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Assessing the impact of income inequality on economic growth:

Evidence from Ethiopia

Author

Andualem Sisay

Supervisor

Tadele Ferede (PhD)

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The impact of income inequality on economic growth

In Ethiopia: ARDL Approach

By: Andualem Sisay

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This is to certify that the thesis prepared by Andualem Sisay entitled with the impact of income inequality on economic growth In the case of Ethiopia Evidence from ARDL Approach and submitted in partial fulfillment of the requirements for the Degree of Master of Science in Economics complies with the regulations of the University and meets the accepted standards with respect to originality and quality. Signed by the Examining Committee:

Eternal Examiner _____Signature_____Date_____

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Advisor _____Signature_____Date_____

Declaration

I hereby declare that this MScs. thesis entitled "The impact of income inequality on economic growth in Ethiopia" was carried out by me for the masters of economics under the guidance and supervision of Dr. Tadele Ferede, Addis Ababa University, College of Business and Economics, Department of Economics. The interpretations put forth are based on my reading and understanding of the original texts and they are not published anywhere in the form of books, articles and reports. The other books, articles and websites, which I have made use of are acknowledged at the respective place in the text. For the present thesis, which I am submitting to the University, no degree or diploma or distinction has been conferred on me before, either in this or in any other University.

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LIST OF ACRONYMS

ADF- Augmented Dickey Fuller

ADI- African Development Indicators

ARDL- Auto Regressive Distributed Lag model

Bop- Balance of Payments

CPI- Consumer price index

CSA -Central Statistical Agency

ECM -Error Correction Method

GDP- Gross Domestic Product

IMF- International Monetary Fund

IMF- International Monetary Fund

LCH -Liquidity Constraint Hypothesis

LICs- Low-income countries

LM -Lagrange multiplier

MDGs- Millennium Development Goals

MDRI -Multilateral Debt Relief Initiative

NPG- Non- Ponzi Game condition

MENA- Middle East and North Africa

MOFEC- Ministry of Finance and Economic Corporation

NBE- National Bank of Ethiopia

OLS- Ordinary Least Square

PPF- Production Possibility Frontier

PPP- Purchasing power parity

OECD- Organization for Economic Co-operation and Development

SSA -Sub-Saharan Africa

UN -United Nation

VIF -Variance inflated Factor

WB -World Bank

WDI- World Development Indicator

Abstract

Identifying the impact of income inequality on economic growth has paramount importance for shared and broad-based economic growth. Thus this study was conducted to examine the effect of income inequality on economic growth evidence from Ethiopia. To achieve this objective time series data from 1982 to 2019 was used and it is examined by using ARDL estimation technique. Economic growth was used as dependent variable and income inequality, population growth, urbanization, inflation and financial development were used as independent variables. The estimation result revealed that in the long run urbanization, financial development, population growth and income inequality have positive significant effect. While in the short run urbanization and financial development have negative significant effect, but population growth and income inequality have positive significant effect. The coefficient of the ECM is negative 0.913 and this signifies that a deviation from the long-run equilibrium subsequent to a short-run shock is corrected by about 91.3 percent at the end of each year. Based on the findings the study recommends that the government and other concerning body the government has to implement pro-poor strategy to include all section of the economy from the benefits of growth, improving the performance of secondary market.

Key words: income inequality; ARDL; economic growth

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

The capitalist system, which brought us industrialization, increasing productivity and improved quality, has influenced economies of nearly all countries around the world and make it one total and interdependent system. Owing to this fact the world economy has experienced the highest rates of growth ever attained during the last century. Unfortunately, despite the high growth levels two-thirds of world population still lives in poverty even in economies with relatively high rates of economic growth. The connection between income inequality and economic growth is the most important one in economics particularly in development economics (hamid, 2013).

This relationship has attracted a lot of attentions, particularly development economists, who forwarded a lot of ideas to explain the issue. Some of the ideas say that there is a conflict between equitable distribution of income and economic growth and believe that in any country, unequal distribution of income is inevitable at its early stage of development. Because of this unequal distribution of income the wealthy section of the society consume fewer amounts and desire more saving and accumulate more capital that leads to more economic growth through investment. However, still there is no clear agreement to be reached whether there is a positive or negative relationship between income inequality and economic growth. The direction of Causality is not clear; i.e. Income inequality is the most important factors that should to be related to the rate of economic growth in the process of national income distribution. Understanding the relationship between these two economic variables is important because of higher income inequality is often found in developing countries (Todaro, 2002).

If there is a clear understanding about the relationship between income inequality and the rate of economic growth, particular economic policies could be employed in the developing countries in the appropriate manner to deal with income inequality and encourage economic growth (Hyse, 1995). There are studies that show the worsening of income inequality at early stage of development as the economy growth (Kuznets Hyse, Chenery, 1955). This income inequality and economic growth (per capital income) relationship may be described by the Kuznets curve is called Kuznets inverted u hypothesis. **(**Kuznets, 1955). Ethiopia has been registering one of the

countries which have high economic growth with average Gross Domestic Product (GDP) growth rate of 6.1 percent, which is about the double of the average growth for Sub Saharan Africa (World Bank, 2020). According to World Bank report on world development indicators (WDI) 2012, the top 10 percent of the population receives 28 percent out of country's total income and in contrast to the bottom 20 percent of the population receives only 8 percent of a country's total income. This fact gives rise to the studies of the relationship between economic growth and income inequality and has occupied the attention of the profession for some 50 years. This paper will attempt to contribute more than was first mentioned relevant evidence to show the effect of income inequality on economic growth in Ethiopia even though it does not provide a definitive answer on the relationship between economic growth and income inequality.

1.2. Statements of the Problem

The relationship between income inequality and economic growth is one of the most interesting, important and challenging areas in modern society. The greatest degree of income inequality in the developing countries appears largely due to the higher share of income received by the richest five percent of income recipients. (Adelman and Morris, 1973) about thirty percent of income in developing urban countries compared with twenty percent in developed urban countries. Many studies have been also conducted to examine the linkage between economic growth and income inequality in different countries for different period of time. To conclude in Ethiopia, varies studies have been conducted at different time in different ways to have better understanding of the issue and came up with the appropriate solution for the problem.

Income inequality continues to be a constraint for human development and it is one of the most serious challenges facing development strategy. Among the inequality that reduce rural development include unequal distribution of basic facility like rode electricity and lower earing for the same work and unequal political participation this is indirectly possible because of not access media in most rural part of the country. The unequal situation of rural part of this county lead to rural selected poverty. The Kuznets curve illustrates this relationship; the level of inequality first rises at the early stage of economic growth and then starts declining at the later phases of economic growth. The Kuznets curve is an inverted U-shaped curve (which is quadratic). Kuznets describes a positive relationship between income inequality and economic

growth at the early phases of growth and a negative relationship in the later phases (Kuznets, 1955).

Studies done in cross countries by Perotti (1996), Forbes (2000), Delbianco et al. (2014) and Lee et al. (2015) showed that the positive relationship between income inequality and economic growth and the studies made by Herzer and Vollmer (2012), Castelló-Climent (2010), Zouheir and Imen (2012), Malinen (2013) and Fawaz et al (2014) shows a negative relationship. Whereas other studies made by Barro (1999), Voitchovsky (2005), Fields (1988), Jong (2010), Halter et al. (2014), Binatli (2012) and Markus and Daniel (2017) shows positive relationship at high income level and negative at lower income level. Moreover, the study made by Tian (2012) in China, Hsing (2005) in the US and Maina (2006) in Kenya show negative relationship between income inequality and economic growth. The study made by Dahan and Tsiddon (1998) and Morteza and Ghasem (2015) showed that follow an inverted U-shaped dynamics.

The empirical studies conducted on the relationship between income inequality and economic growth in different countries showed contradictory findings with inconclusive outcomes. In a situation of inconclusive outcomes, there is a need to do more research in different contexts, and inform policies for particular country contexts accordingly. This thesis is thus an effort to fill up this lacuna in knowledge by investigating the relationship between income inequality and economic growth in Ethiopia using a macro level data and by adopting relevant analytical methodology. This study covers the period between 1982 and 2019.

1.3. Objectives of the Study General objective

The general objective of the study is to investigate the impact of income inequality on economic growth in the case of Ethiopia based on available data for the time period 1982-2019. The Specific objectives include:

- To investigate the impact of income inequality on economic growth.
- To identify the main factors that explains income inequality.
- To assess trends in the key macroeconomic variables including economic growth and income inequality.

1.4. Data and Methodology

1.4.1 Data Source

The study uses secondary data sets collected for the period of 1982-2019 to achieve the above objectives. The data of Gini coefficient and GDP from Planning and Development Commission (PDC) of the Federal Republic of Ethiopia and World Bank and inflation have been collected both from the Planning and Development Commission and Central Statistical Agency (CSA) for the same period.

1.5. Hypothesis

The study hypothesizes that income inequality, inflation and population affect economic growth negatively and significantly, that means the sign of the coefficient of these variables expected to be negative. But the coefficient sign of financial development and urbanization expected to be positive.

1.6. Significance of the study

This study adds to the existing knowledge on the impact of income inequality on economic growth. The findings and implications of the study are expected to shed light on income inequality-economic growth nexus for economies having similar socioeconomic characteristics'.

1.7. Scope of the Study

The relationship between economic growth and income inequality is bi-directional i.e. income inequality affect economic growth and vice versa. It may lead to causality problem, which means the model estimated will be biased. However, the study limited the impact of income inequality on economic growth and only on the case of Ethiopian for the period covering from 1982- 2019.

1.8. Limitation of the Study

This study is limited to the period between 1982 and 2019, which covers forty years of time series data. The limitation of this study is associated with data availability, especially on income inequality.

1.9. Organization of the Study

The study is organized into six chapters. Chapter two presents the review of theoretical and empirical literature while chapter three presents an over view of the Ethiopian economy. Chapter four discusses about the methodologies and model specifications. In chapter five, analysis of results of econometric model is presented. Finally, chapter six presents the conclusions and implications of the study.

CHAPTER TWO

REVIEW OF THEORITICAL AND EMPERICAL LITERATURE

2.1 The review of theoretical literature on the impact of income inequality on economic growth

2.1.1. Concept of economic growth

Economic growth is the increase in output of a country. It is the process by which a nation's wealth increases over time. It occurs when the productive capacity of a country increases. Economic development takes place when there is accelerated economic growth accompanied by major changes in social structures, popular attitudes and national institutions, reduction of inequality and eradication of poverty (Todaro, 1994). Economic growth is not a solution for the country's problems, but it facilitates the implementation of public policies that complement the shortcomings of growth. In short growth is a necessary condition but not sufficient to ensure social welfare (Mamoudou, 2011). There are different measures of national accounts of a certain economy. Some of these are GDP, Gross national income (GNI): GDP plus primary income of residents from the rest of the world minus primary income of non-residents from the economy, Net Domestic Product (NDP): GDP minus depreciation, Net Disposable Income (NDI): net national income at market prices minus taxes. However, most economies used GDP to measure their national accounts (Mankiw, 2010).

2.1.2. Concepts of Income inequality

Inequality is the degree to which distribution of economic welfare generated in an economy differs from that of equal shares among its nations (SID, 2004). According to Gehring and Kulkarni (2006), Income equality is the equal distribution of total income among the population. In a nation with perfect income equality, each and every individual has an equal share of the total income. This is opposite with perfect income inequality, where one individual has all of the total income. But neither of these extreme situations exists in any national economy. In practice nations income distributions occurs somewhere between the two extreme.

2.1.3. Causes of Income inequality

Inequality of incomes and wealth are caused by the following factors; Difference in skill: people differ widely in education, ability, intelligence, motivation, energy and talent. This difference leads to increased income differentials persons who are more efficient than other gets a higher pay. There may be difference in people having some qualification. Some may be more intelligent, hardworking and resourceful. Thus they may be in a higher scale of social values and earn more in some occupation. The system of private property: under the system of private property and individuals are free to earn, save and own property. He/she always tries to multiply it. The private property is the main causes of income inequality and then his/her property starts to earn. This is the reason that some earn less and often more and the gap between households becomes increasing.

Difference in risk, uncertainty and security: occupations differ in risks, uncertainty and safety. These differences are reflected in earnings. People prefer government jobs due to greater security. On the other hand, job in private organizations carry risk and uncertainty employees in government jobs generally earn less than their counter parts in private industries. Difference in economy system: in command economy system there is little income gap but in free market economy there is a high income inequality gap (May leung, 2015).

2.1.4 Measurement of income inequality

Several mathematical and statically measures have been developed to measure the dispersion and inequalities of personal income distribution.

i) Kuznets's Ratio (k):

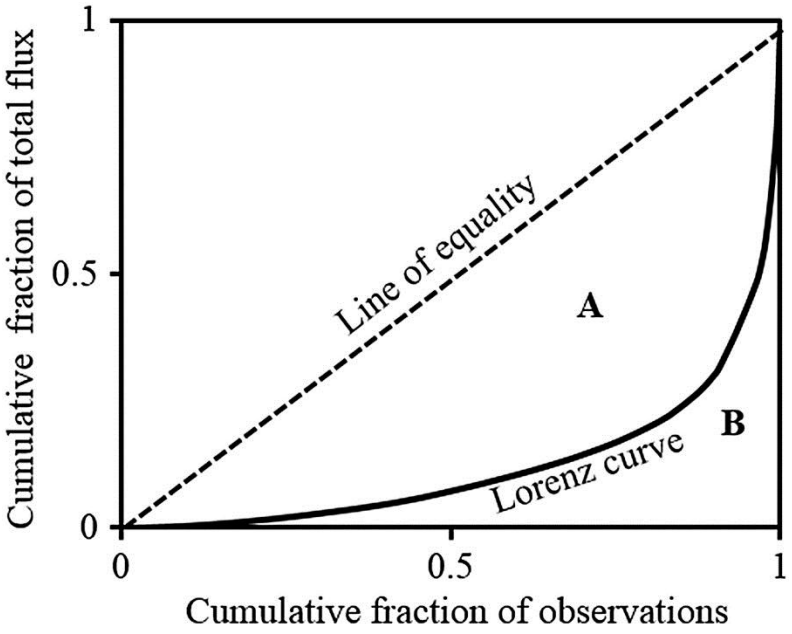
This ratio simply deals with individuals personal or households' total income they received. Economists and statistician arrange all individuals by ascending personal income and then divide the total population into distinct groups or size based on the income level they received. A common method is to divide the population into successive quantities (fifth) or deciles (tenth) according to ascending income levels and then determine what proportion of the total national income is received by each income groups. Poorest (Todaro, 2002) it is a common measure of

income inequality is the ratio of the income received by the richest and income received by the poorest.

ii) Lorenz curve:

Another common way to analyze income inequality is Lorenz curve. The name derived from an American Statistician Dr. coved Lorenz who in 1905 devised in to duplicated and measure inequalities in the distribution of income. The inequality is measured by the vertical distance between the line of equality and the Lorenz curve and in this case the larger the gap leads to the greater will be income inequalities. It is a way of analyzing income inequality and used to compare societies' actual distribution of income among families with an equal distribution. The Lorenz curve is derived by plotting the cumulative percentage or income received on the horizontal axis and usually families are presented rather than individuals and on the percentage population. The ray drawn from the origin at the 45 degree angles i.e. line of equality that representing the even distribution of income among drawn on the basis of hypothetical data (Todaro, 2009).

Figure 1: Lorenz Curve



Source; Todaro, 2009

iii) Gini coefficient(c):

It is the final and very convenient methods and it measures the relative degree of income inequality in a country can be obtained by calculating the ratio of the area between the diagonal and the Lorenz curve. This ratio is also known as 'Gini concentration ratio, names after the Italian statistician who first formulated in 1912.The result of Gini-coefficient should be the gap or vary between zero (perfect equality) and to one (perfect inequality) i.e. the coefficient ratio can vary between this gap. In actual facts as we mean soon discover the Gini coefficient for countries with high unequal income distributions typically lays between 0.5 and 0.7 while the countries with relatively equitable distribution it is on the order of 0.2 to 0.35 Gini coefficients as the average difference in income between all pairs of people divided by the average income, (Deaton, 2013).

2.1.5. The Relationship between Economic Growth and Income Inequality

Theory shows that income inequality is a condition that prevails along with economic growth. According to the utilitarian view, income inequality must exist along with the economic growth in order to maximize social welfare. This is in sharp contrast to the egalitarian view according to which, all members of the society should have equal access to all economic resources in terms of economic power, wealth and contribution. (Kuznets, 1955) introduced the inverted U-shaped Kuznets curve showed that in an economic system, at the initial level of low economic growth, income inequality is low and as growth occurs, income inequality increases then after income inequality decreases with increased economic growth.

There is also both theoretical and empirical literature that divided with some studies concluding that inequality leads to faster growth, and some others suggesting that inequality is likely to lower growth. There are three main arguments for the detrimental impact of inequality on growth. The first is the political economy argument (Alesina and Rodrick, 1994), which is based on the following three premises:

(i) Redistributive government expenditure and taxation are negatively related to growth because of their negative effect on capital accumulation;

(ii) Taxes are proportional to income but the benefits of public expenditure accrue equally to all individuals, which in turn implies that an individual's preferred levels of taxation and expenditure are inversely related to his income; and

(iii) The tax rate selected by the government is the one preferred by the median voter. Taken together, those premises would imply that growth increases as inequality falls.

A second argument for an inequality-to-growth direction of causality relies on the so-called sociopolitical instability approach (Alesina and Perotti, 1996), which can be summarized as follows:

(i) Highly unequal societies create incentives for individuals to engage in activities outside normal markets, such as crime, etc.; and
(ii) Sociopolitical instability discourages accumulation because of current disruptions and future uncertainty. This approach would also imply that growth increases as inequality falls.

A third argument for the proposition that increases in inequality lead to lower growth is the presence of credit constraints. (Galor and Zeira, 1993) note that if

(i) the process of development is characterized by complementarities between physical and human capital so that growth increases as investment in human capital increases; and
(ii) Credit constraints prevent poorer individuals from investing in education, and then inequality will adversely affect growth prospects by reducing the number of individuals who are able to invest in human capital.

2.1.6. from Inequality to economic growth

The effect of inequality on growth is arguable. On the one hand, there are three main arguments in the literature that determine the inverse effect of income inequality on growth: the first argument is that increases in income inequality lead to a lower growth rate because of the presence of credit constraint (Galor and Zeira, 1993.) The authors argue that the growth rises as the investment in human capital increases, assuming that the main characteristic of the process of development is the complementarity between physical and human capital. Poor people would not be able to invest in education due to the credit constraint, which implies that inequality will

affect the growth negatively by increasing the number of people who are unable to invest in human capital.

2.1.7. Kuznets Inverted U Hypothesis

The most important even leading to the study of inequality and economic growth was Simon Kuznets 1955 presidential address to the American Economic Association of Economic Growth and Income Inequality' and a series of follow-up papers published in Economic Development and Cultural Change. Kuznets began his presidential address by saying The central theme of this paper is the character and causes of long term changes in the personal distribution of income (Kuznets, 1955).He then formulated the famous inverted-u hypothesis. According to the hypothesis inequality first rise with the start of economic growth, eventually level off over time, then begin to fall in advanced stages of development thus the relationship is characterized by a trajectory shape of an inverted u, and he concluded that at advanced stages of economic development, inequality first rises then began to decline as these economies continued to expand. According to Kuznets, the intra-sect oral distribution of income is necessarily wider in the urban(manufacturing) sector than in the rural (agricultural)sector, a mass shift in population from a sector with low inequality one with greater inequality increases the weight of the unequal sector, thus rising overall inequality. In line with Kuznets (1955), in a least developed countries (LDC) context there are no guarantees that the higher income groups will save a significant proportion of their incomes in their own country.

2.2. Empirical evidence

In connection with the theoretical literature many researchers have been conducted to examine the relationship between income inequality and economic growth for cross country difference, panel data and time series data in both developed and developing countries using a variety of independent variables. However they gate different relationship; positive, negative, no interaction and following Kuznets curve. Perotti (1996) studied the reduced form relationship between income distribution and growth. He used cross sectional data for a number of countries. From the estimates he found that there is a positive relationship between equality and growth and this positive relationship is quantitatively weaker and statistically insignificant for poor countries

while the relationship between equality and growth is stronger in democracies. Tian (2012) investigates the relationship between income inequality and economic growth in China by using OLS method for 22 years data from 1985 to 2007. The results showed that for the time periods examined, Gini coefficient which as a measurement of income inequality has Negative impact on economic growth rate. Along with this effect, it achieved the expectation that increased income inequality results decreased saving rate and decreased GDP growth rate. Barro (1999) with evidence from a broad panel of countries shows little overall relation between income inequality and rates of growth and investment. Barro (1999) suggested that income inequality have positive effects for high level income but negative for low income per capita. In other words, the effect of income inequality on economic growth in developed countries can be positive while for developing countries the effect seems to be negative.

Jianu et al (2021). examined the relationship between income inequality and economic growth from the perspective of each country's level of development in the European Union, this linkage being reviewed using the median of GDP per capita expressed in the purchasing power standard to split the European Union Member States into two clusters of 14 countries each. They estimated the impact of income inequality on economic growth during the 2010–2018 period at the level of both clusters using the Estimated Generalized Least Squares with a fixed effects method, reinforced by the cross-section weights option. Their results results show that income inequality is positively linked to economic growth in the case of developed EU Member States, while for developing EU countries; income inequality is detrimental to growth. This also demonstrates that income gaps may have positive and negative effects on growth depending on the stage of development.

Lahouij (2017) investigated the impacts of income inequality and other economic growth determinants on economic growth of some selected oil-importing MENA countries using a panel data for the time span 1980-2007. The author's findings indicate that income inequality decelerate the rate of change of economic development. However, the results of this research might conflict with others' results if their research combines oil-exporting and oil-importing MENA countries in their sample or use different methodologies.

Binatli (2012) examined the relationship between income inequality and per capita income in Turkey during the periods of 1970– 1985 and 1985–1999. The results are indefinite showing positive impact of income inequality on economic growth in nineties and negative effect of income inequality in seventies. Jair and Janaina, (2014), examine the Relationship between Income Inequality and Economic Growth in Brazil. Their aim was to verify the correlation between income inequality and economic growth in Brazilian states using the Kuznets inverted U hypothesis for the time period from 1995 to 2012 by using dynamic panel data, the generalized method of moments (system GMM). The empirical evidence found that the relationship between income inequality and economic development in Brazil in the time period analyzed follows the inverted U model as proposed by Kuznets studies.

Zouheir and Imen (2012) examined the nexus between income inequality and economic growth using data of North African countries such as Tunisia, Morocco and Egypt by applying panel regression. They found that high income inequality is harmful for economic growth but trade openness and, physical and human capital investment enhance economic growth. Malinen (2013) investigates the relationship between inequality and growth in a sample of 70 countries in OECD and non-OECD for the time period of 1965 to 2000 by using an alternative measure of income distribution and GMM estimation and founds evidence of a negative relationship between Inequality and growth.

2.2.1. Empirical literature on Ethiopia

Tigist & Maru (2019) investigated the relationship between income inequality and economic growth in Ethiopia. The study hypothesized the existence of long -run and short -run relationship between income inequality and economic growth. It used time series data for 2002 to 2017 and employed Auto Regressive Distributed Lag Model (ARDL) in a time series econometric framework. In the long-run co-integration analysis economic growth is found to be statistically significant. In the short-run, the error correction model was found to be statistically significant with a negative sign implying that the error correction procedure converged monotonically to the equilibrium path relatively quickly and high significance of ECM (-1) is evidence to the existence of established stable long-run relationship between the variables. The positive

relationship between income inequality and economic growth indicates that high income inequality followed the Kuznets hypothesis since Ethiopia is a low income country.

Tassew et al. (2009) analyzed poverty and inequality in Ethiopia and they found that inequality increased in urban areas and remain unchanged in rural areas. In Ethiopia, income growth reduces poverty and increases in inequality increase poverty. According the authors there is growth in urban areas but the increase in inequality in urban areas removed the poverty-reducing effects. And the increase in the Gini coefficient of urban areas and remain unchanged in rural areas indicates that the overall increase in income inequality. Alemayehu et al. (2009) studied about Growth, Poverty and Inequality by using household panel data. Their results showed that there is a strong correlation between growth and inequality. They further estimated that over ten years, as growth per capita increases by four percent, poverty would decline from forty-four to twenty-six percent, but with no change in the aggregate income distribution.

Alemayehu and Addis (2014) also examined the relationship between *g*rowth, poverty and inequality in Ethiopia. They found growth and distributions as important determinants for change in poverty. In rural areas poverty reduction is fully accounted by growth (inequality was not significant). While in urban areas the poverty reduction effect of growth is more than wiped out by the inequality that has accompanied it, and this underscores the need to address the challenges of inequality. Fikadu (2010) analyzed the relationship between Poverty, Inequality and Growth in Rural Ethiopia. The study used unbalanced panel data of five rounds, 1994a, 1995, 1997, 1999 and 2004 obtained from ERHS that was collected from 18 Peasant Associations (PAs). He shows that growth and change in inequality significantly affect the poverty gap in Ethiopia. However, the initial or baseline inequality had insignificant effect; thus inequality plays a role in perpetuating poverty.

In this paper, we report both theoretical and empirical evidence for the impact of income inequality on economic growth with focus on Ethiopia. The empirical reviews indicate that there is inadequate evidence on the link between income inequality and economic growth in Ethiopia using long-term data. In addition, the empirical evidence show that the time period and the variable used in the previous studies have their own limitations, the period is very short and the variables used to understand the income inequality- economic growth nexus are inadequate.

Finally, given the interlinked nature of macroeconomic variables, the empirical studies conducted so far failed to account interdependence of these variables. This study addresses these limitations by including more variables to in the income inequality-economic growth nexus as well as use a suitable methodology that takes care of the endogeneity of variables.

CHAPTER THREE: DATA AND METHODOLOGY

This chapter presents source and types of data, theoretical framework and empirical model that was employed in this study to the impact of income inequality on economic growth: evidence from Ethiopia. It also discusses the statistical tools and necessary diagnostic tests using time series Auto regressive distributed lag model (ARDL) regression that was expected to be used in this study.

3.1. Research Design

This study employed quantitative analytical research approach. It involves testing the effects of variables whose data are expressed quantitatively. Hence in this study descriptive and inferential empirical study designs were used. The reason why the researcher used descriptive method is that to collect detailed description of existing phenomenon with the intent of employing data to justify current conditions and whether and whenever possible to draw conclusion from the facts that the researcher could discovered. The empirical study was used to support the descriptive statistics by statistical evidence.

3.2. Data Source and Scope

In this study time series data of 38 sample years from the period 1982 to 2019 drawn from secondary sources (World development indicator database, international monetary fund database and National Bank of Ethiopia) were used. This study is used secondary data mainly drawn from World Bank (World Development Indicators, national bank of Ethiopia) and IMF (World Economic Outlook) 2018 online databases. The data from international organizations was collected from their respective databases, whereas sources of data from locally concerned authorities was obtained by directly visiting their offices.

3.3. Method of data analysis

The study employed both descriptive and econometric analysis methods. Tables, graphs and charts were incorporated in order to analyze the overall performance of economic growth and income inequality. Furthermore, the Auto Regressive Distributed Lag (ARDL) co-integration

technique developed by Pesaran and Shin (1999) and Pesaran et al. (2001) was employed as an econometric analysis method so as to indicate whether causalities exist between the independent variables and the dependent variable, and if so the directions and magnitudes of the effects.

3.4. Model specifications

3.4.1. Theoretical model specification

Autoregressive distributed lag (ARDL) model is one of the most general dynamic unrestricted model in econometric literature. In ARDL model, the dependent variable is expressed as the lag and current values of independent variable and its own lag value. ARDL model normally starts from reasonably general and large dynamic model and progressively reducing its mass and altering variable by imposing linear and non-linear restrictions (Charemza and Deadman, 1997). ARDL methodology follows general to specific approach that is why it could be possible to tackle many econometric problems like, misspecification, autocorrelation, and come up with a most appropriate interpretable model. Therefore, this study will adopt Autoregressive Distributed Lag (ARDL) to estimate the long run and the short run determinants of private investment in Ethiopia within the study period.

Estimation method to test the long run relationship between dependent variable and independent variable, the study applies Autoregressive Distributed Lag (ARDL) Model. It is proposed by (Pesaran and Shin, 1997; 1999) to investigate the existence of co-integration relationship among variables. This approach has specific advantages over Johansen maximum Likelihood (1988) co-integration approaches: First it avoids the problem of the order of integration associated irrespective of I(0) or I(1). Second unlike Johansen co-integration which is valid for large sample size, it is suitable for small sample size study (Pesaran et al, 2001). Third it provides unbiased estimates of the long run model and valid t-statistics even when some of the regressors are endogenous (Harris & Sollis, 2003).

According to Johansen and Juselius (1990), Pesaran and Shin (1995), and Pesaran et al. (1996b) the general ARDL model is specified as follows.

The ARDL (p, q1, q2, q3…….qk) model specification is given as follows.

$$\Phi(L,p)y_t = \sum_i^k B_i(L,q_i)x_{it} + \delta w_t + u_t \qquad 3.1$$

Where, $\Phi(L,p) = 1 - \Phi_1 L - \Phi_2 L^2 - \cdots \ldots \ldots \ldots \ldots - \Phi_P L^P$

$B(L,q) = 1 - \beta_1 L - \beta_2 L^2 - \cdots \ldots \ldots \ldots - \beta_q L^q$, for i = 1, 2, 3……..k, $u_t \sim iid(0,\delta^2)$ and L is the lag operator.

Based on the above equation 3.1 The ARDL model specifications:

$$\Phi(L)y_t = \varphi + \theta(L)x_t + u_t \qquad 3.2.$$

With $\Phi(L) = 1 - \Phi_1 L - \cdots \ldots \ldots - \Phi_p L^p$,

$$\theta(L) = \beta_0 - \beta_1 L - \cdots \ldots \ldots - \beta_q L^q$$

Hence, the general ARDL (p, q1, q2, q3…qk) model;

$$\Phi(L)y_t = \varphi + \theta_1(L)x_{1t} + \theta_2(L)x_{2t} + \theta_k(L)x_{kt} + u_t \qquad 3.3$$

Using the lag operators L applied to each component of vector, $L^k y = y_{t-k}$, is convenient to define the lag polynomial $\Phi(L,p)$ and the vector polynomial $B(L,q)$. As long as the error term Ut assumed to be, white noise process, or more generally, independent with x_t, $x_{t-1\ldots}$ and y_t, $y_{t-1\ldots}$, the ARDL model consistently estimated using ordinary least squares.

3.4.2. Empirical model specification

Based on theoretical and empirical literatures reviewed in this study five variables were identified as factors those affect economic growth (RGDP). These are income inequality measured by gini coefficient (GINI), financial development measured by broad money supply as a percentage of RGDP (M2)), population growth (POPN), inflation (INFL), and urbanization (URBA). Hence, the general model of the study is specified as follows:

$$RGDP_t = f(GINI_t, M2_t, URBA_t, INFL_t, POPN_t) \qquad (1)$$

3.4.2.1. Checking the existence of long run relationship

This is a stage where the long run relationship existing between variables is assessed. Existence of such a relationship is tested by computing bound test for co-integration (bound F-statistic) in order to establish long run relationship among variables. ARDL is extremely useful because it allows us to describe the existence of an equilibrium/relationship in terms of long-run and short-run dynamics without losing long-run information. The ARDL involves estimating the following equation:

The general ARDL (p, q) model is specified as:

$$Y_t = \gamma_{0j} + \sum_{i=1}^{p} \alpha_j Y_{t-i} + \sum_{i=1}^{q} \beta_j X_{t-i} + \varepsilon_{jt} \qquad (2)$$

Where Y'_t is a vector and the variables X'_t are allowed to be purely I (0) and I(1) or co-integrated; α and β are coefficients; γ_0 is constant; j = 1, 2, ….k; p and q are optimal lag orders for dependent and independent variables respectively; ε_{jt} is vector of error terms i.e. unobservable zero mean white noise vector process (serially uncorrelated or independent.

$$\begin{aligned}\Delta RGDP_t = {} & \alpha_0 + \beta_1 RGDP_{t-i} + \beta_2 GINI_{t-i} + \beta_3 M2_{t-i} + \beta_4 URBA_{t-i} + \beta_5 INFL_{t-i} \\ & + \beta_6 POPN_{t-i} + \sum_{i=1}^{p} \alpha_1 \Delta \mathrm{RGDP}_{t-i} + \sum_{i=1}^{q1} \alpha_2 \Delta GINI_{t-i} + \sum_{i=1}^{q2} \alpha_3 \Delta M2_{t-i} \\ & + \sum_{i=1}^{q3} \alpha_4 URBA_{t-i} + \sum_{i=1}^{q4} \alpha_5 \Delta INFL_{t-i} + \beta_6 \Delta POPN_{t-i} \\ & + \varepsilon_t \qquad (3)\end{aligned}$$

β_i represents long run co-integration/relationship and α_i represents short run dynamics of the model. The existence of long run co-integration will be tested based on the null hypothesis of β_i's = 0 against alternative hypothesis β_i's $\neq$ 0. To identify the presence of co-integration in the long run bound test will be conducted. The value of F- statistics is used as identifying the existence of

long run relationship between dependent and independent variables. ARDL bound test is based on Null hypothesis (H_O): no long run relationship and alternative hypothesis (H_1): there exists long run relationship. The decision is accept H_O if F < critical value for I (0) independent variables or reject if F > critical value for I (1).

Estimation of long run ARDL model requires selection of optimal lag order using appropriate selection techniques. In this study Akaike Information Criterion (AIC) selection criteria was used. Hence, long run ARDL will be estimated based on the following equations.

$$\Delta RGDP_t = \alpha_0 + \beta_1 RGDP_{t-i} + \beta_2 GINI_{t-i} + \beta_3 M2_{t-i} + \beta_4 URBA_{t-i} + \beta_5 INFL_{t-i} + +\beta_6 POPN_{t-i} + \varepsilon_t \quad (4)$$

Most time series data will exhibit non-stationary trend and estimating a regression model with non-stationary data results spurious relationship and in turn causes misleading and biased parameter estimates. Though it only reveals short run dynamics, to resolve such type of problem differencing variables is important. In this regard error correction model (ECM_1) will be included based on the existence of long run co-integration or not.

If long run co-integration exists between dependent and independent variables

$$\Delta RGDP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta \mathrm{RGDP}_{t-i} + \sum_{i=1}^{q1} \alpha_2 \Delta GINI_{t-i} + \sum_{i=1}^{q2} \alpha_3 \Delta M2_{t-i} + \sum_{i=1}^{q3} \alpha_4 URBA_{t-i} + \sum_{i=1}^{q4} \alpha_5 \Delta INFL_{t-i} + \sum_{i=1}^{q4} \alpha_6 \Delta POPN_{t-i} + \mu ECM\_1_{t-i}\, \varepsilon_t \quad (5)$$

On the other hand if there is no co-integration between dependent and independent variables the following short run model was estimated as:

$$\Delta RGDP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta \mathrm{GINI}_{t-i} + \sum_{i=1}^{q1} \alpha_2 \Delta M2_{t-i} + \sum_{i=1}^{q2} \alpha_3 \Delta URBA_{t-i} + \sum_{i=1}^{q3} \alpha_4 INFL_{t-i} + \sum_{i=1}^{q4} \alpha_5 \Delta POPN_{t-i} + \mu ECM\_1_{t-i}\, \varepsilon_t \qquad (6)$$

3.5. Description of Variables and Expected Sign on Economic Growth

3.5.1. Dependent Variable

Economic Growth: In this study the dependent variable is economic growth which is defined the total increasing the quantity or quality of the economy's resources (labor, capital, land, and entrepreneurship). Commonly we can measure economic growth by using three different methods but the result is the same. It is measured by real GDP growth rate. The key is that real gross domestic product is measured in constant prices, the prices for a specific base year/. So, the increase in real GDP means there is an increase in the value of national output / national expenditure.

3.5.2. Independent Variables

Income inequality: The independent variable is income inequality, which is represented by GINI Coefficient it is also known as Gini concentration ratio, is the area between the Lorenz curve and a 45 degree line. It measures how far a country's income distribution is from perfect equality. Income distribution is a manner in which income is divided among the members of the economy. A certain amount of inequality in the income distribution is to be expected because resources are never equally distributed. Gini index is used as a measure of income inequality, which shows extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. Gini index of 0 (zero) represents the distribution is perfectly equal, that is, everyone has exactly the same amount of income or wealth, while an index of 100 implies the distribution is perfectly unequal. The expected sign of GINI in relation to the RGDP could be positive or negative that is the major question of the paper attempts to answer.

Population: In this study total population growth was used. It is the total number of population it is not divided in to age group simply counts the total number population of the country. It is man component of the country economic growth it affects positively or negatively it depends on the country growth policy and the usage of the country resource. But the coefficient of this variable would expect to be a negative.

Inflation: is a persistent increase in the average price level in the economy. Inflation occurs when the average price level or the general price index increases over time. This does not mean that all prices increase the same, or that all prices necessarily increase. Some prices might increase a lot, others a little, and still other prices decrease or remain unchanged. Inflation results when the average of these assorted prices follows an upward trend. In this study inflation rate is calculated from consumer price index measures. The coefficient of this variable would expect to be a positive.

Financial development: Broad money supply (M2): Financial development can be defined as the total improvement and the total capacity of financial sector in other word it describe the policies, factors, and the institutions that lead to the efficient intermediation and effective financial markets. The greater the financial development, the higher would be the mobilization of savings and its allocation to high return projects. It can be measured by examining the performance and activities of the financial markets, banks, bond markets and financial institutions. In this study it is measured as the ratio of liquid liabilities to GDP. It is called broad money denoted by M2, which Includes cash and checking deposits, savings deposits, money market securities, mutual funds, and other time deposits. Some components of this measure of money are less liquid as compared to narrow money (M1), but they can be quickly converted into cash or checking deposits. (Bzhalava, 2014). The coefficient of this variable would expect to be a positive.

Urbanization: is defined as the demographic process whereby an increasing share of the national population lives within urban settlements. Settlements are also defined as urban only if most of their residents derive the majority of their livelihoods from non-farm occupations. Throughout history, urbanization has been a key force in human capital and economic development. The underpinning logic formed behind the argument—urbanization leads economic growth, is that the labor mobility in the nation is the prerequisite to economize the

resources and enhance it permits rapid build-up productive activity in the city. Thus, in this study the sign of the coefficient expected to be negative.

Table 1: expected sign of independent variable

independent variable / Dependent variable	**Income inequality**	Population Growth	**Inflation**	Financial development	Urbanization
Economic growth	-	+	-	+	+

Source: own computation

3.6. POST ESTIMATION DIAGNOSTIC

To accept this model as a good, it should satisfy the Gauss Markov assumptions or the required criteria of the post estimation test such as the existence of co-integration, parameter stability of the model, normality, serial correlation, and heteroscedasticity tests should be hold. Here below all the assumptions are discussed in detail and the test statistics of each test is reported.

3.6.1. TEST OF CO-INTEGRATION

In this study the presence of co-integration in the long run is tested by bound test. The value of F- statistics is used as identifying the existence of long run relationship between dependent and independent variables. ARDL bound test is based on Null hypothesis (H_O): no long run relationship and alternative hypothesis (H_1): there exists long run relationship. The decision is accept Ho if F < critical value for I (0) independent variables or reject if F > critical value for I (1). As we see from the table below the result shows that there exists long run co-integration between variable. As reported in the table below 4.5 at 5 percent F-statistics (85.746) is greater than I (1), which are 3.79. Thus there is long run co-integration between variables.

Table 2: bound test of ARDL estimation

	Critical value 90%		Critical value 95%		Critical value97.5%		Critical value 99%	
K	**I(0)**	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
5	**2.26**	**3.35**	**2.62**	**3.79**	**2.96**	**4.18**	**3.41**	**4.68**

F- statistics = 85.746

3.6.2. Stability test for economic growth

To test a structural stability of the model cumulative sum of squares recursive residuals (CUMSUMSQ) based on a plot of the sum of the recursive residual, which is recommended by (Pesaran and Shin, 1999, 2001) was used. If this sum square goes outside the critical bound, one concludes that there was a structural break at the point at which the sum square began its movement towards the bound. Hence, for the stability test the graph plots both the cumulative sum square of residual with 5% critical lines. And, if the cumulative sum square remains inside between the two critical lines or bounds back after it is out of the boundary lines, the null hypothesis of correct specification of the model cannot be rejected. But, if the cumulative sum square goes outside between the two critical bounds there exists series parameter instability problem. The straight lines represent critical bounds at 5% level of significance. As depicted in the figure below, the plot of CUMSUMSQ lies within the boundary lines. This confirms the equation is correctly specified and the model is stable. Furthermore, the result shows that there is no structural instability in the model during the sample period. Henceforth, the study can precisely conclude that long and short run estimates are quite stable and as well there is no any structural break showing the Results of the estimated model are efficient and reliable.

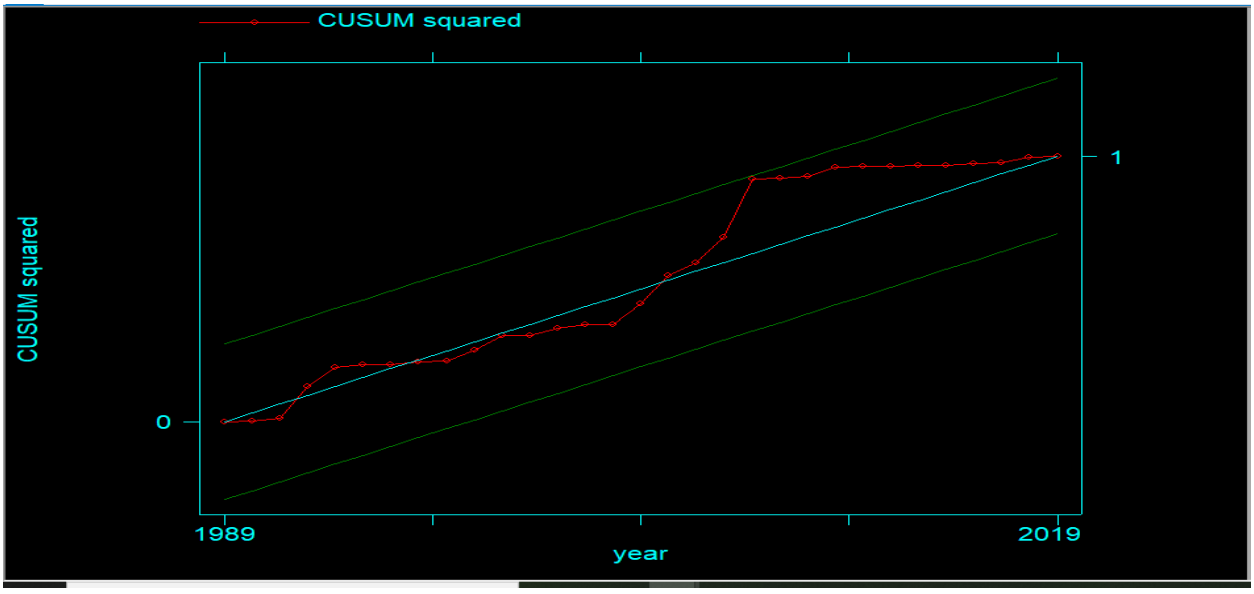


Figure: 2. Test of parameter stability

3.6.3. TESTING FOR NORMALITY

Normality test is used to determine if the data is well-modeled by a normal distribution and to compute how likely it is random variable is underling the data is set to be normally distributed. In this study normality of the distribution of error terms is tested by Jarque- Bera test. The assumption is based on the premises of rejecting alternate hypothesis, which assumes the distribution of error term is not normal, if test statistics is greater than 5%. In this study the test statistics is 84.8% greater than 5%. Hence the error term is distributed normally. See Appendix (A4).

3.6.4. AUTOCORRELATION

The correlation between residuals is called autocorrelation which is induced by the transformation of the original data and manipulation of the data through interpretation and extrapolation. The simplest and most widely used model is one where the error term u and ut-1 have a correlation ρ. For this model one can think of testing hypothesis about ρ on the base of estimated correlation coefficient between the residuals. A commonly used statistic for this purpose is the Durban-Watson (DW) statistic which is denoted by d. when DW statistic is zero (d=0) the estimated correlation coefficient is 1 and d=4 when the correlation coefficient which is estimated is -1. If d is closer to 0 or 4, then the residual are highly correlated. The standard d statistic that serves as a rule of thumb is d =2 which indicates that the estimated correlation coefficient is 0 and hence the residual are not correlated. In this study, Durbin-Watson statistics is 2.15, which is approximately equal to 2 confirming residuals are not correlated. See Appendix (A5).

3.6.5. MULTICOLLINEARITY

Multicollinearity refers to the condition that independent variables are inter-correlated and it is the future of sample not for the population. The classical linear regression model assumes that if there is multicollinearity among the explanatory variables, coefficients are indeterminate and there standard errors are infinite. On the other hand if multicollinearity is less than perfect, the regression coefficient, although determinate, have larger standard error (in relation to the coefficient themselves) which means the coefficient cannot be estimated with greater precision

or accuracy. Correlation matrix of independent variables is used to check the existence of multicollinearity. All the correlation coefficient of independent variables is less than 0.8. As a result in this study multicollinearity is not a problem. See Appendix (A6).

3.6.6. MODEL SPECIFICATION TEST

To see whether the regression model is correctly specified or no specification bias or error, the researcher used link test. Link test is based on a null hypothesis that the predictive value (_hat) is statistically significant at 5 % level of significant and square prediction (_hat sq) is insignificant at 5 % level of significant of the regression model. Therefore, to test this in STATA I generated two variables, predictive value (_hat) and square prediction (_hat sq), from the original regression model. After regressing these two variables with the model, if a predictive value (_hat) is statistically significant at 5 % level of significant and square prediction (_hat sq) is insignificant at 5 % level of significant we do have a good model, unless, the model is wrong (Murteira, 2014).The link test (see Appendices) square prediction (_hat sq) is insignificant at 5 % level of significant with a p value of 0.194. Therefore, the Link test confirmed that there is no model specification error. See Appendix (A7).

3.6.7. OMITTED VARIABLE TEST

To see whether in the regression model excludes relevant variables from the model Ramsey RESET Test was used. In this test null hypothesis (Ho) assumes there is no omitted variable. If the test statistics value of the test is greater than 5% we accept Ho and reject if it is less than 5%. In this model the Ramsey RESET Test value is 61.58 percent. Hence, I failed to reject the null hypothesis of Ramsey RESET test. Result proves that the model did not have omitted variable bias and the models are well constructed. See Appendix (A8).

3.6.8. Test of Hetrosckedasticity

An important assumption of the classical linear regression model is that the disturbance term ui appearing in the population regression function is homoscedastic i.e. all cross sectional error terms have the same variance. But when there is an outlier observation in relation to the observation in the sample, the assumption of constant variance is violated and this violation is

referred to as hetroskedasticity. Breusch-Pagan or Weisberg test for hetroskedasticity is used with the null hypothesis of constant variance and it is possible to reject this hypothesis when p value is greater than 5% significance level. Breusch-Pagan or Weisberg test statistics of the long run model is 99.99%, which is greater than 5% confirming hetrosckedasticity is not a problem in this model. See Appendix (A9)

CHAPTER FOUR: AN OVERVIEW OF THE ETHIOPIAN ECONOMY

4.1. An overview of the Ethiopian economy

In this section, we present an overview of the Ethiopian Economy with a focus on the economic structure, trends in sectorial growth, structure of trade, and poverty and income distribution. Economic growth has been unstable in Ethiopia for many years. In the 1960s, the GDP growth rate was relatively stable with an annual growth rate of 3.8 percent from 1960/61-1972/73 (Yu et al. 2007). This was followed by a dramatic decline during the years 1973/74-1990/91 with an average annual growth rate of only 1.7 percent. The sharpest fall in the GDP growth rate was during the drought famine year of 1984/85 when the real per capita GDP growth rate plummeted by 13 percent. Between the years 1991/92-2004/05, GDP exhibited a relatively higher annual growth rate of 5.3 percent. This is attributed to policy changes, good weather and 'catch-up' growth following a long period of conflict. Generally, the economic performance of Ethiopia can be described as highly volatile, being positive in some years and negative in as many other years The variability in GDP growth could be attributed to, among others, structural rigidity, external shocks and internal conflicts. It is notable that GDP growth follows the growth trend of agriculture, implying the dependence of economic growth on agriculture in Ethiopia.

Economic development transforms an economy from one that is largely agricultural to one that is largely manufacturing and services (Johnston and Mellor, 1961). Since agriculture currently dominates Ethiopia's economy and employment, however, there is an issue as to what its role should be in getting from here to there. In the normal process of economic growth, non-agricultural sectors grow more rapidly than the agricultural sector. The slower growth of agriculture, its relative decline, concern about the difficulty of modernizing agriculture and pessimism about the potentials for technological change in agriculture suggest to some that agriculture should not be given priority for scarce resources in the interests of rapid overall growth. There is substantial evidence, however, that raising agricultural productivity is possible and that agricultural growth plays a key role in economic growth, particularly in low-income countries. Moreover, the Government of Ethiopia is committed to rapid growth of agriculture as a means of accelerating the economic transformation and reducing poverty (John W. Mellor and Dorosh, 2010).

The varied nature of the topography coupled with other environmental features resulted in a variety of agro-ecological zones in the country. The country is endowed with huge human resource, arable land, livestock and natural resources. However, much of its potential has not yet been exploited. The population of Ethiopia was estimated at over 110 million in the year 2020, making it the third most populous nation in Africa and twentieth in the world. The annual growth rate of the population is estimated at 3%. Almost 66% of Ethiopia's landmass is known to have a potential for agricultural development. But only a quarter of this is said to be developed until now. Although the livestock contribution to the economy is limited, its wealth is the largest in the African continent. The forest, water, fish and the mineral resource potential of the country are enormous. These minerals include gold, platinum, marble, tantalum, copper, potash, soda ash, zinc, nickel, iron and natural gas. Of course, these are not yet exploited in the desired and appropriate manner. The economy is characterized by its dualistic nature: the traditional (subsistence) and modern (technological) sector. The traditional sector consists of mainly peasant agriculture, which is the backbone of the country. The modern sector is composed of underdeveloped industrial and service sector. The structure of the economy, in general, is decomposed into the three main sectors: the primary-agricultural sector, the secondary-industrial (manufacturing) sector and the tertiary-service sector. The agricultural sector includes, among other things, such activities as crop production, animal husbandry, fishery, bee keeping and forestry. This sector remains to be the most important sector of the economy since it produces much of the country's annual output, absorbs huge amount of the labor force and generates large proportion of the foreign exchange earnings of the country. The industrial sector includes such activities like mining and quarrying, construction, energy, water supply, small handicrafts and cottage industries, medium and large-scale manufacturing firms. The level of development of the manufacturing sector is at its infancy and the country's industrial base is at its lowest level. The sector is dependent on imported semi-processed materials, raw materials, spare parts and fuel.

Poverty reduction and improving household wellbeing is an important issue for developing countries on their goals of development policies and strategies. Ethiopia is a low-income country ranking 164th out of 187 countries (World Bank, 2017). After decades of low-income levels and sluggish economic growth, since 2004 Ethiopia has seen growth at a higher rate than most African countries. In 2017, Ethiopia overtook Kenya as East Africa's largest economy (IMF,

2017). Real GDP growth averaged 10.9 percent annually (8.0 percent per capita) in 2004 to 2014, Ethiopia is the 11th poorest country in the world by income per person, and home to Sub-Saharan Africa's second most populous with a population size of about 90 million in 2015/16 with 2.5 percent growth per annum (FDRE, 2018), the vast majority (84%) of which are rural dwellers and subsistence farmers, the poorest 40 percent tend to be even more likely to live in rural areas and engage in agriculture (World Bank, 2016).

In the effort to reduce poverty and achieve economic growth, the country has been implementing a series of poverty-focused development strategies. One of which is agricultural growth and investments, since Agriculture accounts for most jobs, about 40 percent of output and exports and contributing 37 percent of GDP in 2015/16. In Ethiopia, each 1 percent growth in Gross Domestic Product (GDP) resulted in a 0.15 percent reduction in poverty. For every 1 percent in agricultural output; poverty was reduced by 0.9 percent. Hence, agriculture is an important driver of economic growth and rapid poverty reduction in Ethiopia, but female farmers benefit less from this because they are less productive than their male counterparts (World Bank, 2016). Economic growth has also driven by the growth in services sectors, contributing 47 percent of GDP in 2015/16. So far the performance of the industrial sector during the First Growth and Transformation Plan (GTP I) from 2010/2011 to 2014/2015 indicated that the sector has not been able to achieve the hoped-for changes in terms of the structure of the economy as it grapples with multiple challenges (UNDP, 2018).

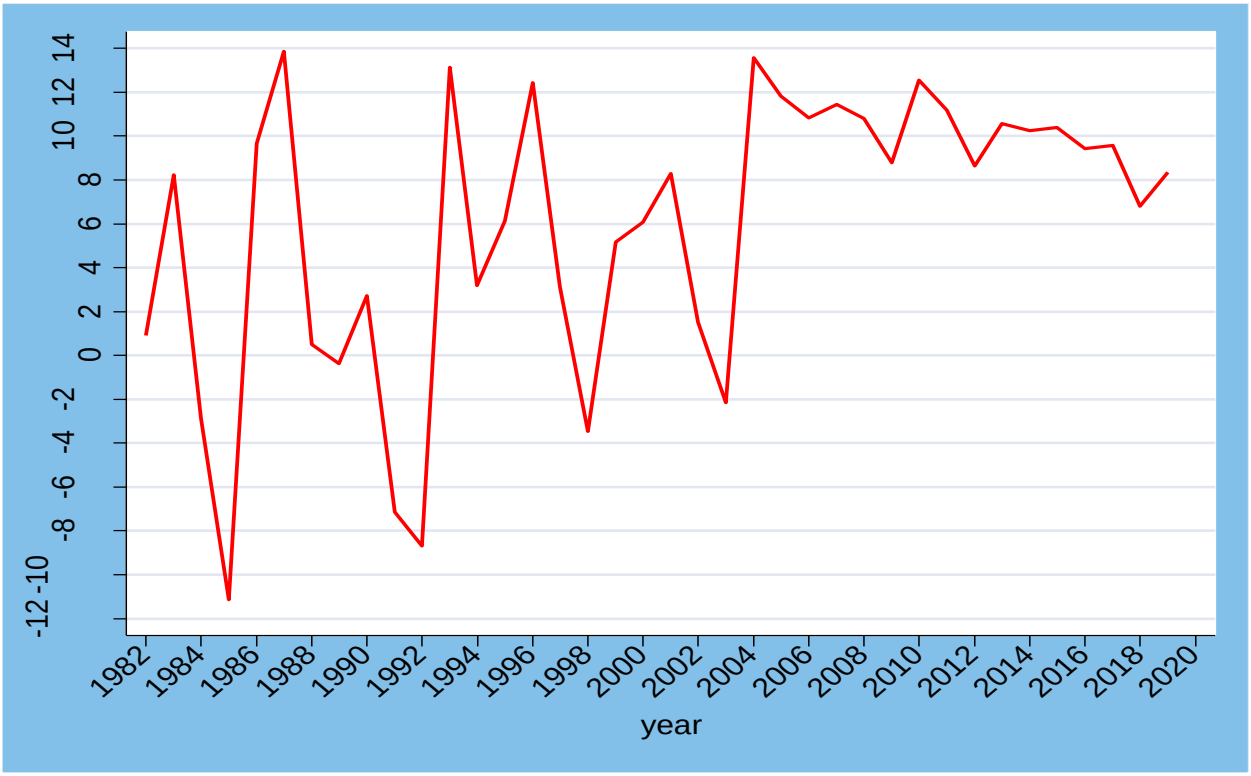
However, despite impressive economic growth, the expansion of social services and a substantial decrease in poverty from 46% of the population living below the national poverty line in 1995, 44% in 2000, 30% in 2011, and also under 24% in 2015/16. While poverty has decreased remarkably in general, poverty is still a challenge in Ethiopia as over 22 million people are living below the national poverty line, with 80 percent in rural areas. The rate of decrease in recent years is slower in rural areas as compared to urban areas. For rural Ethiopia, according to 1995 to 2015/16 household consumption expenditure survey report, based on the national poverty line, the proportion of poor people decreased from 48 percent to 26 percent.

A significant number of children in rural areas remain locked in a vicious circle of poverty and vulnerability to environmental and socio-economic shocks (Ethiopia Poverty Fact Sheet, 2018). Programs targeting poverty should mainly focus on risk factors and shocks that swing households in and out of poverty such as drought, conflict, price fluctuations, flooding, illness and death of household members, underemployment, and the like (Foster, 2007; Gunther & Harttgen, 2009). These shocks and risks can lead to a substantial loss of consumption, income, or wealth of households (Dercon et al., 2005; Gillis et al., 2001). In 2016, the most common shock reported was a food shortage, and crop failure probably resulted from El Nino drove drought that hit many parts of Ethiopia. And also, in 2009 and 2011, almost all households were exposed to at least one economic shock, probably due to persistent monthly food price rises for all items. The random variation observed in the distribution shocks across major regional states as well as survey rounds.

4.2. Trends in economic growth

Ethiopia aims to reach lower-middle-income status by 2025 and its economy experienced strong, broad-based growth averaging 9.4% a year from 2010/11 to 2019/20, while Ethiopia's real gross domestic product (GDP) growth slowed down to 6.1% in 2019/20 due to COVID-19 (corona virus pandemic). Generally speaking the growth of Ethiopian economy ranges from negative 11.144 to 13.86 percent. During this interval it shows ups and downs trend. This is because the country faces many challenges like civil war, famine and drought. The minimum growth is registered in 1985 and the maximum growth is registered in 1987.

Figure 3: RGDP Growth



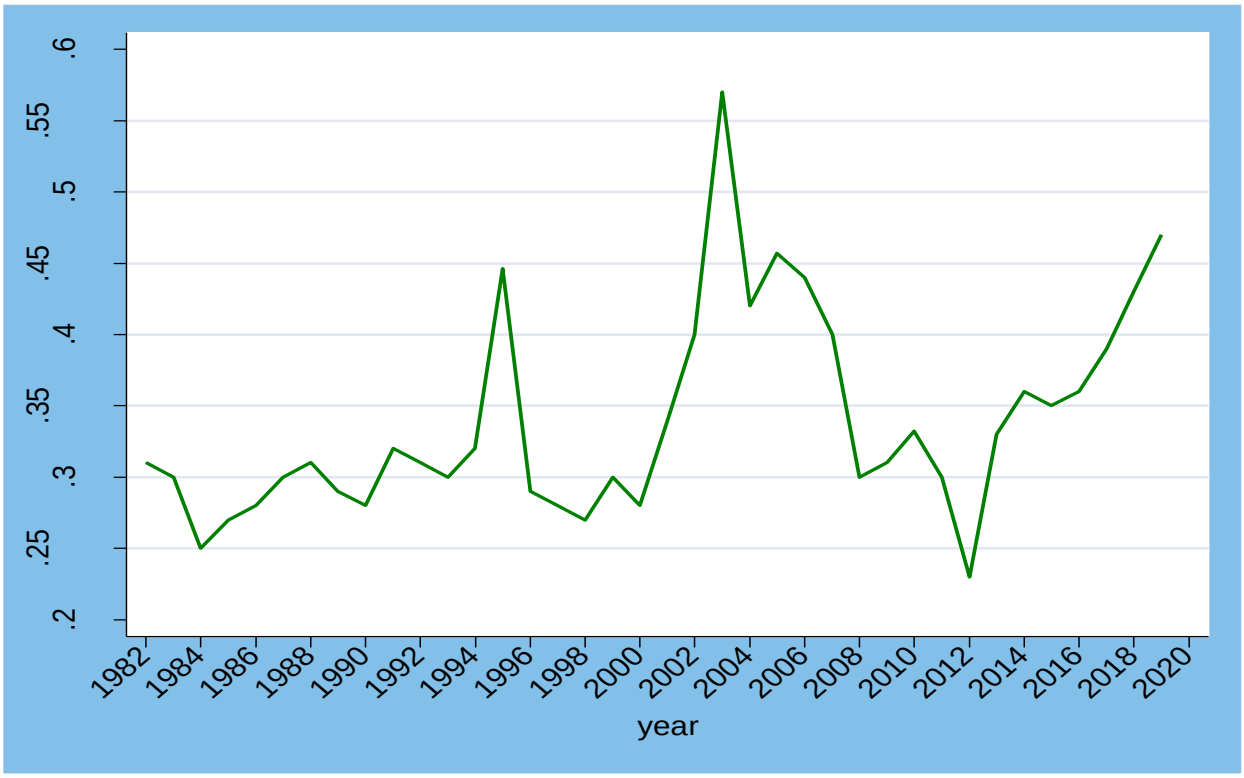
Source: Based on data from the Planning and Development Commission of the Federal Republic of Ethiopia

4.3. Trends in income inequality

The trends of poverty and income inequality between 1999/2000 to 2015/2016 periods based on national representative panel survey estimation result by explain that the situation of poverty has been improving in urban than rural areas, but with considerable variation across the different regions of Ethiopia. the decline of poverty with all measures was observed between 1995 to 2015/2016 with head count index 33.2 in 1995/1996 declined to 14.8 in 2015/2016, with poverty gap index 9.9 in 1995 to 3.7 in 2015/2016 and with poverty severity index 4.1 in 1995 to 1.4 in 2015/2016. Similarly, the level of poverty is substantially declining in urban than rural with headcount indices from 36.9 in 1999/2000 to 35.1 in 2004/2005, further declined from 30.4 in 2010/2011 to 14.3 in 2015/2016; while rural poverty declined with headcount indices from 45.4 in 1999/2000 to 39.3 in 2004/2005 and further declined from 30.4 in 2010/2011 to 25.6 in 2015/2016. Despite such tremendous decline of poverty over the last years, still a worrying

concern as significant proportion of the population remains poor in rural areas indirectly shows the prevalence of food insecurity in rural areas. On the other hand, the trends of income inequality measured by Gini coefficient shows increasing trend from 0.29 in 1995 to 0.3 in 2010/2011 and rising to 0.33 in 2015/2016 with more inequality in urban than rural areas of Ethiopia. The rising trend of income inequality over time is not only exacerbating food insecurity situation of the country, but also it might obscure the short- to long-term effects of the government welfare-oriented planning process.

Figure 4: Trends in income inequality



Source: Planning and Development Commission; World Bank data

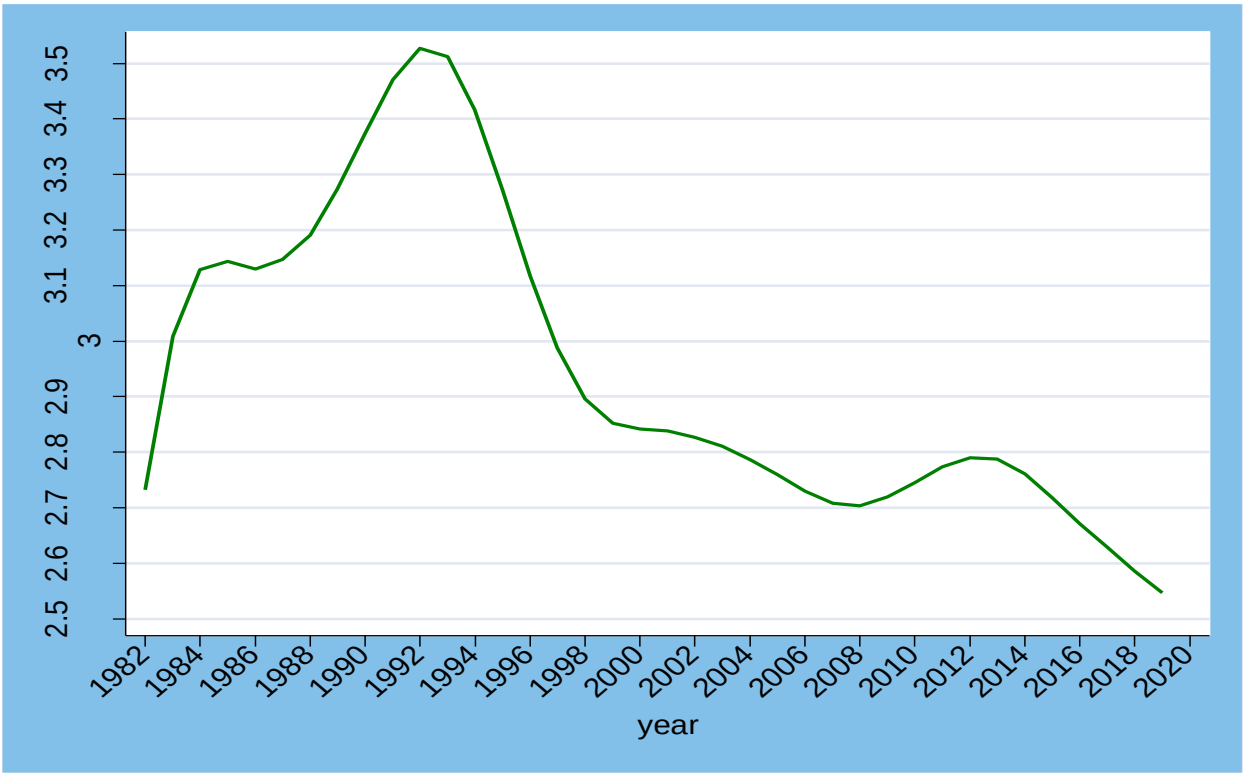
4.4. An overview of other macroeconomic growth

4.4.1. Trends of population

The growth rate of population is determined by two important factors such as fertility rate and mortality rate though migration is taken as insignificant determinant for the growth of Ethiopian population (EEA, 1999/2000). Although the fertility level in Ethiopia is among the highest in the

world, for example the World Bank ranked her 40th in 2011; it shows significant reduction for recent years. Regarding population issue, however, annual growth rate of population was continuously increasing rate of 2.73 with beginning year at 2.3 percent and with last year of 3.5 percent within the period between 1982 and 1992. After 1992 the growth of population is continuously decreasing. This may be because of decreasing trends of fertility and increasing trends of mortality.

Figure 5: Trends in population growth



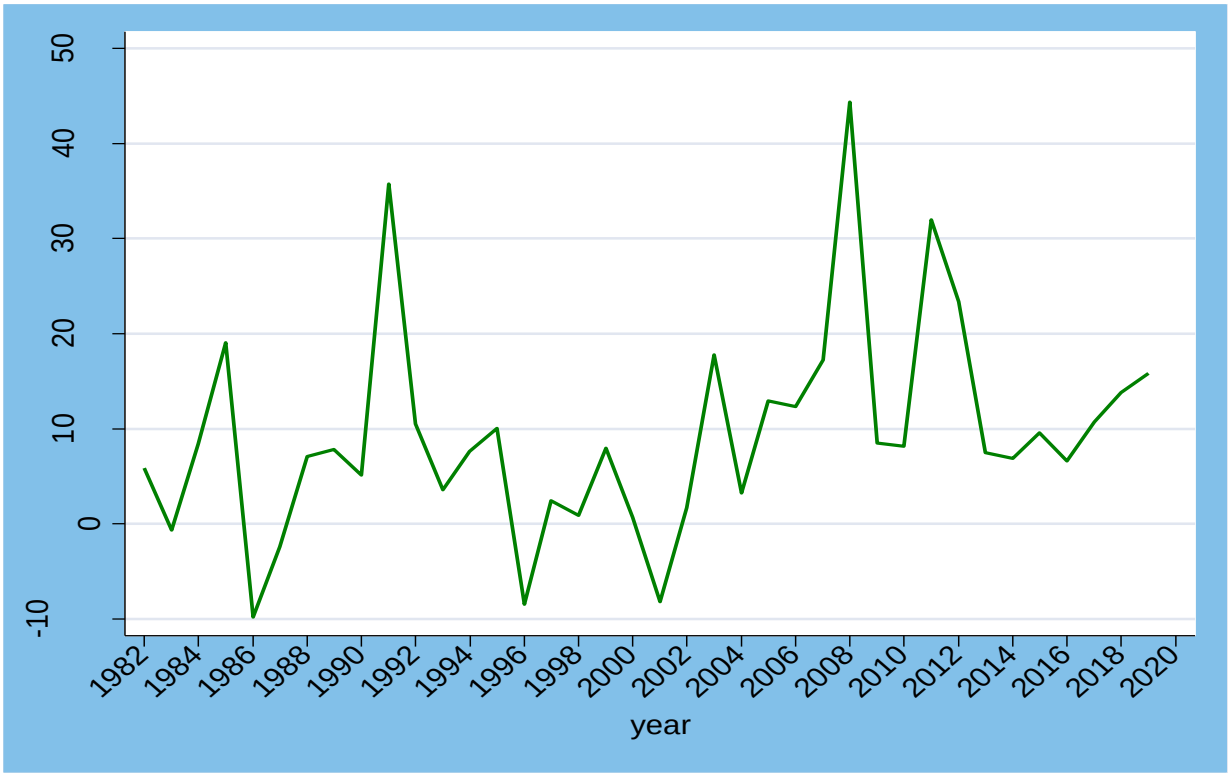
Source: Based on World Bank data

4.4.2. Trends of inflation

Inflation in its general term refers to a phenomenon in which the country's overall price level is rising continuously over a given periods of time. Among the various objectives of the government one is achieving stable macroeconomic condition manifested by price stability so that maximizing its social welfare through its national bank in Ethiopian case. Does it hold true in Ethiopia? To know this one can look at the following figure. From figure 4.6 below one can

understand that the inflation level reaches maximum in 2008 but it showed high ups and downs which implies that even though it showed double digit inflation level. The maximum inflation level was scored in 2008 being 44% which seems associated with the expenditures made to MDG activities. It seems that there was a deterministic relationship between inflation and trade balance after the year 2000 which showed that when the graph of inflation rate moves upward the graph of trade balance shows a downward movement.

Figure 6: Trends in inflation



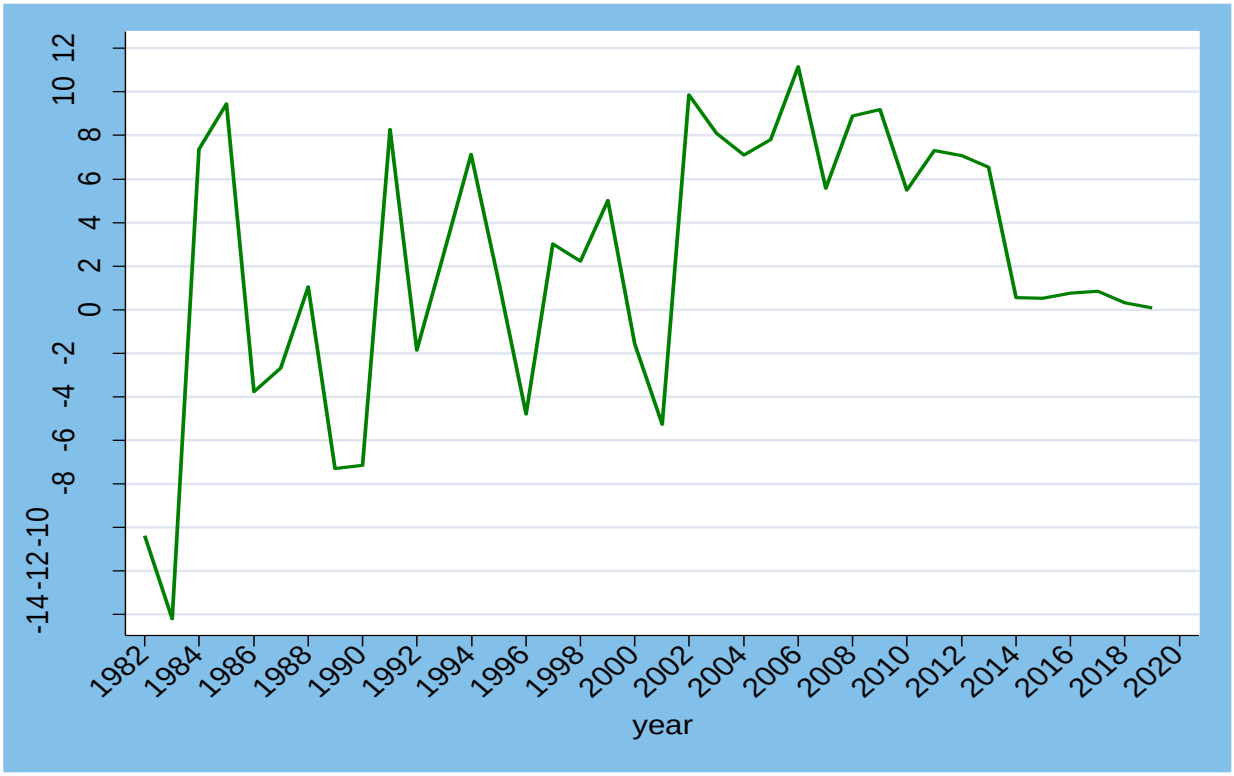
Source: Based on Planning and Development Commission of the Federal Republic of Ethiopia data and Central Statistical Agency

4.4.3. Trends in money supply

Growth of liquid liability (money supply) has no constant trend. This financial development indicator remained low for most of the Derg period. The growth of money supply reaches minimum in 1983 and reaches maximum in 2006. Though the growth of money supply shows higher fluctuation from 1982 to 2012, it has stable growth from 2013 onward. This surge in M2

during 2009/10 was due to an increase in net foreign asset and domestic credit which are components of M2 (NBE, 2009/10). This growth variation among across time in the country may be because of occurrences in domestic and external factors such as continuous deterioration in terms of trade, falling commodity prices, global economic downturn and financial crisis in the international economies.

Figure 7: Trends in money supply



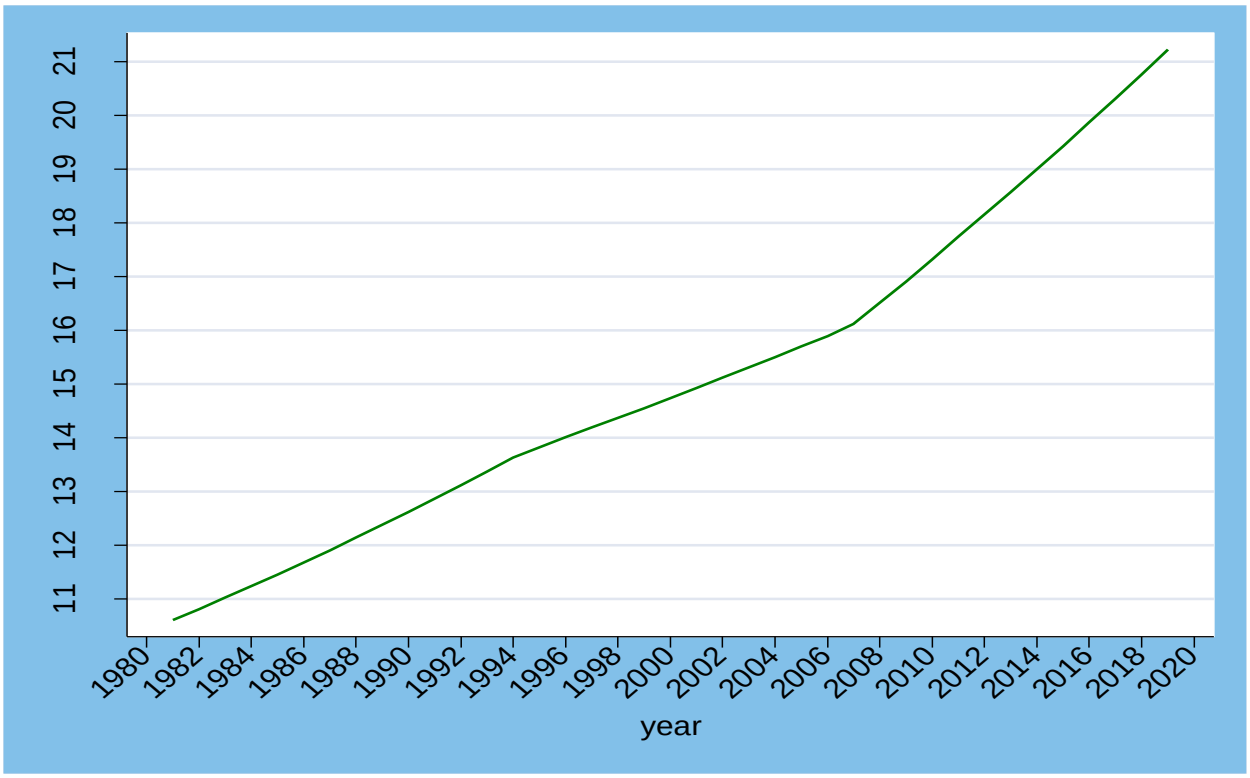
Source: Based on National Bank of Ethiopia data

4.4.4. Urbanization:

Urbanization which is defined as the demographic process whereby an increasing share of the national population lives within urban settlements has increasing trend. As can be seen from the table the share urban population as a share of total population shows sharp increment because now a days the productivity of agriculture sector is considered to be low and backward. Moreover, the increase in industrial growth and the explosion of industrialization and

manufacturing enterprises within certain urban area gives rise to more employment opportunities, which is another factor for urbanization.

Figure 8: Growth in urbanization:

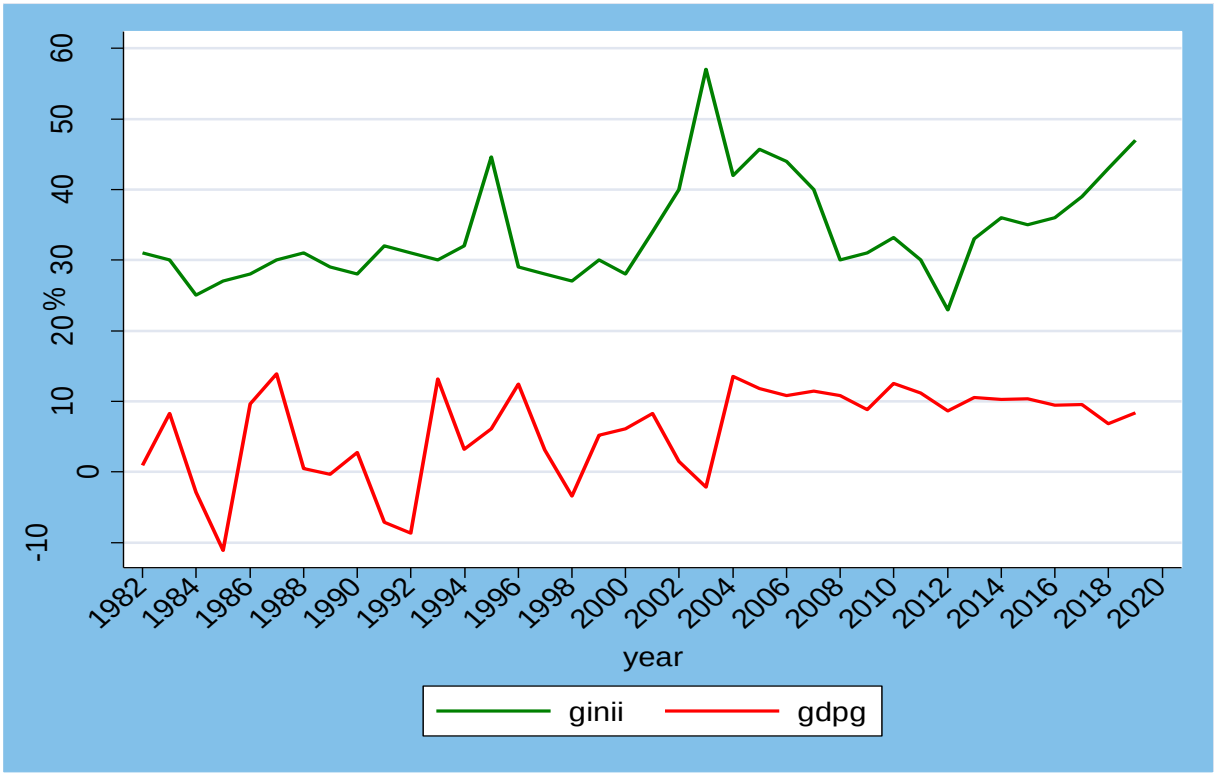


Source: Based on World Bank data and Central Statistical Agency

4.5. Correlation between economic growth and income inequality in Ethiopia

The trend of income inequality (GINI) and growth rate of real GDP relatively low at starting year and shows increase. The graphs illustrate the same properties that increase or slight decrease at the same periods. From 1982 to 1996 income inequality is constant, but growth of RGDP shows high fluctuations. On the other hand, from 1997 onwards the growth fluctuations of GDP decreases, and after that the two variables shows positive relationship between GINI and RGDP. Therefore according to Kuznets hypothesis an increase in income inequality as economy growth at initial stage, Ethiopian income and growth relationship follows Kuznets hypothesis. Since Ethiopia is a low income country.

Figure 9: Correlation between economic growth and income inequality in Ethiopia



Source: World Bank data

CHAPTER FIVE: RESULTS AND DISCUSSIONS

From the general regression result, it can be seen that the major statistics of the theoretical expectations are here below. The static long run equation was estimated and from the result all the variables have the expected signs.

5.1. Summary statistics of variables

The table below represents the statistical summaries of variables used in this study. With the average (mean) value of 5.9, the dependent variable (real GDP) has minimum and maximum growth of -11.144 and 13.855 respectively. The mean, minimum and maximum value of GINI coefficient is 0.413, 0.298 and 0.545 respectively. The implications of the high range, is that the presence of out layers which in turn affects the mean value of data. The standard deviation of RGDP and Gini is 6.532 and 0.0701 respectively, which shows the actual observation of the RGDP is highly dispersed from the mean values while GINI has lowest standard deviation of 0.07 implies its mean value and actual observations are close each other. According to Todaro (2012) the Gini coefficient for countries with highly unequal income distributions typically lies between 0.50 and 0.70, relatively equal distributions, it lies between 0.20 and 0.35 and it is approximately 0.44 for a relatively unequal distribution. The average (mean) value of GINI in Ethiopia which is 0.32 lies between 0.20 and 0.35, represents there is relatively equal distributions. Rate of urbanization ranges from 4.027 to 5.507 per year and its mean rate are 4.814, which show the growth of towns is population in cities and towns are increasing. The mean value of the **inflation** rate in the country is 9.69 percent for the period 1974 to 2018. The minimum and the maximum value of this variable are negative 9.808 and 44.356 percent respectively. The variation from the mean for inflation rate is 10.739 percent. This highest variation from the mean is an indication of macro-economic instability in the region through overall price increasing, which affects economic activities. for the study sample broad money supply growth has a mean value of 2.255 percent with minimum and maximum values of negative 14.185 and 11.172 percent respectively. since the stanard error is higher it represents higher variation from its mean, which indicates in ethiopia there is no stable growth of money sypply proportional to growth of real gross domestic product. finally the growth of population in

ethiopia ranges from 2.546 to 3.256 percent from 1982 to 2019. its mean value is 2.945 percent with standard deviation of 0.277, which is lower indicating lower variation from its mean.

Table 3: Summary statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Real gross domestic product growth	38	5.901	6.532	-11.144	13.855
Gini coefficient	38	0.413	0.057	0.298	0.545
Urbanization	38	4.814	.487	4.027	5.507
Inflation rate	38	9.356	11.113	-9.808	44.391
Broad money supply growth	38	2.255	6.112	-14.185	11.172
Population growth	38	2.945	.277	2.546	3.526

Source: Own survey, 2021 using World Bank data

3.7. Empirical analysis

3.7.1. Unit root test

ARDL estimation requires that the order of integration of variables should be I (0) or I (1). To test the order of integration of the variables used in this study, the researcher used the augmented Dickey Fuller test. This is considered to be the standard for testing unit roots. The orders of integration of all the variables used in this study are either I (0) or I (1). After confirming the variables' order of integration, the ARDL methodology can be applied confidently since it meets the conditions for variables having either a I(0) or a I(1) order of integration. Using ADF test order of integration is reported on table 5.2 below.

Table 4: stationary test statistics and order of integration

Variables	ADF test statistics at level	1st difference	Stationary
Real gross domestic product growth	-4.350	-7.600	I(0)***
Gini coefficient	-1.967	-6.625	I(1)***
Urbanization	-1.387	-4.507	I(1)***
Inflation rate	-4.754	-8.529	I(0)***
Broad money supply as %age of RGDP	-4.454	-7.754	I(0)***
Population growth	-0.394	-4.529	I(1)**

Source: Author's calculation, 2021. The null hypothesis of non-stationary and the alternative hypothesis are stationary. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively. I (1) refer to first difference stationary.

3.7.2. Optimal lag selection

In order to identify the effect of financial development and other independent variables on Economic growth using ARDL model identifying the optimal lag length for each variable should be identified. Therefore, in this study Akaike's information criterion (AIC) optimal lag selection model is used, which provides consistent estimates of the true lag order as compared to Schwarz's Bayesian information criterion (SBIC). As can be seen on Table 5.3 below among the variables real gross domestic product growth and Broad money supply growth has lag length of 3 years. While Gini coefficient has lag length of 1 year and Urbanization has lag length of 2 years. Inflation and population growth has lag length of 0 and 4 years respectively.

Table 5: Optimal lag selection

Variables	Optimal lag length				
	0	**1**	**2**	**3**	**4**
Real gross domestic product growth	6.43974	6.43719	6.49078	6.37482*	6.49315
Gini coefficient	-2.40814	-3.03774*	-2.97891	-2.92591	-2.90178
Urbanization	1.51933	-.105346	-.160552*	-.124848	-.080375
Inflation rate	7.75097*	7.7646	7.82157	7.76302	7.82026
Broad money supply as %age of RGDP	6.13442	6.07462	6.13287	5.93759*	5.99631
Population growth	.373347	-2.70966	-4.32505	-5.12102	-6.03852*

3.7.3. Short Run (ECM) Estimation Result

Applying ARDL estimation technique requires an auxiliary regression, short run ARDL estimation, used to identify the short run dynamics of variables. As a result, in this study the lagged value of all level variables (a linear combination is denoted by the error-correction term, ECMt-1) is retained in the ARDL model. The table below presents the results of the estimated error-correction model of economic growth for Ethiopia using the ARDL technique. Estimation result shows that the coefficient of ECM_{t-1} (error correction term) is negative and it is statistically significant at 1%. The ECM stands for the rate of adjustment in case of disequilibrium to restore equilibrium in the dynamic model following a disturbance. The coefficient of the ECM is negative 0.913 and this signifies that a deviation from the long-run equilibrium subsequent to a short-run shock is corrected by about 91.3 percent at the end of each year. In the short run economic growth is positively affected by income inequality, and population growth. While it is negatively affected by urbanization, inflation, and financial development.

Table 6: Short Run (ECM) Estimation Result

ARDL(2,0,1,1,2,2)		**Dependent variable :Economic Growth**		
Independent variables	**Coefficient**	**Std. Error**	**T- ratio**	**P-value**
ΔRGDP (-1)	**-0.0162**	**0.0493**	**-0.33**	**0.746**
ΔGINI	**2.55**	**0.562**	**4.54**	**0.000**
ΔURBAN**(-2)**	**-4.21**	**1.565**	**-2.69**	**0.013**
ΔINFL(-2)	**-0.232**	**0.031**	**-0.74**	**0.465**
ΔM2g(-1)	**-1.094**	**0.0549**	**19.93**	**0.000**
ΔPOPNG(-1)	**2**	**0.734**	**2.98**	**0.007**
ECM(-1)	**-0.913**	**0.064**	**-14.18**	**0.000*** **
Constant	**3.922**	**0.966**	**4.06**	**0.00*** **

3.7.4. LONG RUN ESTIMATION

Below on Table 4.6 Long run estimation of ARDL model using economic growth as dependent variable and income inequality, urbanization, inflation, financial development, and population growth as independent variable. Long run ARDL estimation result revealed that all variables except inflation have significant effect.

Table 7: LONG RUN ESTIMATION

ARDL(2,0,1,1,2,2)		**Dependent variable :trade balance**		
Independent variables	**Coefficient**	**Std. Error**	**T- ratio**	**P-value**
RGDP(−2)	**0.016**	**0.0493**	**0.33**	**0.746**
GINI	**2.55**	**0.562**	**4.54**	**0.000**
URBAN**(-1)**	**3.41**	**1.329**	**2.57**	**0.018**
INFL(-1)	**-0.001**	**0.027**	**-0.01**	**0.989**
M2g(-2)	**1.094**	**0.055**	**19.93**	**0.000**
POPNG(-2)	**3.249**	**0.56**	**5.801**	**0.007**
Constant	**2.922**	**0.59**	**4.953**	**0.000**

3.7.5. Interpretation of Long Run and Short Run Estimations

Income inequality: - lagged value of the dependent variable is statistically significant at 1 percent level of significance and the coefficient is positive, income inequality positively affects the present time economic growth. If Income inequality grows by 1 percent economic growth will grow by 2.55 percent. Its short run effect is similar with the long run effect. According to the result from the long run test statistics, gini coefficient is significantly and positively related to real GDP. In case it follows Kuznets hypothesis since Ethiopia is a low income country, so the income inequality and economic growth rise at the same time. The finding of the study is similar to the findings of by Perotti (1996), Forbes (2000), Delbianco et al. (2014) and Lee et al. (2015).

Urbanization:-urbanization significant effect on economic growth in the long run and insignificant in the short run. A 1 percent increase in urbanization the may lead to an 11.12 percent increase in economic growth in long run and short runs.

Financial sector development: - like the theoretical relationship in this study in the long run money supply, a proxy for financial development, has positive significant effect on economic growth at 1 percent. In the long run 1 percent increases in financial development results 1.1 percent increase in economic growth of Ethiopia. While in the short run in the short run financial development has negative effect. This may be because as financial development increases and in turn it increases investment and domestic production. As the level of output produced increase there may be an increase in export and in turn improvement in economy. This result is similar with the study by Ahad (2017).

Population growth: - in both long and short run population growth has statistically positive significant effect on economic growth at 5 percent level of significance. 1 percent increase in population increase RGDP by 3.25 and 2 percent in the long run and short run respectively. This may be because as the population grows the total labor force (working age population increases and in turn economic activities. Moreover, population growth with increase in labor force has been considered as a positive factor in stimulating economic growth since high labor force refers to the presence of high productive man power.

CHAPTER SIX: CONCLUSIONS AND IMPLICATIONS

6.1 CONCLUSIONS

The major objective of this study was to analyze the relationship between economic growth and income inequality. The study employed econometric techniques to investigate the relationship between economic growth and income inequality by including others variables like inflation, urbanization, population growth and financial sector development. To determine the relationship among the variables, ARDL model was applied. Before applying an econometric estimation all the variables are tested for their time series properties using the augmented-ducky fuller (ADF) tests. The regression result of ARDL model reveals that in the long run economic growth is positively affected by population growth, income inequality, financial development, and urbanization. But inflation has insignificant effect on economic growth. While in the short run economic growth is positively affected by population growth and income inequality. on the other hand financial development and urbanization have negative significant effect on economic growth. According to Kuznets (1955) in the early stages of economic growth inequality within nations rises as economy growth. That means there is positive relationship between income inequality and economic growth and also he explained that the process of economic growth had reduced income as labor shifts from the agricultural sectors to industrial sectors. From the above finding result income inequality and economic growth are positively related, which is the same to the Kuznets hypothesis. Therefore the relationship between income inequality and economic growth in Ethiopia follows the Kuznets curve since Ethiopia is a low income country whose economy is dominated by agriculture and targets to become a low middle-income by transform the country into a manufacturing hub

6.2 IMPLICATIONS

Based on the empirical findings of the study the following policy implications are drawn.

- The positive relationship between economic growth (measured by real GDP per capital) and income inequality (measured by Gini coefficient) indicates that the government has to consider the income inequality impact on economic growth in creating an environment that is conductive to growth. Direct Transfer Payments and the Public Provision of Goods and Services is important the direct provision of tax-financed public consumption goods and services to the very poor is another potentially important instrument of a comprehensive policy designed to eradicate poverty. Direct money transfers and subsidized food programs for the urban and rural poor, as well as direct government policies to keep the prices of essential foodstuffs low represent additional forms of public consumption subsidies.
- Financial development has positive significant effect on economic growth. The importance of secondary market in developing countries should be given more thought and further studies should be done to this area so that financial markets enter the country's economic structure in the near future. Effort should be made to resolve problems of financial sector in Ethiopia. That is in order to increase the availability of credit and pooling of savings; there should be deep penetration of financial sectors to the agricultural regions/rural regions where there is growth and money to be utilized.
- Urbanization and economic growth has positive significant effect. As a result the government and private sector should create employment opportunities in the rural and urban economies to reduce the level of open and disguised unemployment as well as chronic poverty of rural regions.

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Appendices

Appendix A1: long run estimation result of ARDL model

```
ARDL(2,0,1,1,2,2) regression

Sample:     1984 -     2019                 Number of obs     =         36
                                            F(  13,     22)   =      79.49
                                            Prob > F          =     0.0000
                                            R-squared         =     0.9792
                                            Adj R-squared     =     0.9668
Log likelihood = -49.115312                 Root MSE          =     1.2112
```

gdpg	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdpg						
L1.	.070427	.0444682	1.58	0.128	-.0217943	.1626483
L2.	.0161746	.049298	0.33	0.746	-.0860633	.1184124
gni	2.552275	.561973	4.54	0.000	1.386814	3.717736
urbang						
--.	-4.209665	1.565379	-2.69	0.013	-7.456062	-.9632678
L1.	3.412877	1.329209	2.57	0.018	.656265	6.169488
infl						
--.	-.0231794	.0311748	-0.74	0.465	-.0878319	.0414731
L1.	-.0003967	.027423	-0.01	0.989	-.0572685	.056475
m2g						
--.	.0074572	.0662572	0.11	0.911	-.1299518	.1448661
L1.	-.0760817	.0544391	-1.40	0.176	-.1889814	.0368181
L2.	1.093797	.0548862	19.93	0.000	.9799702	1.207624
popg						
--.	-28.58488	7.679644	-3.72	0.001	-44.51149	-12.65827
L1.	43.24965	13.55962	3.19	0.004	15.12872	71.37058
L2.	-20.08945	6.734074	-2.98	0.007	-34.05506	-6.123833
_cons	23.92267	3.966562	6.03	0.000	15.69653	32.14882

Appendix A2: short run estimation result of ARDL model

ARDL(2,0,1,1,2,2) regression

Sample: 1984 - 2019	Number of obs	=	36
	R-squared	=	0.9848
	Adj R-squared	=	0.9757
Log likelihood = -49.115311	Root MSE	=	1.2112

D.gdpg	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
gdpg						
L1.	-.9133985	.0644203	-14.18	0.000	-1.046998	-.7797989
LR						
gni	2.794263	.7209845	3.88	0.001	1.299032	4.289493
urbang	-.8723334	.9456674	-0.92	0.366	-2.833528	1.088861
infl	-.0258114	.0477447	-0.54	0.594	-.1248279	.073205
m2g	1.122372	.1527156	7.35	0.000	.8056593	1.439085
popg	-5.939009	1.241308	-4.78	0.000	-8.513323	-3.364694
SR						
gdpg						
LD.	-.0161745	.049298	-0.33	0.746	-.1184123	.0860633
urbang						
D1.	-3.412877	1.329209	-2.57	0.018	-6.169488	-.6562652
infl						
D1.	.0003967	.027423	0.01	0.989	-.056475	.0572685
m2g						
D1.	-1.017716	.0706759	-14.40	0.000	-1.164288	-.8711429
LD.	-1.093797	.0548862	-19.93	0.000	-1.207624	-.9799702
popg						
D1.	-23.1602	7.544592	-3.07	0.006	-38.80672	-7.513672
LD.	20.08945	6.734074	2.98	0.007	6.123831	34.05506
_cons	23.92267	3.966561	6.03	0.000	15.69653	32.14882

APPENDIX A3: long run ARDL bound test

Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship F = 85.746
t = -14.179

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

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_5	2.26	3.35	2.62	3.79	2.96	4.18	3.41	4.68

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

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

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_5	-2.57	-3.86	-2.86	-4.19	-3.13	-4.46	-3.43	-4.79

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

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

APPENDIX A4: Normality test

Jarque-Bera normality test: .3298 Chi(2) .848
Jarque-Bera test for Ho: normality:

APPENDIX A5: Test for Autocorrelation

Durbin-Watson d-statistic(14, 36) = 2.153891

Appendix A6: correlation matrix of independent variables

	gdpg	gni	urbang	infl	m2g	popg
gdpg	1.0000					
gni	-0.3732	1.0000				
urbang	-0.1610	0.5959	1.0000			
infl	-0.1633	-0.0726	0.2554	1.0000		
m2g	-0.0360	-0.4214	-0.1323	0.5339	1.0000	
popg	-0.4616	0.4922	0.5050	-0.1401	-0.1905	1.0000

Appendix A7: model specification test

Source	SS	df	MS		
Model	1517.64767	2	758.823834	Number of obs	= 36
Residual	30.6449541	33	.928634973	F(2, 33)	= 817.14
				Prob > F	= 0.0000
Total	1548.29262	35	44.2369321	R-squared	= 0.9802
				Adj R-squared	= 0.9790
				Root MSE	= .96366

gdpg	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	1.030724	.0339199	30.39	0.000	.9617133	1.099734
_hatsq	-.0051468	.0038856	-1.32	0.194	-.0130522	.0027585
_cons	.2169129	.2729119	0.79	0.432	-.3383304	.7721562

Appendix A8: omitted variable test

```
Ramsey RESET test using powers of the fitted values of gdpg
       Ho:  model has no omitted variables
                  F(3, 19) =      0.61
                  Prob > F =      0.6158
```

Appendix A9: Hetrosckedasticity test

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

         chi2(1)      =     0.00
         Prob > chi2  =   0.9999
```