \beta_i \Delta \ln GrRGDP_{t-i} \\
&+ \sum_{i=1}^{q_3} \varphi_i \Delta \ln II_{t-i} + \sum_{i=1}^{q_4} \psi_i \Delta FDI_{t-i} + \sum_{i=1}^{q_5} \rho_i \Delta NetODA_{t-i} + \alpha_1 \ln Top_t \\
&+ \sum_{i=1} \alpha_2 \ln RGDP_{t-i} + \sum_{i=1} \alpha_3 \ln Pov_{t-i} + \sum_{i=1} \alpha_1 \ln II_{t-i} + \alpha_2 FDI_{t-i} \\
&+ \alpha_3 NetODA_{t-i} + e_{1t} \\
\\
\Delta \ln FDI_t &= D_5 + \sum_{i=1}^P \psi_i \Delta FDI_{t-i} + \sum_{i=1}^{q_1} \theta_i \Delta \ln Pov_{t-i} + \sum_{i=1}^{q_2} \beta_i \Delta \ln GrRGDP_{t-i} \\
&+ \sum_{i=1}^{q_3} \varphi_i \Delta \ln II_{t-i} + \sum_{i=1}^{q_4} \omega_i \Delta \ln TOP_{t-i} + \sum_{i=1}^{q_5} \rho_i \Delta NetODA_{t-i} + \beta_3 FDI_{t-i} \\
&+ \sum_{i=1} \psi_2 \ln RGDP_{t-i} + \sum_{i=1} \beta_3 \ln Pov_{t-i} + \sum_{i=1} \alpha_1 \ln II_{t-i} + \alpha_2 \ln Top_{t-i} \\
&+ \alpha_1 NetODA_{t-i} + e_{1t} \\
\\
\Delta \ln NetODA_t &= D_6 + \sum_{i=1}^P \rho_i \Delta NetODA_{t-i} + \sum_{i=1}^{q_1} \theta_i \Delta \ln Pov_{t-i} + \sum_{i=1}^{q_2} \beta_i \Delta \ln GrRGDP_{t-i} \\
&+ \sum_{i=1}^{q_3} \varphi_i \Delta \ln II_{t-i} + \sum_{i=1}^{q_4} \omega_i \Delta \ln TOP_{t-i} + \sum_{i=1}^{q_5} \psi_i \Delta FDI_{t-i} + \alpha_1 NetODA_{t-i} \\
&+ \sum_{i=1} \alpha_3 \ln Pov_{t-i} + \sum_{i=1} \alpha_2 \ln RGDP_{t-i} + \sum_{i=1} \alpha_1 \ln II_{t-i} + \alpha_2 \ln Top_{t-i} + \alpha_3 FDI_{t-i} \\
&+ e_{1t}
\end{aligned}$$

Where

- ✓ $Gr.RGDP_t$ is growth rate of real gross domestic product per capita (a proxy for economic growth)
- ✓ $\ln Pov_t$ is the natural logarithm Poverty index
- ✓ $\ln II_t$ is the natural logarithm income inequality
- ✓ $\ln OP_t$ is the natural logarithm trade openness
- ✓ FDI_t is the flow of direct investment per GDP.
- ✓ FA_t is the foreign aid per GDP.

The bounds testing approach of Pesaran et al. (2001) is employed to test the existence of a co-integration relationship among the variables. The Pesaran et al. procedure involves investigating the existence of a long-run relationship in the form of the unrestricted error correction model for each variable.

The model to identify the interrelationship between economic growth, income inequality and poverty is specified as economic growth and income inequality variables consider as exogenous variable i.e. growth rate real GDP per capita (proxy of economic growth, inequality (gini-coeff), while the endogenous variable is poverty.

The general form of the estimated model is specified as follow:

$$Poverty_t = F(Gr.RGDP_t, II_t, \dots) \dots 9$$

I specified the model in the log-level-log form in order to incorporate the error term then the model is formulated as:

$$\begin{aligned} \Delta \ln RGDP_t &= \sum_{j=1}^k \theta_j \Delta \ln RGDP_{t-j} + \sum_{i=1}^k \eta_i \Delta \ln Pov_{t-i} + \sum_{m=1}^k \varphi_m \Delta \ln II_{t-m} + \alpha_1 \ln RGDP_{t-1} \\ &\quad + \psi_1 \ln Pov_{t-1} + \beta_1 \ln II_{t-1} + u_{2t} \\ \Delta \ln Pov_t &= \sum_{i=1}^k \theta_i \Delta \ln Pov_{t-i} + \sum_{j=1}^k \eta_j \Delta \ln RGDP_{t-j} + \sum_{m=1}^k \varphi_m \Delta \ln II_{t-m} + \alpha_1 \ln Pov_{t-1} \\ &\quad + \psi_2 \ln RGDP_{t-1} + \beta_3 \ln II_{t-1} + u_{1t} \\ \Delta \ln II_t &= \sum_{m=1}^k \theta_m \Delta \ln II_{t-m} + \sum_{j=1}^k \eta_j \Delta \ln RGDP_{t-j} + \sum_{i=1}^k \varphi_i \Delta \ln Pov_{t-i} + \alpha_1 \ln II_{t-1} \\ &\quad + \psi_2 \ln RGDP_{t-1} + \beta_3 \ln Pov_{t-1} + u_{3t} \end{aligned}$$

We can write the ARDL bounds testing approach to investigating the existence of a long-run relationship in the form of the unrestricted error correction model for each variable:-

$$\begin{aligned} \Delta \ln RGDP_t &= D_1 + \sum_{i=1}^p \left(\theta_i \Delta \ln RGDP_{t-i} + \eta_i \Delta \ln Pov_{t-i} + \varphi_i \Delta \ln II_{t-i} \right) + \alpha_1 \ln RGDP_{t-1} + \psi_2 \ln Pov_{t-1} + \beta_3 \ln II_{t-1} + u_{1t} \\ \Delta \ln Pov_t &= D_2 + \sum_{i=1}^p \left(\theta_i \Delta \ln Pov_{t-i} + \eta_i \Delta \ln RGDP_{t-i} + \varphi_i \Delta \ln II_{t-i} \right) + \alpha_1 \ln Pov_{t-1} + \psi_2 \ln RGDP_{t-1} + \beta_3 \ln II_{t-1} + u_{2t} \\ \Delta \ln II_t &= D_3 + \sum_{i=1}^p \left(\theta_i \Delta \ln II_{t-i} + \eta_i \Delta \ln RGDP_{t-i} + \varphi_i \Delta \ln Pov_{t-i} \right) + \alpha_1 \ln II_{t-1} + \psi_2 \ln RGDP_{t-1} + \beta_3 \ln Pov_{t-1} + u_{3t} \end{aligned}$$

The F-statistic is carried out on the joint null hypothesis that the coefficients of the lagged variables are zero. $\alpha_1 - \psi_2 - \beta_3$ Correspond to the long-run relationship, while $\theta_i - \eta_i - \varphi_i$ represent the short-run dynamics of the model.

The null hypothesis of no co-integration in the long-run between the variables in the above equation is:

$H_0 : \alpha_1 = \psi_2 = \beta_3 = 0$ (No long run relationship among the variables):

$H_1 : \alpha_1 \neq \psi_2 \neq \beta_3 \neq 0$ (The long run relationship exists).

The F-test has no standard distribution which depends on whether the variables include in the model are I(0), or I(1), the numbers of regressors', and whether the model contains an intercept and/or a trend (Narayan, 2004). To test the significance of lagged level of the variables under consideration, the appropriate statistic is F or Wald test as Pesaran et al. (2001) proposed for bound test approach will be applied. The short run Error Correction Model (ECM) integrates the short-run dynamics with the long-run equilibrium without losing long-run information.

The F-tests are used for testing the existence of long-run relationships. Thus, the Pesaran *et al* (2001). Approach compute two sets of critical values for a given significance level. One set assumes that all variables are I (0) and the other set assumes they are all I (1). If the computed F-statistic exceeds the upper critical bounds value, then the H_0 (null hypothesis) is rejected. If the F-statistic falls into the bounds, then the test becomes inconclusive. Lastly, if the F-statistic is below the lower critical bounds value, it implies no co-integration. When long-run relationship exists, the F-test indicates which variable should be normalized.

If the F-statistics (Wald test) establishes that there is a single long run relationship and the sample data size is small ($n \leq 30$) or finite, the ARDL error correction representation becomes relatively more efficient.

The ARDL model is reparametrized into ECM when there is one co-integrating vector among the underlying variables. The reparametrized result gives the short-run dynamics and long run relationship of the underlying variables.

When there are multiple long-run relationships, ARDL approach cannot be applied. Hence, an alternative approach like Johansen and Juselius (1990) becomes more appropriate.

3.2.2. Vector Error correction model

The model to identify the relationship between globalization, growth and poverty is specified in two ways the first, is economic globalization, economic growth and income inequality variables consider as exogenous variable i.e. real GDP per capita (proxy of economic growth, inequality (gini-coeff), KOF trade globalization and KOF financial globalization while the endogenous variable is poverty. Secondly, we change the measures of growth and economic globalization of exogenous variables i.e. growth rate of RGDP (proxy for economic growth), trade openness, foreign direct investment and foreign aid, while poverty is endogenous variable. The general forms of the estimated models are specified as follow:

Poverty 1

$$Poverty_t = F(RGDP_t, II_t, KOFTrGi_t, KOFFiGi_t, \dots) \dots 5$$

I specified the model in the log-linear form in order to incorporate the error term then the model is formulated as:

$$\ln Poverty_t = \beta_0 + \beta_1 \ln RGDP_t + \beta_2 \ln II_t + \beta_3 \ln KOFTrGi_t + \beta_4 \ln KOFFiGi_t + \epsilon_t \dots 6$$

$$\begin{aligned} \Delta \ln Pov_t &= D_1 + \sum_{i=1}^{k-1} \theta_i \Delta \ln Pov_{t-i} + \sum_{j=1}^{k-1} \varphi_j \Delta \ln RGDP_{t-j} + \sum_{k=1}^{k-1} \varphi_k \Delta \ln II_{t-k} \\ &+ \sum_{l=1}^{k-1} \omega_l \Delta \ln KOFTrGi_{t-l} + \sum_{m=1}^{k-1} \omega_m \Delta \ln KOFFiGi_{t-m} + \lambda_1 ECT_{t-1} + e_{1t} \\ \Delta \ln RGDP_t &= D_2 + \sum_{j=1}^{k-1} \varphi_j \Delta \ln RGDP_{t-j} + \sum_{i=1}^{k-1} \theta_i \Delta \ln Pov_{t-i} + \sum_{k=1}^{k-1} \varphi_k \Delta \ln II_{t-k} \\ &+ \sum_{l=1}^{k-1} \omega_l \Delta \ln KOFTrGi_{t-l} + \sum_{m=1}^{k-1} \omega_m \Delta \ln KOFFiGi_{t-m} + \lambda_1 ECT_{t-1} + e_{1t} \\ \Delta \ln II_t &= D_3 + \sum_{k=1}^{k-1} \varphi_k \Delta \ln II_{t-k} + \sum_{i=1}^{k-1} \theta_i \Delta \ln Pov_{t-i} + \sum_{j=1}^{k-1} \varphi_j \Delta \ln RGDP_{t-j} \\ &+ \sum_{l=1}^{k-1} \omega_l \Delta \ln KOFTrGi_{t-l} + \sum_{m=1}^{k-1} \omega_m \Delta \ln KOFFiGi_{t-m} + \lambda_1 ECT_{t-1} + e_{1t} \end{aligned}$$

$$\begin{aligned}
\Delta \ln KOFTrGi_t &= D_4 + \sum_{l=1}^{k-1} \theta_l \Delta \ln Pov_{t-l} + \sum_{i=1}^{k-1} \varphi_i \Delta \ln RGDP_{t-i} + \sum_{j=1}^{k-1} \varphi_j \Delta \ln II_{t-j} \\
&+ \sum_{k=1}^{k-1} \omega_k \Delta \ln KOFTrGi_{t-k} + \sum_{m=1}^{k-1} \omega_m \Delta \ln KOFFiGi_{t-m} + \lambda_1 ECT_{t-1} + e_{1t} \\
\Delta \ln KOFFiGi_t &= D_5 + \sum_{m=1}^{k-1} \theta_m \Delta \ln Pov_{t-m} + \sum_{j=1}^{k-1} \varphi_j \Delta \ln RGDP_{t-j} + \sum_{k=1}^{k-1} \varphi_k \Delta \ln II_{t-k} \\
&+ \sum_{l=1}^{k-1} \omega_l \Delta \ln KOFTrGi_{t-l} + \sum_{i=1}^{k-1} \omega_i \Delta \ln KOFFiGi_{t-i} + \lambda_1 ECT_{t-1} + e_{1t}
\end{aligned}$$

Where

- ✓ $\ln RGDP_t$ is the natural logarithm real gross domestic product per capita (a proxy for economic growth)
- ✓ $\ln KOFTrGi_t$ is the natural logarithm KOF trade globalization
- ✓ $\ln KOFFiGi_t$ is the natural logarithm KOF financial globalization
- ✓ $\ln Pov_t$ is the natural logarithm Poverty index
- ✓ $\ln II_t$ is the natural logarithm income inequality
- ✓ β_0 is contains constants
- ✓ β_i are coefficients $i = 1, 2, 3, \dots, 5$

3.2.3. Granger causality test

Once the variables are found to be co-integrated, then there must be Granger cause in at least one direction to hold the existence of long-run equilibrium relationship (Granger, 1986). For this reason, we estimate the following multivariate k^{th} order of vector error correction model (VECM) for testing Granger causality:

$$\begin{aligned}
 \Delta \ln Pov_t &= D_1 + \sum_{i=1}^k \theta_i \Delta \ln Pov_{t-i} + \sum_{i=0}^k \beta_i \Delta \ln RGDP_{t-i} + \sum_{i=0}^k \varphi_i \Delta \ln II_{t-i} + \sum_{i=0}^k \omega_i \Delta \ln OP_{t-i} \\
 &\quad + \sum_{i=0}^k \psi_i \Delta FDI_{t-1} + \sum_{i=0}^k \rho_i \Delta FA_{t-1} + \lambda_1 ECT_{t-1} + u_{1t} \\
 \Delta \ln RGDP_t &= D_2 + \sum_{i=1}^k \theta_i \Delta \ln RGDP_{t-i} + \sum_{i=0}^k \beta_i \Delta \ln Pov_{t-i} + \sum_{i=0}^k \varphi_i \Delta \ln II_{t-i} + \sum_{i=0}^k \omega_i \Delta \ln OP_{t-i} \\
 &\quad + \sum_{i=0}^k \psi_i \Delta FDI_{t-1} + \sum_{i=0}^k \rho_i \Delta FA_{t-1} + \lambda_2 ECT_{t-1} + u_{2t} \\
 \Delta \ln II_t &= D_3 + \sum_{i=1}^k \theta_i \Delta \ln II_{t-i} + \sum_{i=0}^k \beta_i \Delta \ln Pov_{t-i} + \sum_{i=0}^k \varphi_i \Delta \ln RGDP_{t-i} + \sum_{i=0}^k \omega_i \Delta \ln OP_{t-i} \\
 &\quad + \sum_{i=0}^k \psi_i \Delta FDI_{t-1} + \sum_{i=0}^k \rho_i \Delta FA_{t-1} + \lambda_3 ECT_{t-1} + u_{3t} \\
 \Delta \ln OP_t &= D_4 + \sum_{i=1}^k \theta_i \Delta \ln OP_{t-i} + \sum_{i=0}^k \beta_i \Delta \ln Pov_{t-i} + \sum_{i=0}^k \varphi_i \Delta \ln RGDP_{t-i} + \sum_{i=0}^k \omega_i \Delta \ln II_{t-i} \\
 &\quad + \sum_{i=0}^k \psi_i \Delta FDI_{t-1} + \sum_{i=0}^k \rho_i \Delta FA_{t-1} + \lambda_4 ECT_{t-1} + u_{4t} \\
 \Delta FDI_t &= D_5 + \sum_{i=1}^k \theta_i \Delta FDI_{t-1} + \sum_{i=0}^k \beta_i \Delta \ln Pov_{t-i} + \sum_{i=0}^k \varphi_i \Delta \ln RGDP_{t-i} + \sum_{i=0}^k \omega_i \Delta \ln II_{t-i} \\
 &\quad + \sum_{i=0}^k \psi_i \Delta \ln OP_{t-i} + \sum_{i=0}^k \rho_i \Delta FA_{t-1} + \lambda_5 ECT_{t-1} + u_{5t}
 \end{aligned}$$

$$\Delta FA_t = D_6 + \sum_{i=1}^k \theta_i \Delta FA_{t-i} + \sum_{i=0}^k \beta_i \Delta \ln Pov_{t-i} + \sum_{i=0}^k \varphi_i \Delta \ln RGDP_{t-i} + \sum_{i=0}^k \omega_i \Delta \ln II_{t-i} + \sum_{i=0}^k \psi_i \Delta \ln OP_{t-i} + \sum_{i=0}^k \rho_i \Delta FDI_{t-i} + \lambda_6 ECT_{t-1} + u_{6t}$$

$$\begin{array}{llllllllllll} \Delta \ln Pov_t & D_1 & & \theta_i & \beta_i & \varphi_i & \omega_i & \psi_i & \rho_i & \Delta \ln Pov_{t-1} & \lambda_1 & & u_{1t} \\ \Delta \ln RGDP_t & D_2 & & \beta_i & \theta_i & \varphi_i & \omega_i & \psi_i & \rho_i & \Delta \ln RGDP_{t-1} & \lambda_2 & & u_{2t} \\ \Delta \ln II_t & D_3 & + & \beta_i & \varphi_i & \theta_i & \omega_i & \psi_i & \rho_i & \Delta \ln II_{t-1} & \lambda_3 & & u_{3t} \\ \Delta \ln OP_t & D_4 & + & \beta_i & \varphi_i & \omega_i & \theta_i & \psi_i & \rho_i & \Delta \ln OP_{t-1} & \lambda_4 & ECT_{t-1} & + u_{4t} \\ \Delta FDI_t & D_5 & & \beta_i & \varphi_i & \omega_i & \psi_i & \theta_i & \rho_i & \Delta FDI_{t-1} & \lambda_5 & & u_{5t} \\ \Delta FDI_t & D_6 & & \beta_i & \varphi_i & \omega_i & \psi_i & \rho_i & \theta_i & \Delta FDI_{t-1} & \lambda_6 & & u_{6t} \end{array}$$

Where

- ✓ $\ln RGDP_t$ is the natural logarithm real gross domestic product per capita (a proxy for economic growth)
- ✓ $\ln Pov_t$ is the natural logarithm Poverty index
- ✓ $\ln II_t$ is the natural logarithm income inequality
- ✓ $\ln OP_t$ is the natural logarithm trade openness per GDP
- ✓ FDI_t is the flow of direct investment per GDP.
- ✓ FA_t is the foreign aid per GDP.
- ✓ Δ is the first difference operator; D_t is contains constants $t = 1, 2 \dots 6$
- ✓ $\theta_i, \beta_i, \varphi_i, \omega_i, \psi_i$ & ρ_i are coefficients shows the Granger causality between variables $\forall i$
- ✓ ECT_{t-1} denotes the lagged residual term generated from long run relationship,
- ✓ $u_{1t} u_{2t} \dots u_{6t}$ the residuals it are assumed to be spherically distributed and white noise.

ECT_{t-1} is the one period lagged error-correction term derived from the co-integrating equation (this term will be excluded if the variables are not co-integrated). There are two sources of causation, i.e. short run causality and long-run causality. The t-significance of the one period lagged error correction term ECT_{t-1} is normally used to determine the long-run causality and the speed of convergence to the long-run equilibrium if the system expose to shock. Statistical significance of F-statistic in first differences of the variables shows the evidence of short run causality between variables of interest. To examine the short-run causality, we used the likelihood ratio (LR) statistics.

CHAPTER FOUR

4. Results and Discussions

4.1.Descriptive Statistics

In economical and statistical analysis the first step is step of the empirical analysis is the descriptive statistics which provides the detail description of the statistical properties of the series/data used in the analysis using summary statistics (measures of central tendency, measures of dispersion and measures of normality), table and graph (time series graph, scatter plot, and histogram.... etc.). The descriptive statistics of variables are calculated in the level of the series/ data of variables not in the transformed form.

Table 4.1 Summary Statistical results for the data series 1980-2017

Variables	Gr. RGDP	Income inequality	POVERTY	KOFTRGI	KOFFIGI	TRADE OPENNESS	FDI
Mean	5.116189	0.538447	29.46609	23.92336	24.48143	30.6307	2.080983
Std. Dev.	16.38799	0.018425	5.487352	5.719334	7.873896	11.85462	1.728819
Minimum	-24.48911	0.491684	20.83962	16.58205	12.09701	10.90139	0.00162
Maximum	89.88687	0.558594	40.08256	34.394	36.63512	48.91212	5.392123
Skewness	3.756074	-0.953125	0.511712	0.420432	-0.260678	-0.108871	0.434326
Kurtosis	21.42877	2.749261	2.141663	1.715132	1.514367	1.596467	1.94296
Observations	36	36	36	36	36	36	24

Source: Authors computation.

The average of real GDP per capita was ETB 6796.47 million and the average share of investment per GDP ratio, trade openness per GDP ratio, and foreign direct investment inflow per GDP ratio was 21.44, 30.63, and 2.08 percent respectively during the study time. In general when observe the nature of skewness and kurtosis almost all the variable in the study are not

normally distributed. Since for normal distribution the skewness is equal to zero and the kurtosis is equal to three.

4.2. ECONOMETRIC ANALYSIS

In this section I organize the time series analysis as follow first, discuss the pre-estimation test such as, unit root test, decide the optimal lag length and co-integration test i.e. bound test and Johansen co-integration test ...etc. secondly, discuss the model estimated results including vector of autoregressive (VAR) model, vector error correction model (VECM) autoregressive lag distributed (ARDL) model. Finally discuss the post-estimation tests known as model diagnosis test (normality test, heteroscedasticity, autocorrelation test and multicollinearity test), model stability test (using CUSUM & CUSUMSQ) and granger causality test.

4.2.1. Unit root test

before conducting to analyze the long run and short run relationship between economic globalization, economic growth and poverty in Ethiopia firstly, identify/examine the time series properties of the variables included in the model are stationary or non-stationary (the variable has unit root) even if it is stationary identify the stationarity condition, i.e. the variable is stationary at level I (0) or stationary at first difference I (1). According to time series analysis estimating a regression and co-integration analysis without conduct stationary test the result leads to **spurious regression** which the inference (forecasting or prediction and hypothesis testing) of such regression outcomes are misleading and useless. Then for testing the stationary properties of the variables, I used the Augmented Dickey-Fuller and PP test.

Table 1: Phillips-Perron test statistic test (unit root test) results

Variables	test statistic	5 % critical value	test statistic	5 % critical value	decision
	without trend		with trend		
ln-KOFecGIdf	-1.526	-2.966	-0.929	-3.552	
ln-KOFecGIdj	-1.441	-2.966	-2.296	-3.552	
D. ln-KOFecGIdf	-5.679***	-2.969	-5.925***	-3.556	I (1)
D. ln-KOFecGIdj	-6.836***	-2.969	-6.74***	-3.556	I (1)
Ln-Poverty	-1.033	-2.975	-1.382	-3.564	
Ln-Income Inequality	-2.047	-2.975	-2.583	-3.56	
Ln-RGDP	0.574	-2.972	-1.836	-3.564	
ln-KOFTrGi	-0.946	-2.975	-1.689	-3.56	
ln-KOFFiGi	-1.746	-2.975	-1.271	-3.56	
D. Ln-Poverty	-4.045***	-2.978	-4.743***	-3.568	I (1)
D. Ln-Income Inequality	-4.444***	-2.975	-4.669***	-3.564	I (1)
D. Ln-RGDP	-5.034***	-2.978	-5.354***	-3.568	I (1)
D. ln-KOFTrGi	-5.839***	-2.975	-5.737***	-3.564	I (1)
D. ln-KOFFiGi	-5.873***	-2.975	-6.117***	-3.564	I (1)
Growth rate of RGDP	4.04***	2.972	-4.903***	-3.56	I (0)
ln-trade openness	-1.093	-2.972	-1.888	-3.56	
FDI (% of GDP)	-2.37	-2.972	-2.41	-3.6	
Net ODA (% of GDP)	-1.784	-2.972	-1.046	-3.56	
D. ln-trade openness	-5.122***	2.975	-5.036***	-3.564	I (1)
D.FDI (% of GDP)	-5.814***	3	-5.665***	-3.6	I (1)
D.Net ODA (% of GDP)	-4.766***	2.975	-5.041***	-3.564	I (1)

Source: Authors computation.

Table 2: ADF unit root test results

Variables	test statistic	5 % critical value	test statistic	5 % critical value	decision
	without trend		with trend		
ln-KOFecGIdf	-1.705	-2.969	-0.92	-3.556	
ln-KOFecGIdj	-1.327	-2.969	-2.026	-3.556	
D. ln-KOFecGIdf	-3.607***	2.972	-3.753**	-3.56	I (1)
D. ln-KOFecGIdj	-4.883***	2.972	-4.814***	-3.56	I (1)
Ln-Poverty	-1.005	-2.972	-1.307	-3.56	
Income Inequality	-1.503	-2.972	-1.925	-3.56	
Ln- RGDP	0.382	-2.975	-1.905	-3.564	
ln-KOFTrGi	-0.958	-2.975	-1.526	-3.564	
ln-KOFFiGi	-1.871	-2.975	-1.251	-3.564	
D. Ln-Poverty	-5.147***	2.975	-5.653***	-3.564	I (1)
D. Ln-Income Inequality	-3.71**	2.975	-3.834***	-3.564	I (1)
d. Ln- RGDP	-4.281***	2.978	-4.957***	-3.568	I (1)
D. ln-KOFTrGi	-3.989***	2.978	-3.918**	-3.6	I (1)
D. ln-KOFFiGi	-3.606***	2.978	-3.679**	-3.6	I (1)
Growth rate of RGDP	-3.747***	-2.975	-5.099***	-3.564	I (0)
ln-trade openness	-1.232	-2.975	-1.804	-3.564	
FDI (% of GDP)	-2.084	-3	-2.056	-3.6	
Net ODA (% of GDP)	-1.904	-2.975	-1.241	-3.564	
D. ln-trade openness	-3.287**	-2.978	-3.236	-3.568	I (1)
D.FDI (% of GDP)	-4.173***	3	-4.058***	-3.6	I (1)
D.Net ODA (% of GDP)	-3.243**	-2.978	-3.628**	-3.568	I (1)

Source: Authors computation.

based on the table 1 (PP test) and table 2 (ADF test) unit root test without trend and with trend results reported that only growth rate of RGDP per capita is stationary at the level of the variable while the others (Ln-RGDP per capita, Ln-poverty (head quant of consumption), Ln-income inequality (Gini), Ln-trade openness, FDI (% of GDP), Net ODA (% of GDP), Ln-KOF de-facto economic globalization, Ln-KOF de-Jeru economic globalization, Ln-KOF trade globalization and Ln-KOF financial globalization) are stationary at their first difference at 5% level of significance.

4.2.2. Co-integration test

The main objective of co-integration analysis is to examine and identify the long-run relationship and the short run interactions among variables. In this I will conduct three co-integration analysis. Firstly, discuss the relationship between economic growth (RGDP) and economic globalization (measured based on KOF de-facto and KOF de-Jeru economic globalization) based on VAR model. Secondly, discuss the relationship between economic globalization, economic growth and poverty based on globalization-growth-inequality-poverty nexus on two different ways of globalization measures. The first method estimates the model globalization-growth-inequality-poverty nexus relationship using trade globalization and financial globalization measures of economic globalization using vector error correction model (VECM) since, all the variables (RGDP, poverty, inequality, trade globalization and financial globalization) used in model are stationary at their first difference and consider all variables as endogens variable. The second method estimates the model globalization-growth-inequality-poverty nexus relationship using trade openness, FDI and foreign aid as measures of economic globalization using ARDL model since, the variables (growth rate of RGDP, poverty, inequality, trade openness, FDI and foreign aid) used in model are stationary at different order of integration i.e. I (0) and I (1) . Finally, discuss the interrelationship between economic-growth; inequality and poverty using ARDL model because the study variables are stationary at different order of integration that is in the level and at first difference of the variables. Generally, ARDL model can be applied if the study variables are stationary in different order of integration that means stationary in their level and first difference and also it is possible to use all the study variables are stationary at their first difference, however they are not stationary at their second difference i.e. (I (2)).

Vector error correction model (VECM) co-integration technique is the most appropriate and convenience method for estimation and examine the long-run relationships among the study variables. The Vector autoregressive (VAR) model co-integration technique is implemented when the vector error correction model variables has not co-integration in the long-run then convenience method for estimation and examine the short-run relationships among the study variables is VAR. in addition to this the main property is all the study variables are stationary only at their first difference.

In generally in the most co-integration test before implement the co-integration procedure; firstly determine the appropriate optimal lag length based on selection criteria.

4.2.3. Optimal lag length selection-order criteria

Before making co-integration test firstly, decide the most optimal lag length for the model or the variables because, using many lags leads to loss of degree of freedom, cause multicollinearity, serial correlations in the error terms and misspecifications errors. So, decide the optimal lag length using information criteria like AIC, BSIC and HQIC, the lower the values of the information criteria is the better of the model. The optimal lag length for the model vector autoregressive (VAR) model with endogenous variables such as RGDP, KOFEcGidf & KOFEcGidj in the log linear form is 1 and for the ARDL model with variables poverty, growth rate of RGDP and income inequality the optimal lag length is also 1 based on the three selection order of criteria (AIC, BSIC & HQIC) while, AIC criteria has the lower values of selection order criteria value.

In the globalization-growth-inequality- poverty nexus, co-integration for the two model the optimal lag length according to the small information criteria AIC is 4 (see appendix) but, for annual data the optimal lag length is between 1 and 2. Then I decide to use lag length 2 because for annual data the maximum length is 2 if the data not sufficient enough using 4 lag is leads to multicollinearity and loss of degree of freedom problem.

Table 3: Optimal lag length Selection-order criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	5.060266	NA	0.000179	-0.114459	0.017501	-0.0684
1	108.8139	184.4509*	9.29e-07*	-5.378551*	-4.850711*	-5.194321*
2	113.2597	7.162581	1.21E-06	-5.125536	-4.201817	-4.80313

Endogenous ln-RGDP, ln-KOFecGidf, ln-KOFecGidj

Table 4: Optimal lag length Selection-order criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-19.32923	NA	0.00081	1.395577	1.532989	1.441125
1	35.0793	95.21492*	4.76e-05*	-1.442456*	-0.892805*	-1.260262*
2	41.64847	10.26433	5.64E-05	-1.290529	-0.32864	-0.97169
3	46.66002	6.890877	7.56E-05	-1.041251	0.332876	-0.585767
4	54.52867	9.344023	8.83E-05	-0.970542	0.815824	-0.378412

Notes: - * indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5 **per cent**, level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion Endogenous (ln-poverty, growth rate RGDP, ln-income inequality) & Exogenous (cons).

Source: Authors computation.

4.2.4. Johansen co-integration test

One of the main specific objectives of this study is to analyze the relationship between economic globalization, economic growth, and poverty so; I examine this using the globalization-economic growth-inequality-poverty nexus and examine the globalization and growth links. Based on this I used trade globalization and financial globalization as measure of economic growth, real GDP per capita as measure of economic growth, income inequality(GINI index) and poverty (headcount) and de-Jeru economic globalization and de-facto economic globalization in natural logarithm transformation form. According to the stationarity test all the variables are stationary at their first difference, i.e. I (1) order of integration. Therefore I conduct the Johansen co-integration test. For the VECM model the rank test values of both trace test and maximum

eigenvalue test of the Johansen co-integration test shows the null hypothesis no co-integration among variables is rejected means there is at least one co-integrating vector among the given series but, for VAR model (globalization-growth link) the null hypothesis is not rejected (see in appendix). Then there is evidence a long run relationship between economic globalization (financial & trade globalization), economic growth, income inequality and poverty in Ethiopia the VECM is estimated. For the globalization-growth link the unrestricted VAR model is estimated

Table 5: Unrestricted Co-integration Rank Test (Trace & Maximum Eigenvalue)

Hypothesized No. of CE(s)	Trace Statistic	5% Critical Value	Max-Eigen Statistic	5% Critical Value
None *	76.47329	69.81889	38.55823	33.87687
At most 1	37.91506	47.85613	17.30789	27.58434
At most 2	20.60718	29.79707	13.96194	21.13162
At most 3	6.645239	15.49471	6.225669	14.2646
At most 4	0.41957	3.841465	0.41957	3.841465

Trace test & Max-eigenvalue test are indicates 1 co-integrating eqn(s) at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values.

Source: Authors computation from Eviews 11 software

4.2.5. ARDL (autoregressive distributed lag) bounds testing approach

The ARDL approach consists of two steps for estimation the long-run relationships among variables. First identify the co-integration among study variables by applying ARDL bounds test of F-statistic, if co-integration exists or not and finally, if there exists co-integration among study variables estimating the ECM or VECM (Vector Error Correction) model.

The bounds testing approach of Pesaran *et al.* (2001) is employed to test the existence of a co-integration relationship among the variables (Ln-poverty, Ln-RGDP, Ln-income inequality, Ln-KOFTTrGi and Ln-KOFFiGi). The Pesaran et al. procedure involves investigating the existence of a long-run relationship in the form of the unrestricted error correction model for each variable.

According to Pesaran/Shin/Smith (2001) ARDL Bounds Test the hypothesis testing is:-

H_0 : There is not a co-integration (long -run) relationship or $\alpha_1 = \psi_1 = \beta_1 = \varphi_1 = \phi_1$

H_1 : There is a co-integration (long-run) relationship or $\alpha_1 \neq \psi_1 \neq \beta_1 \neq \varphi_1 \neq \phi_1$

Table 6: ARDL bound test using model 3(constant) unrestricted constant and no Trend

Dependent Variables	F -test statistics ARDL bound test	Co-integration	Then next do
$LnPoverty_t$	F_{LnRGDP_t} 8.67 t_{LnRGDP_t} (-5.21)	Yes	Estimate ECM
$Growth\ rate\ RGDP_t$	F_{LnRGDP_t} 8.57 t_{LnRGDP_t} (-4.36)	Yes	Estimate ECM
$LnIncome\ Inequality_t$	F_{LnRGDP_t} 6.02 t_{LnRGDP_t} (-3.27)	Yes	Estimate ECM
$Lntop_t$	F_{LnRGDP_t} 5.55 t_{LnRGDP_t} (-3.70)	Yes	Estimate ECM
$FDI(\% GDP)_t$	F_{LnRGDP_t} 6.224 t_{LnRGDP_t} (1.697)	Yes	Estimate ECM
$Net\ ODA(\% GDP)_t$	F_{LnRGDP_t} 3.451 t_{LnRGDP_t} (0.216)	Inconclusive	--
F-test Statistics	10%	5%	1%
I(1) bound Critical values	3.35	3.79	4.68
I(0) bound Critical values	2.26	2.62	3.41

Source: Authors computation

When the calculated F-statistic is greater than the critical value for the upper bound I (1), then we can conclude that there is co-integration. Reject the null hypothesis no co-integration among variables then estimate the error correction model which gives the long-run relationship among variables. The ECM representation is specified as:-

$$\Delta Net\ ODA_t = D_1 + \sum_{i=1}^p \rho_i \Delta Net\ ODA(\%GDP)_{t-i} + \sum_{i=1}^{q_1} \theta_i \Delta Ln\ Pov_{t-i} + \sum_{i=1}^{q_2} \beta_i \Delta Gr\ RGDP_{t-i} \\ + \sum_{i=1}^{q_3} \varphi_i \Delta Ln\ II_{t-i} + \sum_{i=1}^{q_4} \omega_i \Delta Ln\ TOP_{t-i} + \sum_{i=1}^{q_5} \psi_i \Delta FDI(\%GDP)_{t-i} + e_{1t}$$

When there is co-integration among variable this implies that the series are related and can be combined in a linear fashion. That is, even if there are shocks in the short run, which may affect moment in the individual series, they would converge with time (in the long run). Hence, estimate both the long run and short run model. The appropriate estimation techniques are the autoregressive distributed lag (ARDL) and vector error correction (VEC) models.

When the calculated F-statistic is lower than the critical value for the lower bound I (1), then we can conclude that there is no co-integration. That is, there is no long run relationship. Do not reject the null hypothesis. Implies that do not exhibit a long run relationship. Estimate the short-run model which is there is error autoregressive distributed lag (ARDL) model is.

$$\Delta \ln Pov_t = D_1 + \sum_{i=1}^p \theta_i \Delta \ln Pov_{t-i} + \sum_{i=1}^{q_1} \beta_i \Delta GrRGDP_{t-i} + \sum_{i=1}^{q_2} \varphi_i \Delta \ln II_{t-i} + \sum_{i=1}^{q_3} \omega_i \Delta \ln TOP_{t-i} + \sum_{i=1}^{q_4} \psi_i \Delta FDI(\%GDP)_{t-i} + \sum_{i=1}^{q_5} \rho_i \Delta NetODA(\%GDP)_{t-i} + \lambda_1 ECT_{t-1} + e_{1t}$$

When the calculated F-statistic is falls between the lower bound I (0) and upper bound I (1). The test is considered inconclusive, inference cannot be made.

The bounds testing approach of Pesaran et al. (2001) is employed to test the existence of a co-integration relationship among the variables (poverty, economic growth and income inequality. According to Pesaran/ Shin/ Smith (2001) ARDL Bounds Test the hypothesis testing is:-

H_0 : There is not a co-integration (long -run) relationship or $\alpha_1 = \psi_1 = \beta_1$

H_1 : There is a co-integration (long-run) relationship or $\alpha_1 \neq \psi_1 \neq \beta_1$

Table 7: Pesaran/ Shin/ Smith (2001) ARDL Bounds Test ([1 0 0], [2 0 0] & [1 1 0])

Estimated ARDL Models Dependent Variables	F -test statistics ARDL bound test	Co-integration	Decision
Growth rate RGDP ARDL(Gr.RGDP/ln-pov, ln-inequ)	$F_{LnRGDP_t} 7.24^{***}$ $t_{LnRGDP_t} (-3.678)$	Yes	Estimate ECM
Ln-Income Inequality ARDL(ln-inequ/ln-pov, Gr.RGDP)	$F_{LnRGDP_t} 2.762$ $t_{LnRGDP_t} (-2.561)$	No	Estimate ARDL
Ln-Poverty ARDL(ln-pov/ln-inequ, Gr.RGDP)	$F_{LnRGDP_t} 11.944^{***}$ $t_{LnRGDP_t} (-4.085)$	Yes	Estimate ECM
	10%	5%	1%
I(1) bound Critical values	4.14	4.85	6.36
I(0) bound Critical values	3.17	3.79	5.15

Source: Authors computation.

The ARDL bounds test results table for the globalization-growth-inequality-poverty nexus implies that there are co-integration (long-run) relationships among poverty, economic growth and income inequality and then the null hypothesis of no co-integration is rejected when the dependent variables are Ln-poverty, Ln-RGDP, Ln-income inequality, Ln-top (trade openness), and FDI for each estimate the EC model but for the dependent variable net ODA (official developmental assistance) the bound test is inconclusive.

The ARDL bounds test results table for the growth-inequality-poverty interrelationship shows that there are co-integration (long-run) relationships among poverty, economic growth and income inequality and then the null hypothesis of no co-integration is rejected when the dependent variables are Ln-poverty, Ln-RGDP estimates the EC model but, for the dependent variable Ln-income inequality the null hypothesis of no co-integration is not rejected then estimate the ARDL model.

Generally the results of ARDL bound test of F-statistic calculated for each variable are considered as dependent variable poverty and economic growth (normalized) in the ARDL-OLS regression shows there is long-run relationships among variables poverty, economic growth and income inequality in Ethiopia then I estimate the ECM . However, for income inequality there is no long-run relationship among variables I estimate the ARD model.

4.3.Co-integration estimation results

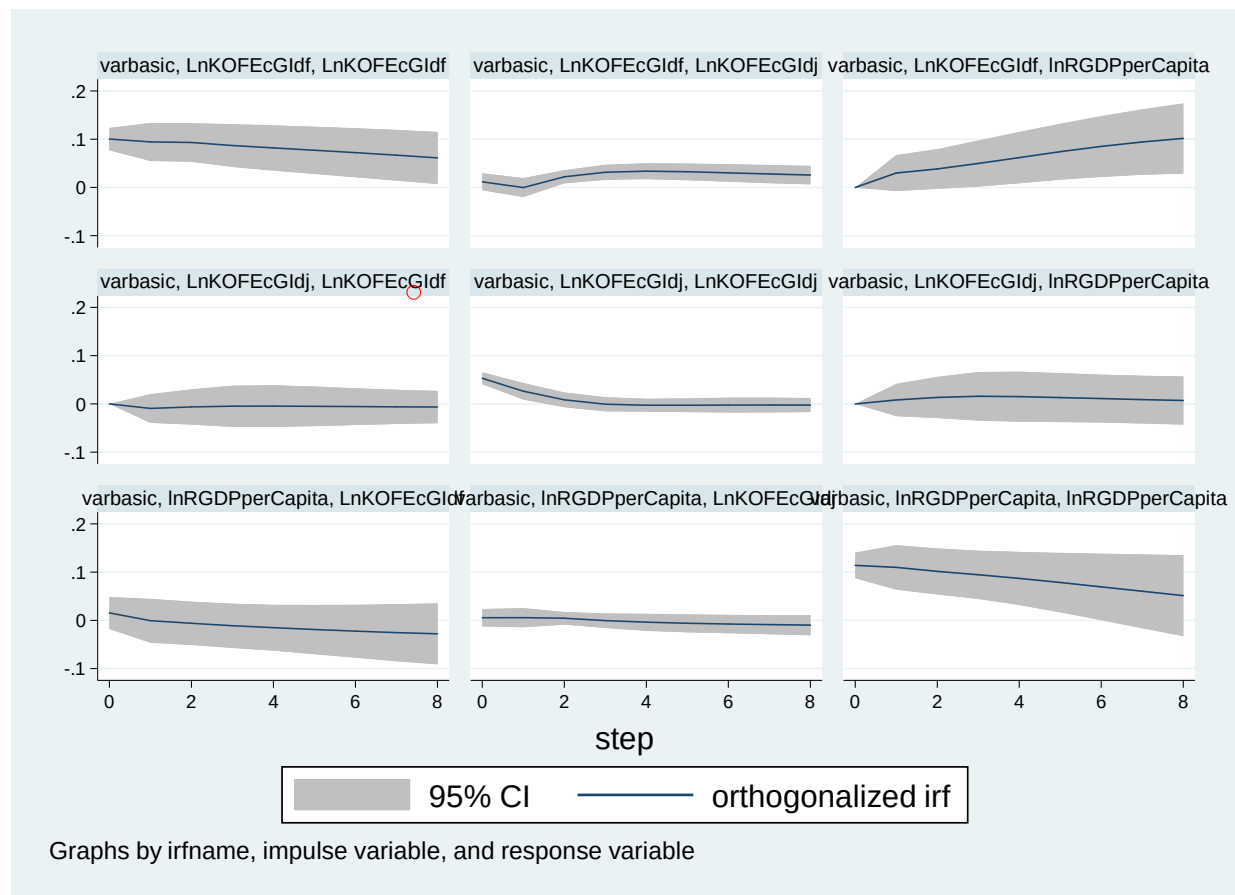
4.3.1. Vector Autoregressive (VAR) Model Estimation Result

Table 8: unrestricted VAR model result

VARIABLES	Ln-RGDP per Capita	Ln-KOFecGIdf	Ln-KOFecGIdj
L. ln-RGDP per Capita	0.918***	-0.127	0.0335
	(0.167)	(0.149)	(0.0804)
L2.lnRGDPperCapita	0.0179	0.0692	-0.0516
	(0.163)	(0.145)	(0.0785)
L. Ln-KOFecGIdf	0.282	0.963***	-0.0583
	(0.189)	(0.168)	(0.0909)
L2.Ln-KOFecGIdf	-0.167	0.0418	0.278***
	(0.209)	(0.186)	(0.1)
L. Ln-KOFecGIdj	0.154	-0.176	0.492***
	(0.321)	(0.286)	(0.154)
L2. Ln-KOFecGIdj	0.0846	0.159	-0.0985
	(0.312)	(0.278)	(0.15)
Constant	-0.505	0.56	1.301***
	(0.599)	(0.533)	(0.288)
Observations	36	36	36

Source: Authors computation.

Graph4. 3.1 VAR impulse response function



The first and second lag of $\ln\text{KOFecGIdf}$ and $\ln\text{KOFecGIdj}$ has no effect on $\ln\text{RGDP}$, on average, *ceteris paribus*. The coefficients are statistically significant at the 5 per cent; level according to the t values. The second lag of $\ln\text{KOFecGIdf}$ has positive effect on $\ln\text{KOFecGIdj}$, on average, *ceteris paribus*. The coefficients are statistically significant at the one **per cent**, level according to the t values.

A one standard deviation shock (innovation) to $\ln\text{RGDP}$ temporary increases the KOF de-facto economic globalization. The positive impact is gradually increasing; there is no steady state value. The shock to $\ln\text{RGDP}$ will have positive impact on $\ln\text{KOFecGIdf}$ in the long-run (period from 6-8) and short-run (period from 0-2). A one standard deviation shock (innovation) to $\ln\text{RGDP}$ temporary increases in the short-run and decreases after steady state value in the long-run of KOF de-Jeru economic globalization.

4.3.2. Vector Error Correction Model (VECM) Estimation result

Table 9: Normalized co-integration coefficients

1 Co-integrating Equation(s):		Log likelihood	301.4312	
Normalized co-integrating coefficients (standard error in parentheses)				
LNPOVERTY	LNRGDP PER CAPITA	LNINCOMEINEQUALITY	LNKOFTRGI	LNKOFFIGI
1	-2.380606	82.25418	-17.84959	13.50005
	(0.7783)	(16.2222)	(3.7847)	(2.17314)
	[3.058725]	[-5.07047]	[4.71625]	[-6.21223]
Adjustment coefficients (standard error in parentheses)				
D(LNPOVERTY)	0.002951			
	(0.01292)			
D(LNRGDP_PER_CAPITA)	0.008436			
	(0.01684)			
D(LNINCOME_INEQUALITY)	0.001192			
	(0.00209)			
D(LNKOFTRGI)	0.052823			
	(0.01299)			
D(LNKOFFIGI)	-0.002149			
	(0.02056)			

Source: Authors computation from Eviews 11 software

In the long run ln-RGDP per capita and ln-KOFTTrGi has positive impact while ln-income inequality and ln-KOFFiGi has a negative impact on ln-poverty, on average, ceteris paribus. The coefficients are statistically significant at the 5 **per cent**, level according to the t values.

A one percentage increase in RGDP per capita leads to 2.38 percentage increase in poverty, on average, ceteris paribus in the long run at 5 **per cent**, level of significance. A one percentage increase in income inequality leads to 82.25 percentage decline in poverty, on average, ceteris paribus in the long run at 5 **per cent**, level of significance.

A one percentage increase in KOFTiGi (trade globalization) leads to 17.85 percentage increase in poverty, on average, ceteris paribus in the long run at 5 **per cent**, level of significance. A one percentage increase in KOFFiGi (financial globalization) leads to 13.502 percentage decline in poverty, on average, ceteris paribus in the long run 5 **per cent**, level of significance. The null hypothesis of no co-integration is rejected against the alternative of a co-integration relationship in the model.

Table 10: Error correction term equation

Co-integrating Eq:	CointEq1
LNPOVERTY(-1)	1
LNRGDP_PER_CAPITA(-1)	-0.00827
	(0.09744)
	[-0.08487]
LNINCOME_INEQUALITY(-1)	8.971161
	(1.70424)
	[5.26402]***
LNKOFTRGI(-1)	-1.242163
	(0.38355)
	[-3.23861]***
LNKOFFIGI(-1)	0.38835
	(0.22823)
	[1.70159]
C	4.952013

Source: Authors computation from Eviews 11 software

$$ECT_{t-1} = [\ln Pov_{t-1} - \beta \ln RGDP_{t-i} - \phi \ln incomeinequ_{t-i} - \omega \ln KOFTTrGI_{t-i} - \psi \ln KOFFiGI_{t-i} - D_1]$$

$$ECT_{t-1} = \ln Pov_{t-1} - 0.0083 \ln RGDP_{t-i} + 8.9712 \ln incomeinequ_{t-i} - 1.2422 \ln KOFTTrGI_{t-i} + 0.3884 \ln KOFFiGI_{t-i} + 4.9520$$

According the t-statistic values in the co-integration equation shows that there is long-run relationship between income inequality and poverty and trade globalization and poverty at one **per cent**, level of significance.

A percentage change point increase in the trade globalization will leads to increase of 1.24 percentage points in poverty, on average, ceteris paribus in the long run one **per cent**, level of significance. A percentage change point decrease in the income inequality will cause the decline of 5.26 percentage points in poverty, on average, ceteris paribus in the long run one **per cent**, level of significance.

Short run coefficient for Vector of Error Correction Model (VECM) in the short-run output can specified as

$$\begin{array}{lcl}
 \Delta \ln Pov_t & D_1 & \theta_i \quad \beta_i \quad \varphi_i \quad \omega_i \quad \psi_i \quad \Delta \ln Pov_{t-1} \quad \lambda_1 \\
 \Delta \ln RGDP_t & D_2 & \beta_i \quad \theta_i \quad \varphi_i \quad \omega_i \quad \psi_i \quad \Delta \ln RGDP_{t-1} \quad \lambda_2 \\
 \Delta \ln II_t & = D_3 + \sum_{i=1}^P & \beta_i \quad \varphi_i \quad \theta_i \quad \omega_i \quad \psi_i \quad \Delta \ln II_{t-1} \quad + \lambda_3 \quad ECT_{t-1} \\
 \Delta \ln KOFTTrGi_t & D_4 & \beta_i \quad \varphi_i \quad \omega_i \quad \theta_i \quad \psi_i \quad \Delta \ln KOFTTrGi_{t-1} \quad \lambda_4 \\
 \Delta \ln KOFTTrGi_t & D_5 & \beta_i \quad \varphi_i \quad \omega_i \quad \psi_i \quad \theta_i \quad \Delta \ln KOFFiGi_{t-1} \quad \lambda_5
 \end{array}$$

$\Delta \ln Pov_t$	0.013		-0.038	-0.242	-0.802	-0.146	-0.262	$\Delta \ln Pov_{t-1}$	0.044
$\Delta \ln RGDP_t$	0.053		0.379	-0.316	9.344	-0.159	0.342	$\Delta \ln RGDP_{t-1}$	-0.312
$\Delta \ln II_t$	= 0.001	+ $\sum_{i=1}^P$	0.042	-0.029	0.748	0.018	0.0001	$\Delta \ln II_{t-1}$	+ -0.042 ECT_{t-1}
$\Delta \ln KOFTTrGi_t$	0.016		0.058	-0.077	-0.018	0.059	-0.137	$\Delta \ln KOFTTrGi_{t-1}$	0.193
$\Delta \ln KOFTTrGi_t$	0.037		-0.096	-0.136	-0.973	-0.038	-0.169	$\Delta \ln KOFFiGi_{t-1}$	0.277

The adjustment term (-0.312) in the Ln-RGDP equation is statistically significant at one **per cent**, level can be interpreted as the previous year's errors (deviation from long-run equilibrium) are corrected for within the current year at a convergence speed of 31.2 **per cent**, The adjustment term (-0.042) in the Ln-Income Inequality equation is statistically significant at one **per cent**, level can be interpreted as the previous year's errors (deviation from long-run equilibrium) are corrected for within the current year at a convergence speed of 4.2 **per cent**.

4.3.3. ARDL-ECM Estimation results

Table 11: Error Correction Results (Dep. variable: $\Delta Gr. RGDP$) ARDL (1 0 0)

VARIABLES	ADJ	LR	SR
Ln-income inequality		198.1*	
		(115.9)	
Ln-poverty		31.98	
		(23.34)	
L. growth rate RGDP	-0.617***		
	(0.169)		
Constant			11.11
			(24.66)
Observations	35	35	35
R-squared	0.407	0.407	0.407

Source: Authors computation

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The error correction term (speed of Adjustment, the first lag of economic growth) is found to be negative (-0.617) and statistically significant at one **per cent**, level of significance. The speed of adjustment process to restore the equilibrium follows a shock in the long run equilibrium relationship. The negative sign indicates of the error correction term implies that how quickly variables return to equilibrium. This result indicates almost faster an adjustment around 61.7 **per cent**, of disequilibrium of previous year's shocks back to the long-run equilibrium in the current year.

Table 12: ARDL (2 0 0) (Dep. variable: Δ inequality, log)

VARIABLES	Ln-income inequality
	1.214***
L. ln-income inequality	(0.17)
	-0.565***
L2.lnincome inequality	(0.161)
	0.000314
Growth rate RGDP	(0.00029)
	-0.0432*
Ln-poverty	(0.0254)
	-0.0735*
Constant	(0.0415)
Observations	34
R-squared	0.889

Source: Authors computation

A percentage point change in the first lag of income inequality is associated with 1.21 **per cent**, increase in income inequality output on average ceteris paribus (all things remains constant) effect in the short-run at one percent statistical significance level.

A percentage point change in the second lag of income inequality is associated with 0.565 **per cent**, decline in income inequality output on average ceteris paribus (all things remains constant) effect in the short-run at one **per cent**, statistical significance level.

A one percentage point decline in the poverty is associated with 0.043 **per cent**, decline in income inequality output, on average, ceteris paribus (all things remains constant) effect in the short-run at 10 **per cent**, statistical significance level.

Table 13: Error Correction Results (Dep. variable: Δ poverty, log) ARDL (1 1 0)

VARIABLES	ADJ	LR	SR
Growth rate RGDP		-0.0131*	
		(0.00651)	
Ln-income inequality		-5.112***	
		(0.949)	
L. ln-poverty	-0.310***		
	(0.0758)		
D. growth rate RGDP			0.00603***
			(0.00129)
Constant			0.069
			(0.189)
Observations	35	35	35
R-squared	0.615	0.615	0.615

Source: Authors computation

The error correction term (speed of Adjustment, the first lag of economic growth) is found to be negative (-0.31) and statistically significant at one **per cent**, level of significance. The speed of adjustment process to restore the equilibrium follows a shock in the long run equilibrium relationship. The negative sign indicates of the error correction term implies that how quickly variables return to equilibrium. This result indicates almost a 31 **per cent**, of disequilibrium of previous year's shocks back to the long-run equilibrium in the current year.

A one **per cent**, decrease in the income inequality rate leads to a decrease of 5.11 **per cent**, in poverty, on average, ceteris paribus in the long-run at one **per cent**, level of significance. There is a negative relation between inequality and consumption per capita. If inequality decreases by one percentage point, consumption per capita increases of 5.11 points, on average, ceteris paribus in the long-run at one **per cent**, level of significance. Therefore, poverty decreases. Inequality has a positive effect on poverty in the long term. In the short-run, poverty is strongly predicted by the first lag of growth rate of RGDP (0.006) at one **per cent**, level of significance.

Table 14: Error Correction Results (Dep. variable: $\Delta \text{Ln-poverty}$) ARDL (1 1 2 0 1 0)

ARDL Error Correction Regression

Dependent Variable: D (LNPOVERTY)

Selected Model: ARDL (1, 1, 2, 0, 1, 0)

Case 3: Unrestricted Constant and No Trend Long-run Coefficient

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Gr. RGDP	-0.019714	0.00524	-3.765263	0.0027
Ln-II	-4.131438	0.5189	-7.961921	0.0000
Ln-TOP	0.108655	0.09534	1.139634	0.2767
FDI	-0.056342	0.0129	-4.368212	0.0009
Net ODA	0.015957	0.00398	4.006211	0.0017

Source: Authors computation.

$$EC = \text{Ln-Poverty} - (-0.0197 * \text{Gr. RGDP} - 4.131 * \text{Ln-II} + 0.1087 * \text{Ln-TOP} - 0.0563 * \text{FDI} + 0.0160 * \text{NET ODA})$$

The error correction term (speed of Adjustment, the first lag of economic growth) is found to be negative (-0.755) and statistically significant at one **per cent**, level of significance. The speed of adjustment process to restore the equilibrium follows a shock in the long run equilibrium relationship. The negative sign indicates of the error correction term implies that how quickly variables return to equilibrium. This result indicates almost faster an adjustment around 75.5 **per cent**, of disequilibrium of previous year's shocks back to the long-run equilibrium in the current year.

A one **per cent**, decrease in the income inequality leads to a 4.13 percent decrease in poverty, on average, ceteris paribus in the long-run at one **per cent**, level of significance. Therefore, inequality has a positive effect on poverty in the long term. A one **per cent**, increase in the Net ODA rate leads to an increase of 0.0160 **per cent**, in poverty, on average, ceteris paribus in the long-run at one **per cent**, level of significance.

A one **per cent**, decrease in the FDI rate leads to a decrease of 0.0563 **per cent**, in poverty, on average, ceteris paribus in the long-run at one **per cent**, level of significance. This implies that poverty has negative relationship with net official development assistance and foreign direct investment. In the short-run, poverty is strongly predicted by the first lag of growth rate of RGDP (0.0135) and FDI (0.0213) at one **per cent** and 5 **per cent**, level of significance respectively.

Table 15: Error Correction Results (Dep. variable: $\Delta Gr. RGDP$) ARDL (2 1 2 2 2 2)

ARDL Error Correction Regression

Dependent Variable: D (Gr. RGDP)

Selected Model: ARDL (2, 1, 2, 2, 2, 2)

Case 3: Unrestricted Constant and No Trend Long-run Coefficient

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Ln-Poverty	-12.08953	10.62084	-1.138283	0.3066
Ln-II	58.73677	66.91193	0.877822	0.4202
Ln-TOP	-14.31322	8.096487	-1.76783	0.1373
FDI	-1.000935	0.544472	-1.838361	0.1254
Net ODA	1.144516	0.413199	2.76989	0.0394

Source: Authors computation.

The error correction term (speed of Adjustment, the first lag of economic growth) is found to be negative (-1.746) and statistically significant at one **per cent**, level of significance. The speed of adjustment process to restore the equilibrium follows a shock in the long run equilibrium relationship. This result indicates almost faster an adjustment around 174.6 **per cent**, of disequilibrium of previous year's shocks back to the long-run equilibrium in the current year.

A one **per cent**, increase in the net official development assistance leads to an increase of 1.1445 percent in growth rate of RGDP per capita, on average, ceteris paribus in the long-run at 5 **per cent**, level of significance.

In the short-run, growth rate of RGDP per capita is negatively predicted by the first and second lag of net official development assistance (-2. 805) and (-2.208) at one **per cent**, level of significance respectively. Therefore, growth rate of RGDP per capita has positive and negative relationship with net official development assistance in the long-run and short run respectively.

$$EC = Gr. RGDP - (-12.0895*Ln-Poverty + 58.7368*Ln-II -14.3132*Ln-TOP -1.0009*FDI + 1.1445*Net ODA)$$

Table 16: Error Correction Results (Dep. variable: $\Delta \ln$ -income) ARDL (1 2 2 1 2 2)

ARDL Error Correction Regression

Dependent Variable: D (LNINCOME_INEQUALITY)

Selected Model: ARDL (1, 2, 2, 1, 2, 2)

Case 3: Unrestricted Constant and No Trend Long-run Coefficient

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPOVERTY	-0.002131	0.083015	-0.025668	0.9804
GROWTH_RATE_RGDP	0.005664	0.004129	1.371713	0.2192
LNTOP	0.191487	0.052062	3.678055	0.0104
FDI	0.008955	0.009449	0.947692	0.3799
NET ODA	-0.011383	0.005072	-2.244399	0.0659

Source: Authors computation.

$$EC = Ln-II - (-0.0021*Ln-Poverty + 0.0057 *Gr. RGDP + 0.1915*Ln-TOP + 0.0090*FDI - 0.0114*Net ODA)$$

The error correction term (speed of Adjustment, the first lag of income inequality) is found to be negative (-0.514) and statistically significant at one **per cent**, level of significance. The speed of adjustment process to restore the equilibrium follows a shock in the long run equilibrium relationship. The negative sign indicates of the error correction term implies that how quickly variables return to equilibrium. This result indicates almost faster an adjustment around 51.4 **per cent**, of disequilibrium of previous year's shocks back to the long-run equilibrium in the current year.

In the long run income inequality has positive relationship with net official development assistance and negative relationship with growth rate of RGDP per capita and trade openness at 5 **per cent**, level of significance.

A one **per cent**, increase in the trade openness leads to raise of 0.1915 percent in income inequality, on average, ceteris paribus in the long-run at 5 **per cent**, level of significance. Similarly, in the short-run income inequality is negatively predicted by the first and second lag of foreign direct investment (-0.0096) and (-0.0053) at 5 **per cent**, level of significance respectively. Income inequality is positively (strongly) predicted by the first and second lag of net official development assistance (0.0084) and (0.0051) at one **per cent**, level of significance respectively

Table 17: Error Correction Results (Dep. variable: $\Delta \ln$ -trade openness) ARDL (1 0 0 0 2 2)

ARDL Error Correction Regression

Dependent Variable: D (LNTOP)

Selected Model: ARDL (1, 0, 0, 0, 2, 2)

Case 3: Unrestricted Constant and No Trend Long-run Coefficient

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPOVERTY	0.525223	0.160274	3.277031	0.0074
GROWTH RATE RGDP	-0.01342	0.005211	-2.576167	0.0258
LNINCOME INEQUALITY	5.966029	0.885021	6.741113	0.0000
FDI	-0.00095	0.01412	-0.067055	0.9477
NET ODA	0.043415	0.006749	6.432441	0.0000

Source: Authors computation.

EC = Ln-TOP - (0.5252*Ln-Poverty -0.0134*Gr. RGDP + 5.9660*Ln-II -0.0009*FDI + 0.0434*Net ODA)

The error correction term (speed of Adjustment, the first lag of trade openness) is found to be negative (-0.852) and statistically significant at one **per cent**, level of significance. The speed of adjustment process to restore the equilibrium follows a shock in the long run equilibrium relationship. The negative sign indicates of the error correction term implies that how quickly variables return to equilibrium. This result indicates almost faster an adjustment around 85.2 **per cent**, of disequilibrium of previous year's shocks back to the long-run equilibrium in the current year.

In the long run trade openness has positive relationship with net official development assistance & growth rate of RGDP per capita while, negative relationship with income inequality & poverty at one **per cent**, level of significance. In the short-run, trade openness is positively (strongly) predicted by the first and second lag of foreign direct investment and negatively predicted by the first and second lag of net official development at one **per cent**, level of significance respectively.

4.4. Model Diagnosis and Stability Test

In this section discuss about the model diagnosis, model stability and granger causality test of the model. Model diagnosis test is test the general OLS model properties tests such that normality test, autocorrelation test, heteroscedasticity test and multicollinearity ...etc. the normality test of the model reported from probability value of Jarque-Bera statistics showed that the estimated residual series is normally distributed with mean zero and constant variance. This gives evidence to reliability of the estimated parameters and important initial condition for other test of diagnosis test such as heteroscedasticity test and autocorrelation test.

In the ARDL (Ln-POV, Gr. RGD &, Ln-inequality) model the Breusch-Godfrey Serial Correlation LM Test results showed that we do not reject the null hypothesis no serial correlation at 5 **per cent**, level of significance and for Heteroscedasticity Breusch-Pagan-Godfrey test the result indicates that does not reject the null hypothesis no heteroscedasticity at 5 **per cent**, level of significance. Finally, the normality test of Jarque-Bera is showed that the model has normal distribution (see figure). In the ARDL (Ln-POV, Gr. RGDP, Ln-inequality, Ln-top, FDI & net ODA) model the Breusch-Godfrey Serial Correlation LM Test results showed that we do not reject the null hypothesis no serial correlation at 5 **per cent**, level of significance and for Heteroscedasticity Breusch-Pagan-Godfrey test the result indicates that does not reject the null hypothesis no heteroscedasticity at 5 **per cent**, level of significance. Finally, the normality test of Jarque-Bera is showed that the model has normal distribution (see ANEX 6.6 GRAPH 1 & 3).

In the VECM (Ln-POV, Gr. RGDP, Ln-inequality, Ln-KOFTTrGi & Ln-KOFFiGi) model the Breusch-Godfrey Serial Correlation LM Test result showed that we do not reject the null hypothesis no serial correlation at 5 **per cent**, level of significance and for Heteroscedasticity Breusch-Pagan-Godfrey test the result indicates that does not reject the null hypothesis no heteroscedasticity at 5 **per cent**, level of significance but, the joint normality test of Jarque-Bera is showed that the model residuals are not normal distribution. This model needs further detection the problem of normality for each variable independently.

Table 19: Model diagnosis test results

Models	Breusch-Godfrey Serial Correlation LM Test:		Heteroscedasticity Test: Breusch-Pagan-Godfrey		Prob. >Jarque-Bera
	Prob. >Chi2	Prob. > F	Prob. >Chi2	Prob. > F	
ARDL(Ln-POV, Gr. RGD & Ln-inequa)	0.7404	0.7647	0.3175	0.3444	0.18596
ARDL(Ln-POV, Gr. RGDP, Ln-inequa, Ln-top, FDI & net ODA)	0.218	0.3969	0.7182	0.8363	0.272
VECM(Ln-POV, Ln-RGDP, Ln-inequa, Ln-KOFFTrGi& Ln-KOFFiGi)	0.8671	0.8716	0.0894		0.0000

Source: Authors computation.

Most of the time model stability test is examined using cumulative sum of recursive residuals (CUSUM) and cumulative sum of square of residuals (CUSUMQ) plot. If the stability graph lies in the between 5 **per cent**, critical boundary of significance level then the model is stable. In the ARDL models such as ARDL (Ln-POV, Gr. RGD & Ln-inequality) the CUSUM graph and ARDL (Ln-POV, Gr. RGDP, Ln-inequality, Ln-top, FDI & net ODA) the CUSUMQ graph are lies inside the 5 **per cent**, critical boundary, I can conclude the models are stable. According the stability test the results of the estimated models are reliable and efficient (see Annex 6.6 figure 2&4).

4.5. Granger causality test

The granger causality test is a technique for determining whether one time series is significant in forecasting another time series (granger, 1969). the standard granger causality test (granger, 1988) seeks to determine whether the past values of a variable helps to predict the change on the other variable when there found at least one co-integration vector in them model then next perform causality test.

The result from table indicates there is unidirectional causality from economic growth (measure in RGDP) to Poverty in the short-run and strong and unidirectional causality from inequality to Poverty.

The result from table indicates there is unidirectional causality from economic growth (measure in RGDP) to Poverty in the short-run and long-run, strong and unidirectional causality from inequality to Poverty. There is unidirectional granger causality from trade openness to economic growth in the long-run, strong and unidirectional causality from trade openness to income inequality, there is also unidirectional granger causality from net official development assistance (ODA) to economic growth in the long-run (see Annex 6.7).

CHAPTER FIVE

5. Conclusions and Recommendations

This study has investigated the nature and direction of causality between economic growth, inequality and poverty. The result of bounds test for co-integration shows that there exists long-run relationship among variable in Ethiopia by using annually data for the period 1980-2015. In the long run we conclude that economic growth does not have significant effect to poverty. However economic growth has strongly predicted poverty in the short-run. The result showed that the poor might suffered more from economic growth in the short run in Ethiopia. In this study the empirical result showed that income inequality has significant and positive causality to poverty in the long run. The empirical result showed that economic growth and inequality does not have significant relationship there is theoretical conflict among the impact inequality in growth. From the interrelationship perspective views among economic growth, inequality and poverty showed that inequality does not have significant impact on economic growth in Ethiopia in the short run.

The main objective of this of this study was to analyze the relationship between some leading indicators of economic globalization (trade openness, FDI and net official development assistance (ODA)), economic growth and poverty in Ethiopia in the past three decade. The empirical result provides strong evidence that the trade openness has granger causality to economic growth and inequality and also economic growth & income inequality has granger causality to poverty and additionally the foreign direct investment and net official developmental assistance has asymmetric effect on poverty from this perspective the economic globalization has impact on poverty in the long-run and short-run time period. The official development assistance in Ethiopia has negative relationship on economic growth in the short-run but, it has positive effect on the long run.

The following Recommendations are made:

- i. Improvement in the foreign direct investment (FDI): The study showed that the net inflow of FDI in to the country is grossly inadequate to bring about any meaningful or significant impact of economic growth and negative effect on poverty in the long run in Ethiopia. So, the efforts should be made by Ethiopian government to increase the net inflows of FDI in to the country and required to invest in the most productive sectors which turns to stimulate the economy as a whole.
- ii. Fractioning out appropriate level of trade openness: There is the need for improvement in trade relationship between Ethiopia and other countries. Adequate measures should be taken to moderate trade relationship in other nations so that Ethiopia can be benefiting more from any trade relationship with other countries. This may require trade restrictions in some aspects of production so as to encourage the domestic industries and promote the real sector of the economy generally.
- iii. Government should encourage an export promotions drive to exploit the gains of trade globalization across African and the world nations.
- iv. The Government should demonstrate good governance at all tiers of government levels, in terms of protectionist domestic policy, fiscal efficiency, a relative political stability and a sound qualitative education to benefit immensely from the wave of economic globalization in the Ethiopia economy (Kuznets, 1955).
- v. Stability macroeconomic policies and poverty reduction should be instituted in order to promote economic and decrease income inequality because of its significant capacity to alleviate poverty in Ethiopia.

6. Appendices

6.1 Annex 1 ESTIMATION TECHNIQUE

Unit root test

According to Granger and Newbold (1974) and Phillips (1986), regression results may be spurious if the variables are non-stationary. To avoid spurious estimation results, it is essential to determine the order of integration for each series. To affirm the order of integration for each series, we applied the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) unit root tests. Generally, before testing for co-integration, first we want to examine whether the time series data is non-stationary not.

1. Augmented Dickey-Fuller (ADF) test

The DF test is extended to an AR (p) model.

$$Y_t = \theta_1 Y_{t-1} + \theta_2 Y_{t-2} + \dots + \theta_p Y_{t-p} + \epsilon_t$$

This similar with

$$Y_t - \theta_1 Y_{t-1} - \theta_2 Y_{t-2} - \dots - \theta_p Y_{t-p} = \epsilon_t$$

Then we can write as a function of just y_{t-1} and a series of differenced lag terms:

$$Y_t = \theta_1 + \theta_2 + \dots + \theta_p Y_{t-1} - (\theta_2 + \dots + \theta_p)(Y_{t-1} - Y_{t-2}) + \dots + \theta_p(Y_{t-p} - Y_{t-p-1}) + \epsilon_t$$

$$Y_t = \theta_1 Y_{t-1} + \theta_2 \Delta Y_{t-1} + \dots + \theta_p \Delta Y_{t-p} + \epsilon_t$$

When the error term is serially correlated then Augmented Dickey-Fuller (1979) having unit root test is used to test order of integration of the time series. In ADF test, with the assumption of no drift and trend in the data, following regressions are estimated:

$$Y_t - Y_{t-1} = \rho_1 Y_{t-1} - Y_{t-1} + \rho_2 \Delta Y_{t-1} + \dots + \rho_p \Delta Y_{t-p} + \epsilon_t$$

$$\Delta Y_t = (\rho_1 - 1)Y_{t-1} + \rho_2 \Delta Y_{t-1} + \dots + \rho_p \Delta Y_{t-p} + \epsilon_t$$

$$\Delta Y_t = (\phi_1 Y_{t-1} + \rho_2 \Delta Y_{t-1} + \dots + \rho_p \Delta Y_{t-p} + \epsilon_t$$

$$\Delta Y_t = \phi_1 Y_{t-1} + \sum_{j=2}^p \rho_j (\Delta Y_{t-j+1}) + \epsilon_t$$

$$\phi_1 = \theta_1 + \theta_2 + \dots + \theta_p - 1$$

$$\rho_j = -\theta_{j+1} + \dots + \theta_p \quad \text{where } j = 1, 2, 3, \dots, p-1$$

The null hypothesis of the Augmented Dickey-Fuller t-test is

$H_0 : \phi_1 = 0$ (i.e. the data needs to be differenced to make it stationary) Versus

$H_a : \phi_1 < 0$ (i.e. the data is stationary and doesn't need to be differenced)

The ADF test is the t-test

$$T_c = \frac{\phi_1}{s.e. \phi_1}$$

2. The Phillips-Perron (PP) Unit Root Test

The PP test is non-parametric it use Newey-West robust standard errors to account any serial correlation and heteroscedasticity in the error tem that may present in the data generating process (DGP) of MA terms by modifying the standard DF t-statistics.

The approach of Phillips and Perron (1988), based on an initial least squares fit of the regression

$$y_t = \alpha y_{t-1} + u_t$$

Phillips and Perron (PP) showed that the test statistics

$$PP = Z_\alpha = T \alpha - 1 - \frac{1}{2} \lambda^2 - S^2 \frac{1}{T^2} \sum_{t=1}^T y_{t-1}^2 \quad \text{and}$$

$$PP_t = \frac{s}{\lambda} t_{\alpha=1} - \frac{1}{2} \lambda^2 - S^2 \frac{\lambda^2}{T^2} \sum_{t=1}^T y_{t-1}^2$$

Where $\hat{\alpha}_{\alpha=1} = s^{-1} (\alpha - 1) \left(\sum_{t=1}^T y_{t-1}^2 \right)^{-1/2}$, $\hat{S}^2 = \left(\sum_{t=1}^T u_t^2 \right)^{-1/2}$ and λ^2 are estimators of the short and long run variances of u_t respectively. Following Perron and Ng (1996), two alternative estimators for the long-run variance may be considered.

Firstly, a non-parametric kernel estimator based on the sample auto-covariance's, $\lambda^2 = s_{WA}^2$ with $s_{WA}^2 = \left(\sum_{h=-T+1}^{T-1} w_h \gamma_h \right) / \sum_{h=-T+1}^{T-1} w_h^2$, $\gamma_h = T^{-1} \sum_{t=1}^{T-h} u_t u_{t+h}$

Where u_t are the OLS residuals from regressing x_t on y_{t-1} , with kernel function $\omega(\cdot)$ satisfying $\sum_{h=-\infty}^{\infty} \omega(h) = 1$ and the bandwidth parameter $m \in (0; \infty)$ satisfying $m + m^2/T \rightarrow 0$ as $T \rightarrow \infty$

Secondly, a parametric autoregressive spectral density [ASD] estimator, $\lambda^2 = s_{AR}^2$ of the form suggested by Berk (1974), where $s_{AR}^2 = \left(\sum_{k=1}^K \left(1 - \sum_{i=1}^k \alpha_i \right)^2 \right)^{-1}$ and $s_k^2 = T^{-1} \sum_{t=1}^T \epsilon_{k,t}^2$ are computed using the estimates from the ADF-type regression, for $k = 2$

$$\Delta y_t = \gamma y_{t-1} + \sum_{j=1}^k \theta_j (\Delta y_{t-j}) + \epsilon_{kt}$$

Co-integration Test

1. Multivariate Johansen co-integration test

Multivariate Johansen Co-integration test used to examine the presence of long-run relationship between poverty, economic growth, globalization, and income inequality. The main advantage of using multivariate Johansen-Juselius co-integration approach in this study is for two and more than variables of system. This methodology of analysis does not sensitive to choice of dependent variable because it assumed that all variables are endogenous (Johansen, 1988; Johansen and Juselius, 1990).

Consider a Vector Auto Regression (VAR) of order p with M I (1) variables in levels:

$$Y_t = A_0 + A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + \epsilon_t$$

Then we can write as a function of just y_{t-1} and a series of differenced lag terms:

$$Y_t - Y_{t-1} = A_0 + A_1 Y_{t-1} - Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + \epsilon_t$$

$$\Delta Y_t = A_0 + A_1 - I Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + \epsilon_t$$

$$\Delta Y_t = A_0 + A_1 - I Y_{t-1} - A_1 - I Y_{t-2} + A_1 - I Y_{t-2} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + \epsilon_t$$

$$\Delta Y_t = A_0 + A_1 - I \Delta Y_{t-1} + A_2 + A_1 - I Y_{t-2} + \dots + A_p Y_{t-p} + \epsilon_t$$

$$\Delta Y_t = A_0 + A_1 - I \Delta Y_{t-1} + A_2 + A_1 - I Y_{t-2} - A_2 + A_1 - I Y_{t-3} + A_2 + A_1 - I Y_{t-3} + A_3 Y_{t-3} + \dots + A_p Y_{t-p} + \epsilon_t$$

$$\Delta Y_t = A_0 + A_1 - I \Delta Y_{t-1} + A_2 + A_1 - I \Delta Y_{t-2} + A_3 + A_2 + A_1 - I Y_{t-3} + \dots + A_p Y_{t-p} + \epsilon_t$$

Similarly

$$\Delta Y_t = A_0 + A_1 - I \Delta Y_{t-1} + A_2 + A_1 - I \Delta Y_{t-2} + A_3 + A_2 + A_1 - I \Delta Y_{t-3} + \dots + A_{p-1} + A_{p-2} + \dots + A_2 + A_1 - I \Delta Y_{t-p-1} + A_p Y_{t-p} + \epsilon_t$$

$$\Delta Y_t = A_0 + \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \Gamma_3 \Delta Y_{t-3} + \dots + \Gamma_{p-1} \Delta Y_{t-p-1} + \Gamma_p Y_{t-p} + \epsilon_t$$

The VAR (p) can be rewritten as

$$\Delta Y_t = A_0 + \Pi Y_{t-1} + \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \Gamma_3 \Delta Y_{t-3} + \dots + \Gamma_{p-1} \Delta Y_{t-p-1} + \epsilon_t$$

$$\Delta Y_t = A_0 + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \epsilon_t$$

VAR (p) model then the error correction representation contains additionally (p-1) difference terms. The approach of Johansen is based on the maximum likelihood estimation of the matrix $(\Gamma - I)$ under the assumption of normal distributed error variables. Following the estimation the hypotheses $r = 0, r = 1 \dots r = M-1$ is tested using likelihood ratio (LR) tests. Then the Johansen-Juselius co-integration approach can be applied within the vector error-correction model (VECM) as follow:

$$\Delta Y_t = A_0 + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \epsilon_t$$

$$\Pi = \sum_{i=1}^p A_i - I$$

$$\Gamma_j = - \sum_{j=i+1}^{p-1} A_j \text{ where } i = 1, 2, 3, \dots, p$$

Where

- ✓ Δ is the first difference operator of $Y_t - Y_{t-1}$
- ✓ Y_t is of endogenous variables such that poverty, gross domestic product (GDP), income inequality, foreign aid, foreign direct investment(FDI), and trade openness.
- ✓ D_t is deterministic term which contains constants, a linear terms or seasonal dummies.
- ✓ ϵ_t are error terms assumed to be normally distributed and white noise.

All factor in this equation except ΠY_{t-1} are stationary, if the variables are cointegrating, this means also ΠY_{t-1} must be stationary. If the coefficient matrix Π has reduced rank $r \leq m$ then there exists $m \times r$ matrices α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta'Y_t$ is Stationary. r is a number of cointegrating relationships, the element of **matrix** α are known as adjustment parameters in the vector error correlation model and matrix β is a co-integrating vector.

Johansen-Juselius co-integration approach offered two likelihood ratio (LR) test statistics, namely

$$\text{Trace test, } LR \quad \lambda_{trace} = -T \sum_{i=r+1}^m \ln(1 - \lambda_i)$$

$$\text{Maximum Eigen values test, } \lambda_{max} = T \ln(1 - \lambda_{r+1})$$

Where λ_r is the Eigen value corresponding to “r” cointegration vector, $\lambda_1 \geq \lambda_2 \geq \lambda_3 \dots \geq \lambda_r$ and T is the number of observations.

The optimal VECM system for multivariate Johansen-Juselius co-integration test was determined by minimizing the system-wise Akaike Information Criterion (AIC). The AIC performed well than any other information criterions (e.g. SBC and HQ) when the estimated sample size is relatively small ((2004) and Lütkepohl (2005)).

6.2 Annex 2: Globalization index

Table 1, Components of index of globalization, 2006

A. Data on economic integration		[35%]
(i) Actual Flows		(50%)
Trade (in percentage of GDP)*	(23%)	
Foreign direct investment (in percentage of GDP)*	(29%)	
Portfolio investment (in percentage of GDP)*	(27%)	
Income payments to foreign nationals (in percentage of GDP)*	(22%)	
(ii) Restrictions		(50%)
Hidden import barriers	(20%)	
Mean tariff rate	(30%)	
Taxes on international trade (in percentage of current revenue)	(24%)	
Capital account restrictions	(26%)	
B. Data on political engagement		[28%]
Embassies in country*	(34%)	
Membership in international organizations*	(34%)	
Participation in UN Security Council missions*	(32%)	
C. Data on social globalization		[38%]

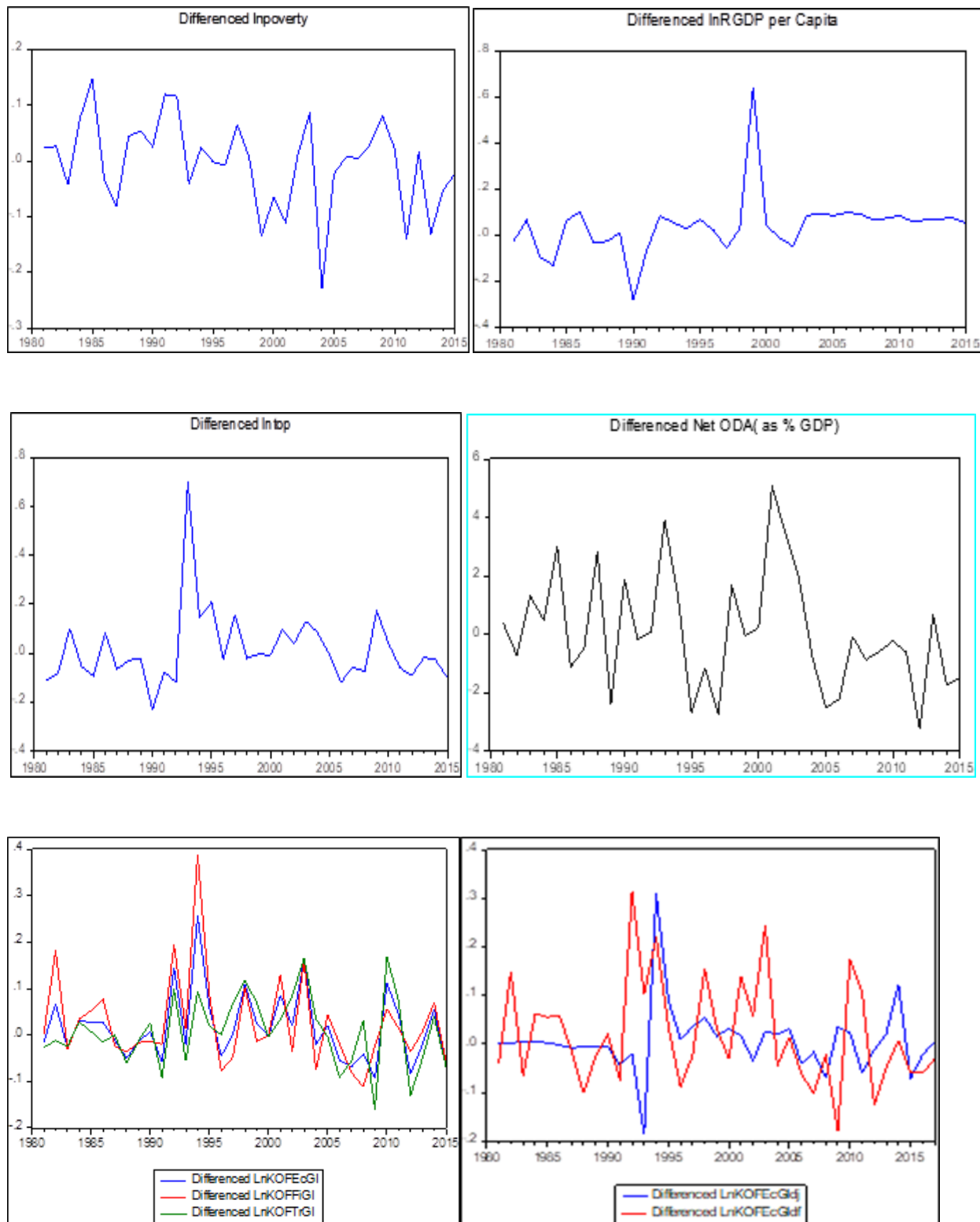
(i) Data on personal contact		(24%)
Outgoing telephone traffic*	(31%)	
Transfers (in percentage of GDP) *	(9%)	
International tourism*	(1%)	
Telephone average costs of call to USA	(33%)	
Foreign population (in percentage of total population)	(26%)	
(ii) Data on information flows		(39%)
Telephone mainlines (per 1000 people)	(18%)	
Internet hosts (per capita)*	(15%)	
Internet users (as a share of population)*	(18%)	
Cable television (per 1000 people)	(16%)	
Daily newspapers (per 1000 people)	(16%)	
Radios (per 1000 people)	(17%)	
(iii) Data on cultural proximity		(37%)
Number of McDonald's restaurants (per capita)	(100%)	

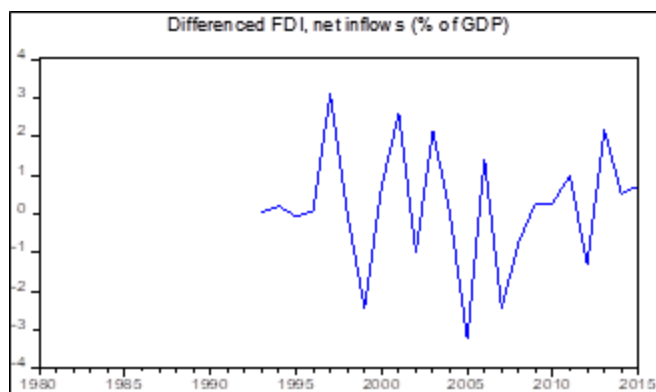
Table 2.2, Structure of the 2018 KOF Globalization Index

Globalization Index, de facto	Weights	Globalization Index, de jure	Weights
Economic Globalization, de facto	33.3	Economic Globalization, de jure	33.3
Trade Globalization, de facto	50.0	Trade Globalization, de jure	50.0
Trade in goods	38.8	Trade regulations	26.8
Trade in services	44.7	Trade taxes	24.4
Trade partner diversity	16.5	Tariffs	25.6
		Trade agreements	23.2
Financial Globalization, de facto	50.0	Financial Globalization, de jure	50.0
Foreign direct investment	26.7	Investment restrictions	33.3
Portfolio investment	16.5	Capital account openness	38.5
International debt	27.6	International Investment Agreements	28.2
International reserves	2.1		
International income payments	27.1		

Social Globalization, de facto	33.3	Social Globalization, de jure	33.3
Interpersonal Globalization, de facto	33.3	Interpersonal Globalization, de jure	33.3
International voice traffic	20.8	Telephone subscriptions	39.9
Transfers	21.9	Freedom to visit	32.7
International tourism	21.0	International airports	27.4
International students	19.1		
Migration	17.2		
Informational Globalization, de facto	33.3	Informational Globalization, de jure	33.3
Used internet bandwidth	37.2	Television access	36.8
International patents	28.3	Internet access	42.6
High technology exports	34.5	Press freedom	20.6
Cultural Globalization, de facto	33.3	Cultural Globalization, de jure	33.3
Trade in cultural goods	28.1	Gender parity	24.7
Trade in personal services	24.6	Human capital	41.4
International trademarks	9.7	Civil liberties	33.9
McDonald's restaurant	21.6		
IKEA stores	16.0		
Political Globalization, de facto	33.3	Political Globalization, de jure	33.3
Embassies	36.5	International organizations	36.2
UN peace keeping missions	25.7	International treaties	33.4
International NGOs	37.8	Treaty partner diversity	30.4

6.3 Annex 3: Stationary of variables in graph





6.4 Annex 4: Lag length Selection of model

Table 1: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-81.38128	NA	0.000114	7.943753	8.24131	8.013849
1	22.97746	142.3074*	2.61E-07	1.729322	3.812221	2.21999
2	80.26391	46.87073	9.44e-08*	-0.205810*	3.662432*	0.705431*

Endogenous variables: Ln-Poverty Gr. RGDP Ln-II Ln-TOP FDI Net ODA

Table 2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	21.15636	NA	2.66E-07	-0.950374	-0.725909	-0.873825
1	153.7343	218.3636	4.84E-10	-7.278486	-5.931697*	-6.819193
2	188.7299	47.34709*	2.98e-10*	-7.866467*	-5.397354	-7.024429*

Endogenous variables: Ln-POVERTY Ln-RGDP Ln-II Ln-KOFTRGI Ln-KOFFIGI

6.5 Annex 5: ARDL-ECM ESTIMATION RESULTS

Table 1: Error Correction Results (Dep. variable: $\Delta \text{Ln-poverty}$) ARDL (1 1 2 0 1 0)

VARIABLES	ADJ	LR	SR
Growth rate RGDP		-0.0197***	
		(0.00524)	
Ln-income inequality		-4.131***	
		(0.519)	
Ln-top		0.109	
		(0.0953)	
FDI		-0.0563***	
		(0.0129)	
Net ODA		0.0160***	
		(0.00398)	
L. ln-poverty	-0.755***		
	(0.145)		
D. growth rate RGDP			0.0135***
			(0.00313)
D. ln-income inequality			1.878
			(1.082)
LD. ln-income inequality			1.601
			(0.949)
D.FDI			0.0213**
			(0.00967)
Constant			0.344
			(0.44)
Observations	23	23	23
R-squared	0.849	0.849	0.849

Source: Authors computation

Table 2: Error Correction Results (Dep. variable: Δ Gr. RGDP) ARDL (2 1 2 2 2 2)

VARIABLES	ADJ	LR	SR
LD. Growth rate RGDP			0.36
			(0.281)
D. ln-poverty			14.65
			(14.4)
D. ln-income inequality			100.2
			(81.28)
LD. ln-income inequality			116.4
			(132.4)
D. ln-top			14.28
			(9.323)
LD. ln-top			8.822
			(5.488)
D.FDI			2.403
			(1.318)
LD.FDI			1.533
			(1.009)
D.Net ODA			-2.805***
			(0.663)
LD.Net ODA			-2.208**
			(0.572)
ln-poverty		-12.09	
		(10.62)	
ln-income inequality		58.74	
		(66.91)	
ln-top		-14.31	
		(8.096)	
FDI		-1.001	
		(0.544)	
Net ODA		1.145**	
		(0.413)	
L. growth rate RGDP	-1.746***		
	(0.4)		
Constant			213.7***
			(52.42)
Observations	22	22	22
R-squared	0.94	0.94	0.94

Source: Authors computation

Table 3: Error Correction Results (Dep. variable: $\Delta \text{Ln-II}$) ARDL (1 2 2 1 2 2)

VARIABLES	ADJ	LR	SR
D. ln-poverty			-0.0476
			(0.0408)
LD. ln-poverty			0.049
			(0.0338)
D. growth rate RGDP			-0.000824
			(0.00126)
LD. Growth rate RGDP			-0.00148
			(0.000981)
D. ln-top			-0.0311
			(0.0291)
D.FDI			-0.00959**
			(0.00286)
LD.FDI			-0.00529**
			(0.00157)
D.Net ODA			0.00854***
			(0.00184)
LD.Net ODA			0.00509**
			(0.00176)
Ln-poverty		-0.00213	
		(0.083)	
Growth rate RGDP		0.00566	
		(0.00413)	
Ln-top		0.191**	
		(0.0521)	
FDI		0.00895	
		(0.00945)	
Net ODA		-0.0114*	
		(0.00507)	
L. ln-income inequality	-0.514*		
	(0.214)		
Constant			-0.625**
			(0.169)

Source: Authors computation

Table 4: Error Correction Results (Dep. variable: $\Delta \text{Ln-Top}$) ARDL (1 0 0 0 2 2)

VARIABLES	ADJ	LR	SR
Ln-poverty		0.525***	
		(0.16)	
Growth rate RGDP		-0.0134**	
		(0.00521)	
Ln-income inequality		5.966***	
		(0.885)	
FDI		-0.00095	
		(0.0141)	
Net ODA		0.0434***	
		(0.00675)	
L. ln-top	-0.852***		
	(0.23)		
D.FDI			0.0411***
			(0.0123)
LD.FDI			0.0379***
			(0.0115)
D.Net ODA			-0.0612***
			(0.0175)
LD.Net ODA			-0.0329**
			(0.0148)
Constant			4.350**
			(1.412)
Observations	22	22	22
R-squared	0.841	0.841	0.841

Source: Authors computation

Table 5: Error Correction Results (Dep. variable: ΔFDI) ARDL (2 2 0 2 0 2)

VARIABLES	ADJ	LR	SR
LD.FDI			-1.077***
			(0.232)
D. ln-poverty			-7.14
			(4.001)
LD. Ln-poverty			4.452
			(3.406)
D. ln-income-inequality			-63.58*
			(30.23)
LD. Ln-income inequality			-82.60**
			(33.14)
D.Net ODA			0.925***
			-0.236
LD. Net ODA			0.558**
			(0.168)
Ln-poverty		-8.572	
		(7.461)	
Growth rate RGDP		-0.269	
		(0.217)	
Ln-income inequality		25.52	
		(71.95)	
Ln-top		-16.56	
		(13.1)	
Net ODA		1.450*	
		(0.704)	
L.FDI	0.565		
	(0.328)		
Constant			-51.04**
			(18.39)
Observations	22	22	22
R-squared	0.901	0.901	0.901

Source: Authors computation

Table 6: Selected Model: ARDL (2, 1, 0, 2, 1, 0)

Dependent Variable: NET ODA

Method: ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
NET ODA (-1)	0.914951	0.181618	5.03778	0.0003
NET ODA (-2)	0.139326	0.241227	0.577574	0.5742
Ln-POVERTY	3.410274	5.130395	0.66472	0.5188
Ln-POVERTY(-1)	8.168763	5.246067	1.557121	0.1454
GROWTH_RATE_RGDP	-0.24099	0.132009	-1.825532	0.0929
Ln-INCOME_INEQUALITY	82.20896	29.02334	2.832512	0.0151
Ln-INCOME_INEQUALITY(-1)	-48.6041	38.1405	-1.274344	0.2267
Ln-INCOME_INEQUALITY(-2)	58.83984	30.25807	1.9446	0.0756
Ln-TOP	1.571597	2.56226	0.613363	0.5511
Ln-TOP(-1)	-5.7523	2.512602	-2.289378	0.041
FDI	0.24933	0.236364	1.05486	0.3123
C	32.86315	15.70712	2.092245	0.0583
R-squared	0.916566	Mean dependent var		11.1349
Adjusted R-squared	0.840084	S.D. dependent var		3.71469
S.E. of regression	1.485485	Akaike info criterion		3.936213
Sum squared resid	26.48	Schwarz criterion		4.52524
Log likelihood	-35.2346	Hannan-Quinn criter.		4.092
F-statistic	11.98414	Durbin-Watson stat		2.3916
Prob(F-statistic)	0.000076			

Source: Authors computation

Table 7: Short run coefficient of Vector Error Correction model

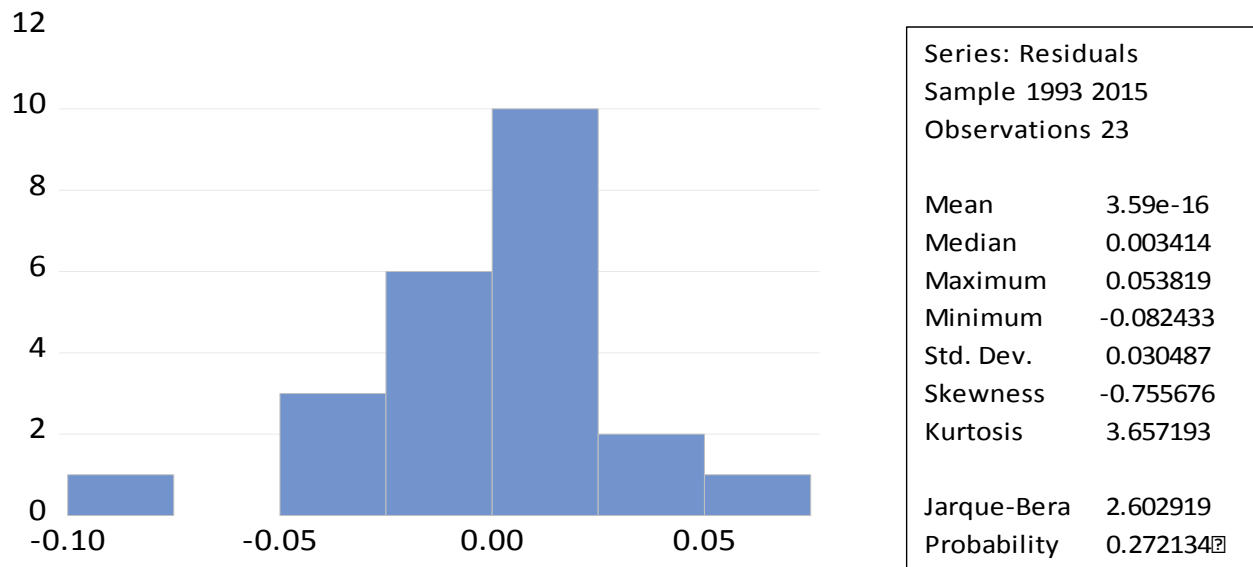
Error Correction:	D(Ln-POV)	D(Ln-RGDP)	D(Ln-II)	D(LNKOFTRGI)	D(LNKOFFIGI)
CointEq1(speed of adjustment)	0.044238	-0.312413	-0.041986	0.193351	0.277359
	(0.09504)	(0.11436)	(0.01545)	(0.10369)	(0.13138)
	[0.46545]	[-2.73184]***	[-2.71754]***	[1.86463]	[2.11117]**
D(Ln-POV(-1))	-0.037829	0.378961	0.041665	0.057447	-0.095493
	(0.17178)	(0.2067)	(0.02792)	(0.18742)	(0.23745)
	[-0.22021]	[1.83342]	[1.49205]	[0.30652]	[-0.40215]
D(L-RGDP (-1))	-0.241829	-0.315739	-0.028531	-0.076879	-0.136284
	(0.12023)	(0.14467)	(0.01954)	(0.13117)	(0.16619)
	[-2.01135]**	[-2.18252]	[-1.45981]	[-0.58608]	[-0.82003]
D(Ln-INCOME INEQUALITY (-1))	-0.801607	9.343971	0.747469	-0.017468	-0.972988
	(1.15347)	(1.3879)	(0.1875)	(1.25845)	(1.59442)
	[-0.69495]	[6.73247]***	[3.98644]	[-0.01388]	[-0.61024]
D(LNKOFTRGI (-1))	-0.145967	-0.159149	0.018437	0.059365	-0.038009
	(0.20059)	(0.24135)	(0.03261)	(0.21884)	(0.27727)
	[-0.72770]	[-0.65941]	[0.56544]	[0.27127]	[-0.13708]
D(Ln-KOFFIGI (-1))	-0.261897	0.341775	0.000121	-0.137236	-0.169302
	(0.16044)	(0.19305)	(0.02608)	(0.17504)	(0.22178)
	[-1.63235]	[1.77040]	[0.00463]	[-0.78400]	[-0.76339]
C	0.013986	0.052827	0.001094	0.01612	0.03662
	(0.01374)	(0.01653)	(0.00223)	(0.01499)	(0.01899)
	[1.01788]	[3.19521]*	[0.48971]	[1.07529]	[1.92804]

Source: Authors computation from Stata-15 software

Standard errors in () & t-statistics in []

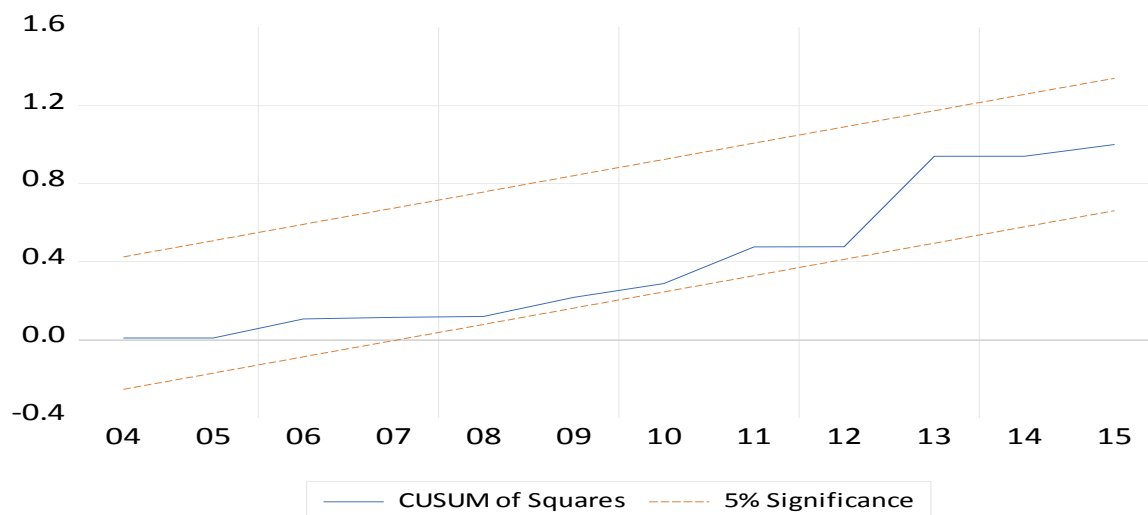
6.6 Annex 6: STABILITY AND DIAGNOSIS TEST GRAPHICALLY

Graph 1: Normality test of ARDL (Ln-pov, Gr. RGDP, Ln-II, Ln-TOP, FDI and net-ODA)



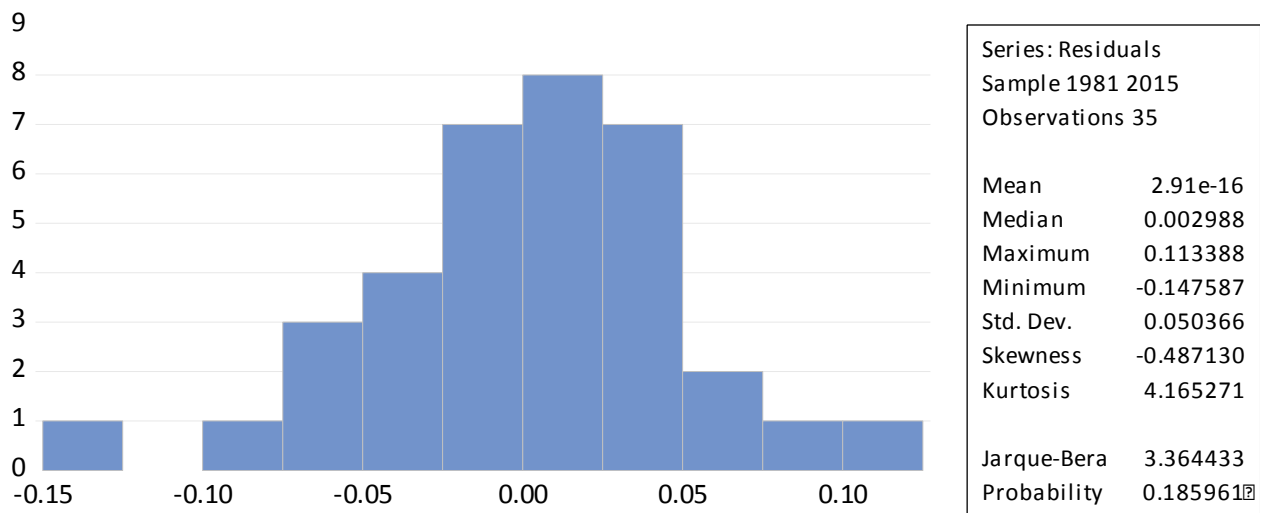
Source: Authors computation

Graph 2: CUSUMQ Stability test of ARDL (Ln-pov, Gr. RGDP, Ln-II, Ln-TOP, FDI and net-ODA)



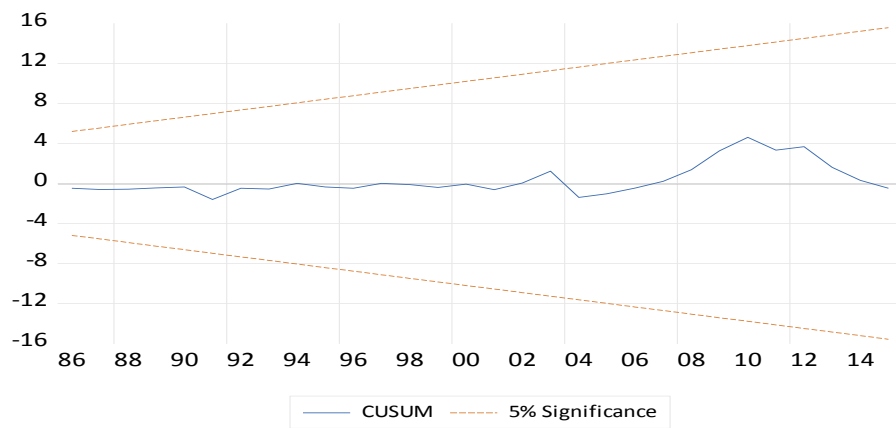
Source: Authors computation

Graph 3: Normality test of ARDL (Ln-pov, Gr. RGDP and Ln-inequality)



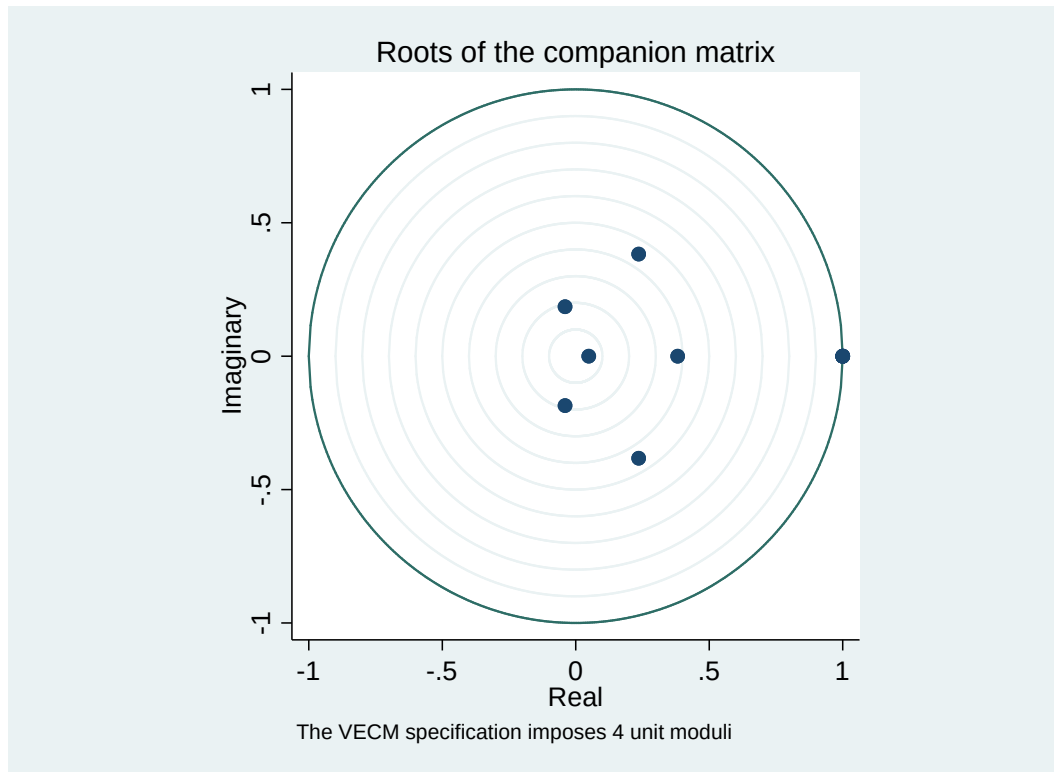
Source: Authors computation

Graph 4: CUSUM Stability test of ARDL (Ln-pov, Gr. RGDP and Ln-inequality)



Source: Authors computation

Graph 5: Eigen values Stability test of VEC Model



Source: Authors computation

6.7 Annex 7: Granger causality results

Table 1: Results of short-run, long-run and Granger causality results for ARDL model

Dependent variable	Ln-POVERTY	Gr. RGDP	Ln-INCOME INEQUALITY	ECT	Pair wise Granger Causality Tests
Ln-POVERTY		-0.013254* 0.006 *** ST	-5.113223***	-0.306867***	Ln-inequality Granger Cause Ln-poverty
Gr. RGDP	33.54794		205.6168*	-0.616226***	Gr. RGDP Granger Cause Ln-poverty
Ln-INCOME INEQUALITY	Income inequality predicted by its first and second lags in the SR				

Source: Authors computation

Table 2: Results of short-run, long-run and Granger causality results for VECM model

Null Hypothesis:	Obs.	F-Statistic	Prob.
Ln-RGDP does not Granger Cause Ln-POVERTY	34	6.82792	0.0037
Ln-II does not Granger Cause Ln-POVERTY	34	6.05098	0.0064
Ln-KOFTRGI does not Granger Cause Ln-POVERTY	34	4.94232	0.0142
Ln-POVERTY does not Granger Cause Ln-KOFTRGI		3.39957	0.0472
Ln-KOFFIGI does not Granger Cause Ln-POVERTY	34	5.54941	0.0091
Ln-II does not Granger Cause Ln-RGDP	34	18.9034	6.00E-06
Ln-RGDP does not Granger Cause Ln-II		5.45562	0.0097

Source: Authors computation

Table 3: Results of short-run, long-run and Granger causality results for ARDL model

Variables Dependent	ln-poverty	Gr. RGDP	Ln-inequality	Ln-top	FDI	Net ODA	ECT
ln-poverty (LR)		-0.0197***	-4.131***		-0.0563***	0.0160***	-0.755***
Short-run		0.0135***			0.0213**		
Gr. RGDP (LR)						1.145**	-1.746***
Short-run						-2.805***	
Ln-inequality (LR)				0.191**			-0.514*
Short-run					-2.805***	0.00854***	
Ln-top (LR)	0.525***	-0.0134**	5.966***			0.0434***	-0.852***
Short-run					0.0411***	-0.0612***	
FDI (LR)							0.565
Short-run			-1.077***			0.925***	

Source: Authors computation

Table 4: Pair wise Granger Causality Tests ARDL model

Null Hypothesis:	Obs.	F-Statistic	Prob.
Gr. RGDP does not Granger Cause Ln-POVERTY	34	10.1422	0.0005
Ln-INCOME INEQUALITY does not Granger Cause Ln-POVERTY	34	6.05098	0.0064
Ln-TOP does not Granger Cause Gr. RGDP	34	3.93976	0.0306
NET ODA does not Granger Cause Gr. RGDP	34	3.61439	0.0397
Ln-TOP does not Granger Cause Ln-INCOME INEQUALITY	34	3.35232	0.049

Source: Authors computation

7 Reference

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