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**ECONOMIC GROWTH, INCOME INEQUALITY, AND
POVERTY REDUCTION: EVIDENCE FROM SUB
SAHARAN AFRICA COUNTRIES**

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**Economic Growth, Income Inequality, and Poverty Reduction:
Evidence from Sub Saharan Africa Countries**

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Abstract

In recent times there has been a renewed interest in relationships between economic growth, inequality, and poverty. In this paper, we use System GMM estimation of dynamic panel data on the twenty-seven SSA countries to consider whether the recent tremendous growth has had an appreciable impact on Poverty and Inequality. We argue that such economic growth have been associated with poverty reduction and widen income inequality. Thus, Economic growth in SSA countries is often aimed at improving the life of the poor, although the effectiveness has often been hindered by inequality on transferring growth into poverty reduction. Moreover, although the non-monetary measure and income poverty measures have similar result-shows reducing poverty, the non-income poverty especially the destitution data suggests that SSA countries are poorer than we thought. We argued that SSA countries would do promote a policy of Income-enhancing (i.e. economic growth) and inequality-reducing complementarily to translate into poverty reduction. In addition, we revealed that the Kuznets hypothesis was invalid. So, strengthening the egalitarian income distribution system in every stage of development is recommended rather than after a certain level of development as Kuznets argued. Furthermore, we find that Credit has an important contribution to reducing poverty but it increases income inequality. Our argument here is building a pro-poor credit institution which should concentrate on consumption banking to benefit the poor, and to reduce income inequality. As well as being important to policy debates, this study may help to diffuse the more general pessimism that can underestimate the effect of economic growth on income redistribution in developing countries specifically in SSA countries.

Keywords: Economic Growth, Income Inequality, Poverty, SSA countries, System GMM

Declaration

I, Yohannes Kefale, declare that this thesis entitled with, "Economic Growth, Income Inequality, and Poverty Reduction: Evidence from Sub Saharan Africa countries," is my original work and it is prepared by myself in partial fulfillment of the requirements for the honor of Master of Science Degree in Economics at Addis Ababa University, has been approved and accepted by the following:

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Chairperson, Department Committee on Graduate Students/ Graduate Program Coordinator

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Chapter 1

Introduction

1.1 Background of the Study

The performance of growth, the severity of poverty, and distribution of income are different across continents, regions, and countries (Kanbur et.al, 2000 & UNCTAD, 2019). Sub-Saharan Africa (SSA) experiencing 4.73% of mean annual average GDP growth from 2010 to 2018 despite 446 million individuals still live in extreme poverty in the region based on a poverty line of \$1.9 per day and the average income inequality crumpled to a serious level (Jolliffe and Prydz, 2015 & WB, 2019). Furthermore, the condition of development and the level of non-income poverty are still worse in Sub-Saharan Africa countries. However, the government of these countries and international organizations plan and put a goal to reduce poverty, income inequality, and strive to transform the fragile economy. In order to achieve these goals, many Sub Saharan Africa countries adopted the proposal of Bretton Woods institutions of the structural adjustment reforms in the early 1980s. And the World Bank also come-up with a policy proposal to eradicate absolute poverty in the 1990's which is emphasized on human capital, environmental issues, and economic development (Dasgupta, 1997).

By then in the twenty-first century, most Sub Saharan Africa governments formulated their own programs to down poverty level and accelerate economic development, thus, the Poverty Reduction Strategy Papers (PRSPs) have been proposed. The PRSPs described policies and strategies to promote broad-based growth and mitigate poverty by integrating economic, structural, and social issues as well as associated financing needs and major sources of financing. In connection with this, under the Highly Indebted Poor Countries (HIPC) initiative the finance was the core element for development support and debt relief to most Sub Saharan Africa countries by the organization of International Monetary Fund (IMF) and World Bank to meet

Millennium Development Goals (MDGs)¹ and then Sustainable Development Goals (SDGs)² (IMF, 2016).

In many Sub Saharan Africa, the cause of underdevelopment and poverty were both natural and artificial factors mainly drought, political instability, conflict, war, inflation, inappropriate use of aid, corruption, inadequate education, and other devastating ingredients; so that 59.7% in 1993, 46.5% in 2010, 41.5% in 2018 live in the hardship of income poverty (WB, 2019). Moreover, more than 571 million people live in multidimensional poverty. Among this, around 200.3 million people live in destitution in SSA. In Ethiopia, for example, 56.8 million people live in destitution (Alkaire et al, 2014). In 2016, more than 9.7 million people were found in a severe food crisis (FSIN, 2017). According to the World Food Program (2019), recently in 2018, more than 7.8 million people were being in hunger. In some years back in 1984/5 more than 1 million people were died despite the fact that growth could have reduced the poverty headcount by some 31 percent from 1981 to 1995 (Bourguignon, 2004).

Although these factors accelerate the poverty level and decrease the benefit of the poor, economic growth is high in the region. This is because either the growth data were politically driven or the growth is not holistic which means that the income inequality was wider between the rich and the poor. If it is the case, the reduction of extreme poverty and income inequality should give attention and become a key policy issue. Thus, this study analyzed the relationship between economic growth, poverty, and income inequality in the region. And after the researcher assessed the effect of economic growth on poverty and income inequality in the region, a comparative analysis among countries will be made to determine which country has performed very well in terms of achieving greater poverty level reduction, more equal distribution of income, and better economic development.

This is very essential because different countries may have some difference in economic dynamics depends on a factor such as technology and innovation, nature of economic growth (Agricultural, industrial or service), and the performance of institutions, despite the homogeneous feature of SSA. This paper also devoted to examine the impact of economic growth on poverty reduction and income inequality by employing System Generalized Method of Moments (System-GMM) dynamic panel data estimation.

¹See (UN, 2015) for the lists and discussion of MDGs.

²SDGs will be achieved by 2030 which is dedicated to “no poverty”, zero hunger, reduce income inequality, quality education, decent work and economic growth, health, clean water and sanitation, promote industrialization and foster innovation, sustainable cities, ensuring consumption and production, conserve aqua life, protect ecosystem, affordable and clean energy, gender equality, strong institution, good climate and partnership (UN, 2017).

1.2 Statement of the Problem

Searching effective means of poverty reduction and income inequality minimization is the main goal of sustainable development economics (Besley and Burgess, 2000). To achieve the goal, researchers propose different alternative economic policies (Christiaensen and Kaminski, 2015). However, the importance of their efforts has been questioned. Some studies argued that economic growth represents an important means for reducing poverty but little impact on income inequality in developing countries (see Adams, 2003; Rodrik, 2007; Fosu, 2010; Eric, 2014). Notwithstanding, Other researchers emphasized that economic growth is accompanied at the expense of hundreds of millions of poor people or by hurting them. So, until the inequality crisis is tackled, the fight against poverty will not be won (see Adelman and Morris, 1973; OXFAM, 2016). Surprisingly, Ravallion (2001) tries to reconcile these two opposing ideas in which the poor's are benefited as well as lost from economic growth. So that the growth, poverty, and inequality literature has not yet provided a definitive answer to the question concerning the relationship between growth, poverty, and income inequality. Due to the fact that policy analysts need strong and satisfactory empirical evidences and ways to succeed their goals.

Other, even though there are many studies on growth, poverty, and inequality, few studies appear to be analyzed in Sub-Saharan African countries comprehensively. Among these Fosu (2010) and Eric (2014) investigated economic growth, income inequality, and poverty reduction in developing country regions specifically on SSA countries. However, both studies didn't address the idiosyncratic feature of Sub-Sahara African countries in detail and they merely concentrate on comparison among regions³. Moreover, this study assessed the spread, depth, and severity of poverty⁴ in SSA countries in detail.

Another profound reason for this study is the lack of robust empirical evidence concerning growth, poverty, and inequality in economics literature where previous studies mostly depend on the cross-sectional analysis (see Fosu, 2008). Here cross-sectional is not appropriate because the nature of growth and poverty is dynamic so that Panel data analyses give more information, variability⁵, and efficiency⁶ (Green, 2003). Other benefits include panel data are not only suitable to model or explain why individual units behave differently but also to model why a given unit behaves differently at different periods including better power properties of the

³Eastern Europe and Central Asia, South Asia, Sub-Saharan Africa, Latin American Countries, Middle East, North Africa, and OECD countries

⁴The spread, depth, and severity of poverty can be measured by head-count ratio, poverty-gap ratio, and the squared poverty-gap ratio respectively.

⁵For example, within and between variation.

⁶It is more reliable estimates due to more data.

testing procedures with dynamic analysis when compared to other methods (Verbeek, 2004).

Furthermore, in the literature of poverty, growth, and inequality many studies used OLS, fixed effects or random effects estimation techniques to address the impact of growth on poverty and inequality (see Adam (2003), Heshmati (2004), Fosu (2008), Luebker (2012), and Bouincha and Karim (2018)). However, these estimation techniques are biased and fail to answer the problem of endogeneity⁷ associated with dynamic panel data analysis (Roadman, 2009). So that, this study used System Generalized Method of Moments (System-GMM) that was developed by Blundell and Bond (1998) to address OLS, fixed effects and random effects estimation problems specifically: endogeneity, biasedness, country-specific heterogeneity, and serial correlation problems. Moreover, this study captured other explanatory variables where most studies didn't include in their work of growth, inequality, and poverty relationship regressions.

On top of these, most developing countries achieve positive economic growth with high income inequality including Sub Saharan countries (Fosu, 2010; Nemati and Raisi, 2015; OXFAM, 2016). Hence, in the ladder of development, income inequalities minimize the benefit of economic growth to the bottom society. So, as extreme poverty and income inequality reduction have been the main objective of these countries in their development process, the next questions have to be raised. First, Does really the poor are not benefited from economic growth? Second, how does economic growth affect poverty and income inequality? Third, to what degree does income inequality affect the poor? Lastly, how we can ramp up the reduction of poverty and income equality along with economic growth?

1.3 Objective of the study

1.3.1 General Objective

The general objective of this study is examining the relationship between economic growth, income inequality, and poverty in SSA countries using System-GMM dynamic panel data estimation.

1.3.2 Specific Objective

- To assess the impact of economic growth on poverty reduction and income inequality.
- To investigate how income inequality related to the level of per capita income (i.e. Kuznets curve).
- To Analyze the effect of income inequality on poverty.

⁷It arises when there is a correlation between one or more of the explanatory variables and the error term.

1.4 Significance of the study

In Sub Sahara African countries, the number of studies conducted so far on the relationship between economic growth, income inequality, and poverty reduction which is investigated with advanced dynamic panel data model is limited in number, in which further study is required in the region. Therefore, this study will help in filling knowledge gap in such area. Specifically, the findings may help to diffuse the more general pessimism that can underestimate the effect of growth on income redistribution in developing countries especially in SSA countries. More importantly, as sustaining economic development and poverty reduction with equitable income distribution is the objectives of developing countries and international organizations, the expected outcome from this study will also be useful in improving policy design, institutional setup, and implementation of relevant policy on income distribution and poverty reduction along with economic growth especially in SSA countries. Besides, it can trigger further study in the area.

1.5 Scope and Limitation of the study

This study used panel data from 2010 to 2018 for Sub Saharan Africa countries to investigate the relationship between economic growth, poverty, and income inequality using the System-GMM estimation approach. This study is devoted to cover most of Sub Saharan Africa countries under analysis but only 27 counties are included in the regression analysis. This is due to data availability problem on the variables used in the study and the time period covered. As data on many variables included in the study is not available for many of the countries before the year 2010, this study is limited to the period from 2010 to 2018. So that the major limitations of this study, among others, is the problem of getting data for all SSA countries and for a longer period of time in the region.

1.6 Organization of the Study

This study is organized into five chapters as follows. Chapter 1 presented the introduction part. In chapter 2 relevant theoretical, empirical, and conceptual works of literature are reviewed. In Chapter 3 the data set and methodology applied were discussed. The main findings and results are revealed in Chapter 4. Finally, Chapter 5 discloses conclusions and implications.

Chapter 2

Literature Review

Review of literature is very essential not only in understanding the issues involved but also in identifying gaps, planning, and execution of the experiences of others. Further, the wisdom to identify key questions and gaps of empirical research provides a method to answer the queries and filling gaps to the extent possible which in turn helps in making logical conceptualization of the study. This chapter presents the review of theoretical literature and empirical findings of studies related to poverty, income inequality, and economic growth with an emphasis on their relationship. However, there are crucial issues that emerge from many theoretical and empirical studies on poverty and inequality definition, measurement, data (i.e. inconsistency between official estimates and other estimates), and extent of shift and factors affecting them. Having this, the conceptual framework is developed and presented in the last section of this chapter to provide a valid formulation of the study.

2.1 Theoretical Literature Review

We now turn to explore the definition of concepts and theories related to the relationship between poverty, economic growth, and income inequality including their specific explanation and measurement issues.

2.1.1 Poverty

So far, there is ambiguity as to how the word poverty is used and as a result, a lot of definition exists, influenced by different disciplinary approaches, world views and ideologies (Handley et al., 2009). Historically, early studies in the 18th century have been defined poverty in terms of basket of goods and monetary phenomena i.e. based on income or consumption level. For instance, Adam Smith (1776) defined poverty as *"the inability to purchase necessities*

required by nature or custom" (quoted in Davis and Martinez, 2015). And afterwards, further development have been seen on the concept of poverty which has not only defined in terms of lack of income but also in terms of wellbeing and failure of social entitlements: the denial of opportunities and choices, lack of access to health, capability, decent standard of living, power and freedom, dignity, self-esteem, education, improved water access and basic social services deemed necessary for survival (World Bank, 2000; Sen, 1983 and Macinnes et al, 2013). So that, in general economic reasoning, poverty can be defined as social deprivation from a decent quality of life (Mabughi and Selim, 2006).

Furthermore, the concept of poverty can be framed by accompanying qualifiers, such as absolute and relative poverty (Davis and Martinez, 2015). Absolute poverty is a condition characterized by severe deprivation and/or unable to meet basic human needs; such as food, shelter, education, health, safe drinking water, and sanitation facilities. As a result, it is described as subsistence poverty (UNDP, 1995). Additionally, Amartya Sen (1983) defines absolute poverty in terms of human capabilities instead of income or commodities. However, Relative poverty compares the income (expenditure) of the person or household's to the income distribution of the country of residence; it is an indicator of inequality. In other words, it refers to the amount of minimum income that an individual needs to enjoy what is considered an average standard of living in the country of reference. Relative poverty, therefore, differs from one country to another and it is judgmental, hence, some luxuries may become necessities. Additionally, relative poverty may be described as "relative deprivation" because the people falling under this category may not enjoy the same living standard as everyone else in the country (Marx and Bosch, 2000).

To cast a light on measurements, description, and conceptualization of poverty, Ravallion (1997) made an attempt. He claims that there is enormous polarization between the extensive definitions of poverty found in the literature and what is viable to measure and operationalize on the ground. Thus, for research purposes, the livelihood approach or the three-dimensional measures of poverty sketch out by the World Bank or Multidimensional Poverty Index ¹ analysis of UNDP may be convenient to think about poverty, while at the same time measuring poverty from income perspective can be advantageous in two ways: income used as a welfare measure

¹ MPI is a compressive indicator that the wellbeing of a household or an individual depends not just on income or consumption, but also on several other dimensions or capabilities such as health, education, and standard of living. But may not be limited to, health, education, the standard of living also to empowerment, work, environment, safety from violence, social relationships, and culture based on A. Sen's view. Alkire and Santos (2010) come up with an intuitive approach to identifying the poor that uses two forms of line/cutoffs. The first is the traditional dimension-specific cutoff, which identifies whether a person is deprived of in that dimension. The second delineates how widely deprived a person must be to be considered poor. Their benchmark procedure used a counting methodology in which a second line is a minimum number of dimensions of deprivation.

or income can proxy the living standard of individuals and households.

This means that measurement of poverty has to be done in terms of income but a broad analysis of poverty is not forgotten here because it is important for analysis purposes and in targeting the impact and effectiveness of applicable policies. Thus, if we have decided on the income-based measures of poverty for quantification purposes, the next challenge is the determination of the poverty line. The most commonly used income poverty line internationally is the World Bank poverty line \$1 or \$2 a day based on a fixed year PPT measure. In addition, specific countries have their own poverty lines based on the minimum income that is considered to meet basic needs in that country (Fosu, 2010). Although the methods or an empirical base to set a poverty line is questionable, the international standard of the poverty line is widely used to compare the poverty level across countries and regions.

In developed countries, relative measures of poverty are mostly used but in poor countries, the absolute measures of poverty continue to dominate (Ravallion and Chen, 1997). In order to discuss the link between growth and poverty relation, the selection of relative or absolute poverty lines is very important. If a relative poverty line (e.g. 60% or 50% of the population), this poverty line will be changed by economic growth, and poverty will be declined to some extent and go hand in hand with more equal income distribution. However, if the poverty line is determined based on absolute poverty measures (e.g. \$2 a day), economic growth can shift the mean income without changing the relative incomes of the poor. However, absolute poverty measures capture more urgent actions and pressing concerns than relative poverty measures. And also many studies take a given level of income as a poverty threshold in order to compare poverty levels across countries and over time (World Bank, 2005).

2.1.2 Poverty Reduction and economic Growth

Many theorists stand from the puzzle of “*Are the reduction of poverty and the acceleration of growth in conflict? Or are they complementary*” (Todaro and Smith, 2012). Traditional theorists held that rapid growth is bad for the poor because they would be bypassed and marginalized by the structural changes in modern growth (ibid). Apart from this, Dolar and Kraay (2002) & Ravallion (1997) argued that growth is good for the poor because the lion’s share of the income of the poor is what they have earned themselves, not transfers from the state, development agencies or individuals. Thus, the income of the poor increases because they produce more in agriculture, get better prices for their crops, and higher off-farm wages. Moreover, a neoclassical theorist, A. Marshal supports the argument of growth is good for the poor, and he claims that income should be the first economic variable to alleviate poverty

because it gives purchasing power over commodities and resources (Davis and Martinez, 2015). The well-known economist of Keynesian economics, J.M. Keynes² also claimed that growth can bring poverty alleviation. On the contrary, K. Marx's argued that growth alone may be insufficient to left out poverty, for instance, a certain class may not reap any benefit from overall income growth. Lastly, an important contribution of Marxian economists is the sense that poverty is a moral as well as a technical issue (i.e. is not only a matter of efficient use of resources but also a matter of justice) (Ibid).

On top of these polar theory arguments, the relationship between economic growth and improvement in the life of the poor may not by itself indicate causality. The effect probably runs from improved education, health, and income (i.e. through remittances or aid) among the poor to reduce poverty. Thus, poverty reduction may be possible without rapid growth despite many theorists expect growth to facilitate poverty reduction But whatever the causality, it is clear that growth and poverty reduction are entirely compatible objectives (Todaro and Smith, 2012).

2.1.3 Income Inequality

According to Todaro and Smith (2012) income inequality is defined as the disproportionate distribution of total national income among people. In measuring income inequality, the most widely used measure of income inequality is the Gini coefficient, developed by the Italian statistician Corrado Gini in 1912. Gini coefficient takes the value between zero and one, with 0 being perfect equality (all have the same income) and 1 being perfect inequality (all income earned by one person). The intuition behind the Gini coefficient can be expressed as the share of GDP that has to be reallocated to achieve perfect income equality (Gini=0). For example, if a country has a Gini coefficient of 0.7, it will be the case that 70% of GDP should be given to the poor from the rich to make income distribution fair.

There are also other widely used measures of income inequality that can be derived from the ratio of the income received by the top 20% and bottom 40% of the population (Pickety, 1997). This ratio, sometimes called a Kuznets ratio after Nobel laureate Simon Kuznets has often been used as a measure of the degree of inequality between high and low-income groups in a country. This gives the ratio between the richest average income and the poorest average

²Keynes has a similar view on education to reduce poverty but not with an individual decision rather government intervention takes a central role. He believed that intervention of the state is needed to reduce poverty level down by fighting against involuntary unemployment to enhance the accumulation of human capital through investment in education which promotes economic development and helps to combat poverty. And he argues that to combat poverty, macroeconomic policy should be designed.

income. This has an intuitive justification: how many times the riches are rich compared to the poor? However, the Kuznets ratio is less satisfactory as compared to the Gini coefficient, because the Kuznets ratio turns a blind eye to change in the middle-income range. For example, a transfer of income within the 40 % in the middle-income group could not affect the Kuznets ratio but would alter the Gini coefficient.

2.1.4 Income Inequality and Economic Growth

From the theoretical point of view, Kuznets (1995) sheds a light on the relationship between income inequality and economic growth in which the level of economic growth has an influence on income inequality of a country. Kuznets's hypothesis argues that, at the initial stages of development, a high degree of income inequality is needed in the distribution of resources in order to foster huge investments, and in turn, it will increase factor productivity. Moreover, high wage inequality earning initiates workers to join innovative sectors to seek employment. So, workers become more productive, and therefore they will earn a higher and higher wage. Consequently, the productivity of labor enhances the growth of GDP. However, after a certain level of economic development, the society demand of a more egalitarian resource makes the government introduce a welfare distribution system in order to decrease income inequality between the poor and the rich.

Thus, Kuznets recommends that income inequality is a dependent variable and economic growth is an explanatory or independent variable. In addition to that Kuznets hypothesizes the relationship of income inequality and economic growth takes a form of inverted U shape (Abhijit and Duflo, 2003). As just noted, the Kuznets curve can be generated by a steady process of modern-sector enlargement growth as a country develops from a traditional to a modern economy. Alternatively, returns to education may first rise as the emerging modern sector demands skills and then may fall as the supply of educated workers increases and the supply of unskilled workers falls. So while Kuznets did not specify the mechanism by which his inverted-U hypothesis was supposed to occur, it could in principle be consistent with a sequential process of economic development (Todaro and Smith, 2012). But, the traditional and modern sector enrichment would tend to pull inequality in opposing directions, so the net change in inequality is ambiguous, and the validity of the Kuznets curve is an empirical question³.

³Notwithstanding Kuznets's hypothesis theory and investigation, many empirical studies argued differently. Adams (2004), for example, found that income inequality and economic growth has no significant relationship. Ravallion (1997) also challenged the Kuznets hypothesis by investigating growth has no impact on income inequality. Piketty (2007) also question Kuznets's hypothesis by claiming that, between the end of the nineteenth

2.1.5 Relationship between poverty, inequality and economic growth

Recently, one of the leading figures in the poverty, inequality, and growth relationship literature is François Bourguignon, who was a Senior Vice President and Chief Economist of the World Bank and known by his theory of “Poverty-Growth-Inequality Triangle”. In that address, Bourguignon claimed that once it is accepted that the absolute income poverty reduction is a meaningful development goal, then a direct link may be constructed between development, growth, and income distribution. An arithmetic identity links the growth of the average income in a given population, with the change in income distribution – or in ‘relative’ incomes -and the reduction of absolute poverty. The arithmetic relationship of poverty, inequality, and growth may be displayed with the “PGIT” below; in which the rate of growth and distributional changes fully determine a development strategy.

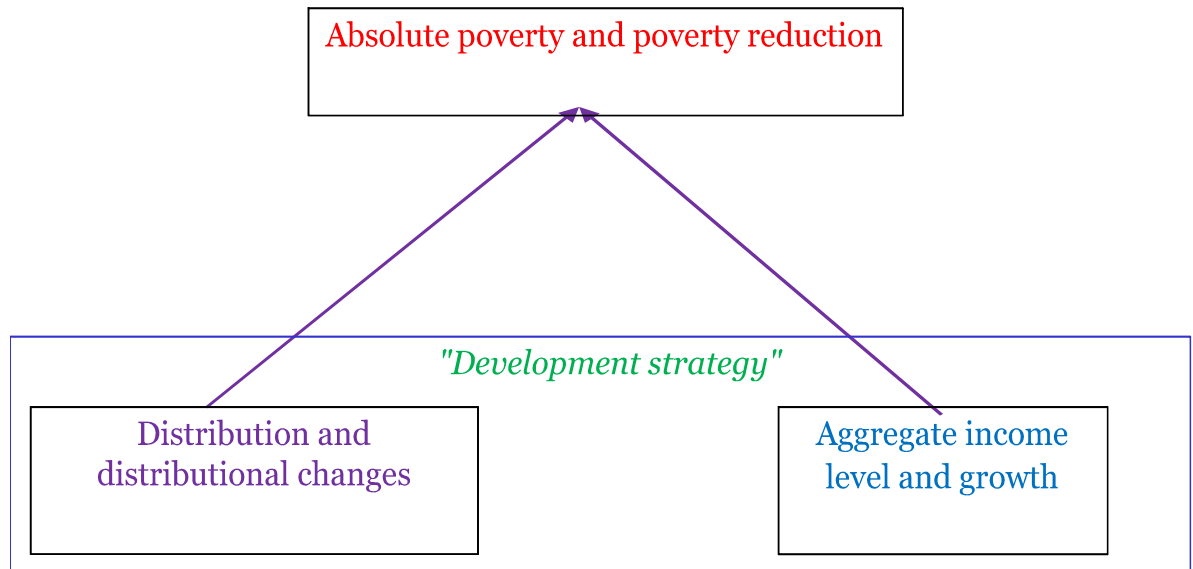


Figure 2.1: The Poverty-Growth-Inequality Triangle (PGIT) (Source: Bourguignon’s, 2004)

and the beginning of the twentieth century, the western world witnessed an unambiguous trend i.e. no evidence of a downward trend of inequality and it is in contrast to Kuznets’s prediction of declining inequality after the initial stages of industrialization. However, it is not said that Kuznets Hypothesis is not supported by other empirical evidence; for example, Forbes (2000), Fosu (2010), and Marrero and Serven (2018) supported the Kuznets hypothesis. Chen (2003) also found an inverted-U relationship between income distribution and long-run economic growth using cross country data but not in the short-run (sighted in Heshemati, 2004).

From the viewpoint of forming a theoretical relationship, a change in poverty can be shown to be a function of income growth, income distribution, and the change in distribution. Hence, $\text{Change in Poverty} \equiv F(\text{growth, distribution, change in distribution})$. Bourguignon further showed the decomposed change in the distribution of income into two effects. The first is growth effect, the effect of a proportional change in all incomes that leaves the distribution of relative income unchanged. Second, there is the effect of change in relative income distribution which, by definition, is independent of the mean, i.e. a distributional effect. Hence, he shows clearly that both growth and inequality changes play a major role in generating changes in poverty. However, the impact of these phenomena depends on the initial level of income and inequality. Moreover, the relative effects of both phenomena may differ quite dramatically across countries.

In conclusion, the debate on the relationship between poverty, inequality, and growth is characterized by confusion and strong, polarized positions. As stated earlier some consider economic growth to be the key to the reduction of poverty, while others argue that it tends to lead to marginalization and greater inequality and poverty. These positions reflect two major theoretical conclusions in the discussion about poverty. First, the view of poverty in terms of lack of economic advancement, normally equated with insufficient economic growth. Second the view of poverty as a result of uneven/class-based development, exploitation, and income distribution. According to the first view, the income poverty problem is solved by making total income or GDP bigger, while the second argues the problem should be addressed by giving the poor a bigger share of the total income (Angelsen and Wunder, 2006).

2.2 Empirical Literature Review

Several studies have attempted to analyze the relationship between economic growth, income inequality, and poverty reduction. Among these Iradian (2005) investigated the impacts of growth, inequality, and government spending on poverty reduction using cross country unbalanced panel dataset for 82 countries for the period 1965–2003 by applying FE and differenced GMM estimation techniques. The empirical results suggested that higher per capita income growth is associated with higher rates of poverty reduction but if the adverse impact of an increase in income inequality more than offsets the reduction in poverty associated with growth, poverty would rise. Additionally, the paper argued that poverty will be reduced more in countries with low initial income inequality than in countries with high initial income inequality, for the same per capita income growth. The results in this paper also confirm that the validity of the Kuznets curve but in the long term he argued inequality may have an adverse impact on growth. He recommended Sub-Saharan African countries to grow by at least 6.5% a year to reduce the poverty level from 47 % of the population in 2001 to 22% by 2015 (by assuming the level of income inequality remains unchanged).

The article published in the Quarterly Journal of Economics by Sala-I-Martin (2006) investigated the World Distribution of Income by integrating individual income distributions for 138 countries between 1970 and 2000. The estimation result revealed that global income inequality is reduced during the 1980s and 1990s, with all eight measurements of inequality deliver the same picture. The main reason he pointed out is that incomes of some of the poorest and most populated countries in the World (most notably China and India, but also many other countries in Asia) rapidly converged to the incomes of OECD citizens. This force has been larger than the divergence effect caused by the dismal performance of African countries. The estimates range from a 2.6 percent reduction in the variance of log-income to a 30 percent decline in the top-20-percent-to-bottom- 20-percent ratio. The study also asserts that poverty is reduced during the study period. The reason suggested behind the reduction in world poverty level is that where poverty was mostly an Asian phenomenon 30 years ago (80 percent of the world's poor lived in East and South Asia), poverty is, today, an essentially African problem (75 percent of the poor live in Africa today whereas only 19 percent live in Asia).

Heshmati (2004) also examines the linkage between growth, redistribution, and poverty using the WIDER inequality database around the world. The empirical result suggests that economic growth benefits the poor but he argued that the absence of effective redistribution growth affects income distribution. Moreover, the regression outcome approves that income

inequality is declining. Heshmati also supports the Kuznets hypothesis of the global relationship between income inequality and growth. However, the main problem of this study is country data aggregation using population share as a weight to test the Kuznets hypothesis. So entry and exit of countries with a large population (like India and China) affect the stability of inequality and development series and regression results.

Using 50 developing data Adams (2003) investigates economic growth, poverty, and inequality linkage by applying two types of measurement in growth-the survey mean income and changes in GDP per capita. He found that economic growth tends to reduce poverty by increasing incomes in all including the poor because growth has little impact on income inequality. However, poverty is reduced more when mean income is used than when GDP per-capita is used. Moreover, Econometric analysis indicates that economic growth has no statistical effect on income distribution. He also asserts that economic growth is critical in poverty reduction. So, to reduce poverty, economic growth should be accelerated in developing countries. Particularly, effort should be exerted in identifying the catalysts used for achieving a high rate of economic growth in a certain region of the developing world. However, the problem is he didn't address the catalysts that achieve a high rate of growth.

Another research which is investigated in developing country regions is by Eric (2014). He found that economic growth has led to a reduction in both income and human poverty levels in all developing regions which is a similar result with Iradian (2005). This study investigated the implication of economic growth on income inequality and poverty reduction from the notion of regional comparative analysis of developing countries regions using panel data System-GMM modeling estimation approach among 76 countries across Sub-Saharan Africa, South and East Asia, Latin American countries and the OECD region for the period 1990 to 2010. The thesis also claimed that economic growth translates into little poverty reduction in all the regions when income inequality is high than when it is low. The results also show that economic growth significantly reduced income inequality in SSA. However, growth led to an increase in income inequality in Latin American countries and the OCED region. The results of the study also imply that countries should not only target the incomes of the poor as a means of reducing poverty, however, but equally important means such improving life expectancies and economic provisioning are also channels of eliminating absolute poverty. He recommended that governments should not only focus on economic growth in its effort to reduce poverty but should also pay important attention to promoting macroeconomic stability, proper use of ODA, and government spending.

Another research in developing country by Ravallion and Chen (1997) report a new set of results using household surveys for 67 developing and transitional economies over the period 1981 to 1994. The SSA subsample included 19 countries (with 28 surveys) representing 65.9% of the region's population in 1993. The results in this paper of poverty measures are reported using an international poverty line of \$1 per person per day in 1985 PPP. According to these results, between 1978 and 1993 poverty increased in SSA for all poverty measures used by the authors: the head-count ratio increased from 38.5% in 1987 to 39.1% in 1993 while the poverty-gap index increased from 14.4% in 1987 to 15.3% in 1993. Further, among all developing regions, SSA is found to rank 2nd to South Asia in terms of the incidence of poverty and ranks first in terms of the depth of poverty as measured by the poverty-gap ratio.

Africa as a case study, Fanta & Upadhyay (2009) study the relationships among growth, inequality, and poverty using a data set for 16 African countries based on household budget surveys. They find strong support that poverty decreases in response to economic growth, with the estimated elasticity ranging between 0.5 and 1.10. Besides, they further claimed that the attainment of a higher level of development allows a country to translate a given growth into greater poverty reduction. However, unequal income distribution is an impediment to effective poverty alleviation. Hence, they indicate a policy of country-specific circumstances, particularly regarding the stage of development, and the level and trend in inequality in Africa.

Seyi and Ada (2018) also empirically examine the growth-inequality relationship and the channel through which growth influences income inequality by employing the Panel Fixed Effect model of 20 African countries from the period 1991 to 2015. They find that there exists a positive relationship between growth and inequality in the selected African countries. The results also suggest that government spending is a principal determinant of poverty reduction and income inequality within the selected African countries. They indicate African countries should combat inequalities because it would make the African nations stay vulnerable to poverty.

The Sub-Saharan Africa-specific literature on the linkages growth-poverty-inequality is sparse. Despite that, a pioneered researcher Fosu (2008) assesses the nexus between inequality, growth, and poverty using Africa data. He develops an analysis of the covariance model to give imputes the growth effect on poverty retarded by greater inequality. He then estimates the model using 1990 rural and urban cross-sectional data from a sample of 16 SSA countries. He found that poverty is responding to growth and hence, for efficient poverty reduction more emphasis is required for growth relative to inequality but it may differ substantially across African countries. Fosu also asserts that a more equitable income distribution would enhance the rate at which growth is transferred to poverty reduction and that there is variance of growth impact

among SSA countries (It is also asserted in Fosu, 2015 update with a different model). He recommends that an efficient poverty reduction strategy requires a country-specific approach to be undertaken in determining the appropriate emphasis on growth vis-à-vis income inequality.

Ali and Thorbecke (2000) also analyses and provides estimates on the condition and trajectory of poverty in SSA countries using the World Bank database and national statistical agency data of different countries. Hence, their study is more of descriptive. They showed that about 59% of the rural population was living under a poverty line of US\$311 per person per annum and about 43% of the urban population was living under a poverty line of US\$521 per person per annum. Overall, half of the population of SSA was living under poverty during the first half of the 1990s. In addition to this widespread poverty, it is also shown that poverty is deep and severe in SSA countries. The paper also looks at changes and sensitivity in poverty over time in terms of growth and distribution components. For instance, SSA urban poverty is more sensitive to distribution factors than to growth variables but the different conclusions for rural poverty based on different poverty measures.

Sembene (2015) assess poverty, growth, and inequality in Sub-Saharan Africa countries with a match of the PRSP approach using a fixed-effect model and IV regression. He finds that PRSP implementation has neither reduced poverty headcount nor raised the income share of the poorest quintile in Sub-Saharan Africa while countries in other regions have been more successful in reducing poverty and increasing the income share of the poor. His evidence also shows that economic growth was more important for the rich than the poor at the time of PRSPs implementation.

Another study in SSA is by Habimana (2014) who investigate Inequality and Economic Growth in the SSA region based on a panel of 29 countries for the period 1980-2011. Evidence from Random-effects model estimates revealed that inequality and growth has an insignificant connection in SSA countries. Another recent study by Shimeles and Nabassaga (2018) found economic growth has a positive relationship between inequality and growth using the Demographic and Health Surveys for 38 countries from 1989 to 2013. He further finds that inequality is lower in countries with lower education. Furthermore, Nel (2003) find a negative relationship between growth and inequality.

In sum, the empirical works of literature we have observed reveal several facts, investigations, and justifications about the poverty, growth, and inequality in a different part of the world with special emphasis on Sub-Saharan Africa. First, from the mid-1970s to the mid-1990s is a period of economic contraction for Sub-Saharan economies, but showed slow recovery since the mid1990s. In parallel, after the mid-1990s more than half of the world's extreme poor live in the

region of Sub-Saharan Africa i.e. poverty in SSA grew while the rest of the world experienced a dramatic reduction in poverty rates (Sala-I-Martin, 2006). In fact, the number of poor in the region increased by 9 million, with 413 million people living on less than US\$1.90 a day in 2015. Despite the world’s population lived on less than US\$1.90 a day declined from nearly 36% in 1990 to 10% in 2015 (WB, 2019). If the trend continues in SSA, by 2030, approximately 9 out of 10 extreme poor will exist in the region which will be an impediment for the sustainable development goal of “No Poverty”. Second, the empirics highlighted that SSA has one of the highest average regional income inequality levels, and high-income inequality within countries has remained more or less constant over the last four decades. Hence, high-income inequality is one of the distinct attributes of Sub-Saharan economies.

Third, beyond the statistical trend, the empirical findings in the literature, based on a large sample of countries and relatively long time period, in general, indicate a negative relationship between economic growth and poverty levels i.e. economic growth is associated with a reduction in poverty levels⁴ (see Ravallion, 2001; Adams, 2000; Heshmati, 2004; Iradian, 2005; Fanta & Upadhyay, 2009; Eric, 2014). In contrast to growth poverty linkage, the relationship between income inequality and economic growth (explanatory) is more controversial and inconclusive. For instance, the U shape of the Kuznets curve is criticized by some authors (Ravallion and Chen 1997; Atkinson and Pickety, 2007; Ladaique and Pearson, 2001). However, Heshmati (2004) support the Kuznets curve. And other authors found negative (Nel, 2003; Eric, 2014), positive (Shimeles and Nabassaga, 2018), and insignificant (Adams, 2003; Habimana, 2014) relationship among growth and inequality. But, despite the controversy, most of the results in the literature suggest that there is a relationship between income inequality and economic growth.

On top of these, by considering the gap of the literature on growth, inequality, and poverty, in general, this study takes a serious analysis of the relationship between economic growth, poverty reduction, and income inequality by taking a different approach as already discussed in the previous chapter.

⁴However, the elasticity of income poverty varies across countries that a unit increase in income leads to more or less poverty reduction (Ravallion, 2001). The rate at which the growth of income translates into a reduction of poverty depends on the change in distribution. Even in the absence of a shift in income distribution, a given rate of growth may be associated with a range of poverty outcomes due to the effect of initial inequalities (Bourguignon’s, 2004). And in countries with initial income inequality is high, growth converted to less reduction of poverty because it is more likely growth is needed to lift a person out of poverty (Ravallion and Chen, 1997).

2.3 Conceptual Framework

The conceptual approach in understanding poverty, inequality, and growth⁵, can be broadly classified into three. The first is microeconomic and outlines factors that affect poverty and inequality dynamics, and economic mobility at the household level (Ravallion, 2001). The second is macroeconomic, mainly arising from growth theories, and focuses on the mechanism by which a whole nation can achieve a sustained rise in aggregate income or be caught in the poverty trap (Barro & Sala-i Martin, 2004). The third is a micro-macro approach which merges the above two approaches by emphasizing on rapid elimination of absolute poverty as the goal for development and strong, country-specific combinations of growth and distribution policies by aggregating the given level of expenditure or income of household or individual for a given country (Sala-I-Martin, 2006 and Zerayehu et.al, 2019).

Moreover, *"linking micro-macro can help to deal with the limitations of single and pure micro (respectively macro model) that when taken solely, only provides partial responses of policies at the macro-level (respectively the micro-level) allows integrating all relevant economic aspects, especially existing spillover effects in the economy and resource re-allocation"* (Mas-samba, 2016). The analyses give valuable information on the responsiveness of the inequality and poverty to growth driven by a specific country, as many policies are formulated by targeting specific country programs (Fosu, 2008)). Hence, in this paper, the researcher focused on the third (micro-macro) approach. And, Income structure will be used as a framework to examine inequality and poverty between countries and that of inequality and poverty of opportunity for the purposes of understanding within-country inequality and poverty with an understanding that there is a good deal of overlap between the two approaches.

In reference to the income structure of countries and regions, the World Bank database and most literature widely recognized that Sub-Saharan Africa is one of the most unequal (Gini coefficient is estimated at 0.48), and impoverished regions with rapid growth in the world especially starting from the mid-1990s. However, beyond this general statistic, there might exist different channels and structures of inequality and poverty between countries in the SSA region. So, a deep analysis of the structure and the evolution of inequality and poverty along with growth over the years and along the income scale is required. Besides, the presented

⁵Economic growth is generally defined as an increase in total production of goods and services i.e. Gross Domestic Product (GDP), either in GDP per capita or total GDP (Ivic, 2015). Loosely speaking, GDP is the amount of total income for a country. Thus, economic growth can be similar to the average income growth. The definition of growth is a potential source of dissension in the growth-poverty debate. However, it is a technical concept to an economist as defined above despite the term is often interpreted beyond its technical meaning (Angelsen and Wunde, 2006). So, this study will use the term economic growth as its pure technical meaning as stated above- as an increase in average income.

framework allows analyzing how inequality and poverty respond to economic growth and to different economic variable profiles plus we have seen the spread, severity, and depth of poverty in the region.

As we discussed in the empirical literature, there is no clear consensus that growth- poverty nexus. However, many argued that growth reduces poverty (see Adam, 2003; Ravallion and Chen, 1997; Dollar and Kraay, 2006). Regarding growth-inequality linkage, the literature are controversial especially in testing the Kuznets hypothesis. In contrast to the growth-poverty nexus, the literature shows that there is little consensus regarding growth-inequality linkage. However, this study investigates whether this relationship might depend on the nature of the growth, the parts of the income distribution that is considered, the shape of inequality, and/or other variables. Not only this but how poverty is determined by growth, and its initial condition also assessed. In fact, different growth sources might have heterogeneous effects on inequality and poverty at the different parts of the income distribution and poverty level because they affect household income differently and are not all growth-neutral (Massamba, 2016).

Lastly, the link between growth, income inequality, and poverty can be multidimensional. However, this thesis focuses on one direction of the interaction that is how growth might impact income inequality and how growth affects poverty. This thesis also frames to sheds light on the difference of structure of inequalities and poverty between and within selected sub-Saharan African countries by taking into account the heterogeneity in the income distribution and initial poverty. Secondly, the investigation going to other determinants that allow poverty reduction and equal income distribution. Hence, beyond the investigation of growth, inequality, and poverty relationship our framework will allow in identifying the economic variable lead to more egalitarian economies of the income distribution, and poverty-free country. To do so, we develop interesting diagrammatical conceptual flows to easily understand the variable under study (see Appendix A).

Chapter 3

Data and Methodology

3.1 The Data Set

This study used annual panel data from 2010 to 2018 for selected¹ Sub-Saharan Africa countries. However, in cross country studies quality of data and measurement errors are given a priority concerns, particularly in the case of inequality and poverty data. In this thesis, a concerted effort has been made to ensure the comparability of statistics across countries and over time, using a similar variable definition for each country and year. From this perspective, one of the most widely used standards for poverty measure is the percent of the population living below \$1.9 a day of consumption or income at constant prices, adjusted for purchasing power parity (PPP), introduced and used by the world Bank². However, in the data collection process, most individuals and households underpin their income. Hence, it underestimates the income data. So, using expenditure data is more accurate than income data because of the less likely to underreport their expenses.

Furthermore, using income as measurement may double the counting process overtime; saving is counted initially in income and then again when one receives the returns from that saving (Sala-I-Martin, 2006; Ravallion and Chen, 2010). Hence, Consumption is also thought to be measured more accurately than income, especially in agrarian economies (i.e. developing countries). Having this, when there is a choice between income and consumption measure of poverty and inequality data, this study use consumption rather than income, in the expectation that consumption is a good and the better measure of current household/individual economic

¹The selection is based on the data availability of a given country.

²The World Bank assessed poverty using household expenditure on consumption per capita or household income per capita as measured from the national household sample surveys. Then this institution ranked the households by income or consumption per person and the distributions are weighted by the size of the household. Thus, the poverty counts give the number of people living in households with per capita income or consumption below the international poverty line (Ravallion and Chen, 2010).

welfare.

The new data from the World Bank, Standardize World Income Inequality (SWIID)³, and national household survey make the need for poverty and inequality data compelling. First, the WB took a considerable effort to improve the data including the best calculation for the new PPPs to calculate the poverty line. New PPPs calculation based on International Comparison Program (ICP) survey implies that the cost of living in poor countries is higher than was thought, implying greater poverty at any given poverty line (Ravallion and Chen, 1997). Not only this but also the World Bank exerted a lot of effort to reduce measurement errors and survey comparability problems with the rest of the data set. This is because most of the surveys were done by governmental statistics offices as part of their routine operations, and the estimation comes from the primary data in various forms, ranging from the most common microdata to specially designed grouped tabulations from the raw data.

Second, the SWIID upgrade the income inequality data with a comprehensive methodology to calculate the Gini index based on the standard of a particular survey to reduce measurement errors and great heterogeneity problem. In many cases, the principles and guidelines used by SWIID is the best effort to reduce irregularities in the Gini coefficients reported in the literature. What they do is that once they had identified the Gini coefficient collected from the prominent literature is far apart from the household survey statistics in a given country, they drop it from the analysis to approach to have a high-quality data set. Moreover, the SWIID data is the best that could be done at this time with the best national poverty lines estimate for many countries. So, we collect the assembled data of Gini coefficients from SWIID.

Furthermore, from the perspective of Poverty Measures, measuring or looking poverty only from poverty headcount index at given international poverty lines may not give a full image of the poverty level in Sub Saharan Africa. So, to obtain a complete picture of how living standards are evolving, the study uses the poverty gap index and it's square to see the depth and severity of poverty. Furthermore, it may not enough to analyze the severity and depth by poverty gaps measures. Looking poverty from multidimensional measurement makes the analysis of poverty full-fledged because it not only shows people in severe multidimensional poverty but also the intensity of deprivation and vulnerability of the poor. In this instant, the multidimensional poverty index collected from the OPHI data set. Lastly, other variables included in the analysis taken from the World Bank⁴, IMF⁵, and OECD⁶ database.

³ Available at <https://dataverse.harvard.edu/>

⁴ Available at <https://data.worldbank.org/>

⁵ Available at <https://www.imf.org/en/Data>

⁶ Available at <https://data.oecd.org/>

3.2 Model specification

This study will use two regression models to examine the relationship between economic growth, income inequality, and poverty in SSA countries. So that the researcher will drive the poverty model for the linkage between economic growth and poverty; and the income inequality model for the relationship between economic growth and income inequality. This paper will follow Fosu (2008) and Eric (2014) by assuming that if basic human needs are an increasing function of economic growth, then poverty function can be specified in a Cobb-Douglas form as:

$$P = \alpha_0 Y^\theta \quad (3.1)$$

Where; P is poverty, Y is real GDP growth, θ is the income elasticity of poverty and the constant α_0 is an estimate of the subsistence level of Poverty. Poverty can be measured based on the monetary measure (income) or non-monetary measure. For the non-monetary measure of poverty, the study used the Multidimensional poverty index which remained in descriptive analysis and for income-based poverty; I used the poverty headcount ratio, poverty gap, and squared poverty gap. Thus, based on the measurement of poverty, we will have three separate models in one estimation technique. This study incorporated other important explanatory variables that affect poverty levels such as, Human Capital, Government Expenditure, Foreign Aid, Inflation, Remittance, Population growth, Openness, Credit, Arable Land, and Agricultural value growth. By taking into account the individual country-specific heterogeneity using a one-way fixed-effect error component model, equation [3.1] can be modified and further specified as:

$$P_{it} = \alpha_0 (Y_{it}^\theta Z_{it}^\delta) U_{it} \quad (3.2)$$

Where; Z_{it} is a set of explanatory variables that affect poverty other than real GDP growth, and U_{it} is the compound error term which includes the country specific term, and the time varying disturbance term, which is assumed to be iid (identically and independently distributed).

Taking logs of equation [3.2] become

$$\ln P_{it} = \ln \alpha_0 + \theta \ln Y_{it} + \delta \ln Z_{it} + \ln U_{it} \quad (3.3)$$

Consequently, equation [3.3] can be contextualized as a dynamic panel data model to allow for some degree of persistence in the data generating process. For instance, with the downward

trending nature of poverty levels, it is reasonable to assume that poverty levels of countries in a particular period may depend on that of the previous year level. How fast poverty levels change at the end of this period may depend on the initial levels of poverty. It also takes time before policies such as the structural reforms. Thus, the inclusion of lags can help explain the partial adjustment of poverty levels over time in order to reach long-run equilibrium. Econometricians explain that the inclusion of lag dependent variable as a regressor in the model is also a parsimonious way to account for the continuing effect of explanatory variables in the past (Roadman, 2001). The dynamic form of equation [3.3] after including the lag dependent variable (LnP_{it-1}) becomes:

$$LnP_{it} = Ln\alpha_0 + \varphi LnP_{it-1} + \theta LnY_{it} + \delta LnZ_{it} + LnU_{it} \quad (3.4)$$

Let us assume $Ln\alpha_0 = \beta_0$, and $LnU_{it} = \cup_{it}$ then Equation [3.4] can be modified as

$$LnP_{it} = \beta_0 + \varphi LnP_{it-1} + \theta LnY_{it} + \delta LnZ_{it} + \cup_{it} \quad (3.5)$$

$$Here; \cup_{it} = \rho_i + \nu_{it} \text{ (For } i = 1, 2, 3, 4 \dots \dots \dots, N : t = 1, 2, 3, 4 \dots, T) \quad (3.6)$$

Where;

LnP_{it} is the log of the poverty level for country i at time t , LnP_{it-1} is the log of lagged poverty level for country i at $t-1$, LnY_{it} is the log of real gross domestic product growth for country i at time t , LnZ_{it} is the log of other explanatory variables for country i at time t . Ln indicates natural log form. β_0, φ, θ , and δ are all expressed as elasticities. $\cup_{it}$ is the compound error term which includes the country specific term, ρ_i and the time in varying disturbance term, ν_{it} which is assumed to be iid (identically and independently distributed).

In this proposed study Poverty is measured using the World Bank's definition, the percent of the "population living below \$1.9 a day" at a constant price which is adjusted for purchasing power parity. Economic growth is generally defined as an increase in total production of goods and services i.e. Gross Domestic Product (GDP) growth, either in GDP per capita or total GDP growth (Ivic, 2015). Loosely speaking, GDP is the amount of total income for a country. Thus, economic growth can be similar to the average income growth. The definition of growth is a potential source of dissension in the growth-poverty debate. However, it is a technical concept to an economist as defined above despite the term is often interpreted beyond its technical meaning (Angelsen and Wunde, 2006). So, this study used the term economic growth as its

pure technical meaning as stated above- as an increase in average income. For the poverty model (equation 3.5), the income elasticity of poverty, θ is hypothesized to be negative. This is because economic growth is expected to lead to a reduction in poverty levels.

We contented Human Capital (measured by Human Development index) as an explanatory variable because many theories and findings argued that human capital is considered as the primary weapon against poverty. We also included government expenditure to examine whether various policies and government programs have improved the lives of the poor. Government spending includes expenditures on goods and services (including workers compensation) as well as transfer payments. Foreign Aid (which is measured by the flow of ODA) also selected as an explanatory variable because even under the PRSPs, assistance was given to countries that achieved success in bringing down poverty levels and achieving the MDGs. Aid has, therefore, become an important tool in reducing poverty levels.

We also incorporated inflation to account for macroeconomic instability. High levels of inflation affect the purchasing power of the people, hence, adversely affecting the income and living conditions of the poor. As inflation is a general increase in price, it is measured as a percentage change in consumer prices. Remittance is also an important variable that should be included in the model because most of the people who migrated from developing countries specifically SSA are from a poor family and they send money to support their poor family. Hence, remittance has a vital role in reducing poverty because the money sends to the poor has a direct impact to fulfill the household's basic needs.

Lastly, we also hypothesize Population growth, Credit, Arable Land, and Agricultural value growth have a positive effect on poverty reduction. Conversely, Openness to international trade expected to have a negative relationship with poverty reduction because the global meltdown of the economy affects the poor worst. Additionally, as many studies argued that it increases capital flight which is also depressing the poor.

The Income Inequality Model

The income inequality model is designed to investigate the relationship between economic growth and income inequality. To shed light on it, if economic growth benefits the rich more than the poor, then income inequality worsens. But, if economic growth benefits the poor more than the rich, then income distribution will improve. So, we cannot determine the effect of economic growth on income inequality a prior rather than putting a conception. It is known that Income inequality is not only determined by economic growth but also by other explanatory variables such as Human Capital, rate of unemployment, government spending, population growth, and credit.

There is currently no agreement on the adequacy of a linear model to model the relationship between income inequality and economic growth. Barro (2000) warns against the presence of non-negligible nonlinearities in the analysis of the relationship between inequality and growth. And also Banerje and Duffo (2003) find evidence that the relationship between economic growth and inequality takes the form of an inverted "U" shape. Additionally, Iradian (2005) puts forward a similar claim. If we assume that the individual country specific effects do not vary over time, the dynamic panel form of the economic growth-income inequality relationship is specified as follows:

$$LnINQ_{it} = \gamma_0 + \varpi LnINQ_{it-1} + \vartheta LnY_{it} + \pi LnY_{it}^2 + \tau LnA_{it} + \varepsilon_{it} \quad (3.7)$$

In equation [3.6], INQ_{it} is income inequality of country i at time t (where the Gini index is a measure of income inequality), $LnINQ_{it-1}$ is the log of income inequality of country i at time $t-1$, LnY_{it} is the logarithmic increase in real GDP per capita (growth) of country i at time t . LnA_{it} is log of explanatory variables other than economic growth that affect income inequality, listed above. $\gamma_0, \varpi, \vartheta, \pi, \tau$ are parameters to be estimated which are all expressed as elasticities. And ε_{it} is a composite error term.

Income inequality: As to the measure of the income distribution, we used the Gini coefficient, which is one of the most popular representations of income inequality. Gini coefficient can measure the individual or household income/expenditure distribution extent from a deviation of perfect equality (Todaro and Smith, 2012). A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality. Economic growth, an important explanatory variable in this study, simply seen as an increase in average income growth, and in the model, there is a variable that is square of Y growth, this is because to check the inverted U hypothesis of Kuznets.

Another explanatory variable is Unemployment refers to the share of the labor force that is without work but available for and seeking employment. The unemployment rate is calculated by expressing the number of unemployed persons as a percentage of the total number of persons in the labour force. This implies that the measurement of the unemployment rate requires both employed and unemployed. So, unemployment is an important determinant of income inequality in the developing world specifically in SSA countries because it is mostly more prevalent among

the poor more than the rich.

Human Capital assumed to improve the development of any economy. So it is assumed that, in the long run, Human Capital which contains education in its calculation enhances the productive potential of the poor which could help decrease income inequality. However, if education benefits the rich more than the poor, then income inequality will increase. Regarding the measurement, UNDP introduces the Human Development Index which includes education, life expectancy, and decent life. Another variable that included in the income inequality model is Government Spending: we include government expenditure because, if government policies and programs benefit the poor the most, then we can expect income inequality to improve. Moreover, we expect Population growth to raise income inequality. And Credit will also facilitate inequality.

On top of these, the poverty and the income inequality model are estimated using the dynamic panel estimation techniques to capture the problems of static panel estimation methods. In addition, the descriptive analysis will be based on multi-measurements of the variables under study to capture the full image of poverty and inequality in SSA countries.

Chapter 4

Result and Discussion

In this chapter, the researcher presents the analysis of poverty, inequality, and growth using different interesting techniques. So, to explore the spread, severity, and depth of poverty in SSA countries; this chapter goes a long distance both from income and non-income poverty measures. The extraordinary effort of the Oxford Poverty and Human Development Initiative (OPHI) MPI data set makes the non-income poverty analysis compiling. The OPHI data set is not only giving us the people who live in multidimensional poverty but also the destitution / the poorest of the poor who live in SSA countries. However, for model estimation/regression the income poverty measure is used in this study. Indeed, this section explores and discusses the main results of the analysis of poverty and inequality along with growth in SSA countries based on the panel dataset.

4.1 Income Poverty, inequality and growth

Let us begin with the analysis from the income poverty measure. In recent years SSA countries is a home of more than half of the world's poor people based on a \$1.9 poverty line. For example, in 2015, the MDGs target year, 419 million poor people reside in SSA out of 736 million world poor. When we go back to the 1990s generations, the poverty headcount rate was 59.7 % in 1993, 59.04 in 1996, and 58.4 in 1999. Hence, it is perhaps clear that at the beginning of the 1990s poverty in SSA was very widely spread, above 59% of the population found to be living below the poverty line of approximately \$57 per month per person.

Then at the beginning of the 21st century, the poverty headcount ratio declines to 55.4% in 2002, 50.9% in 2005, and 47.9% in 2008 (see table 4.1). So, it shows a 10 percentage point decline in the poverty headcount. This might be for the reason that the government of SSA countries adopts and work with the MDGs. Because this period indicates that almost all SSA

was on track to achieving MDGs of halving the poverty rate by 2015. However, the number of poor was strictly increasing for the last decade before 2015. For instance, in 1993 the number of poor was 330.4 million and it increased to 353.7 million in 1996, 378.7 million in 1999, 388.3 million in 2002, 386.45 million in 2005, and 394.58 million in 2008, and 404.89 million in 2010. From this, we can infer that the number of poor is increased but the poverty headcount ratio is declining. So, this contradicting statement to understand poverty is concord with the high population growth of the region.

After 2015 where SSA follows the principle of SDGs, the headcount of the poor is rising but in a slow tremendous increment. In this period most of SSA is on the move of achieving the SDGs of ending poverty in all dimensions. But the rate at which poverty was declining in the starting of SDGs was lower than the rate at which MDGs were started. In other words, there are more signs of improvement against poverty in SSA since 2000. Before the MDGs were started, the \$1.9-a-day poverty headcount rate for SSA peaked in 1993 and fell steadily after, even though not enough to bring the count of poor to the lower level given population growth.

Table 4.1: The poverty head count, poverty gap and poverty gap square in SSA

Year	Poverty Head count (%)	Poverty Gap (%)	Squared pov. gap	Number of Poor (mil.)	Population (mil.)
1990	54.90	24.7	14.4	279.75	509.45
1993	59.74	28.01	16.59	330.40	553.02
1996	59.04	27.60	16.39	353.71	599.07
1999	58.43	26.82	15.76	378.69	648.15
2002	55.39	24.70	14.28	388.30	701.07
2005	50.92	21.67	12.19	386.45	758.92
2008	47.95	19.49	10.56	394.58	822.95
2010	46.59	18.65	10	404.89	869.03
2011	45.18	17.77	9.4	403.44	893.05
2012	44.10	17.20	9.06	403.25	914.48
2013	43.13	16.65	8.69	405.28	939.76
2015	42.29	16.16	8.38	419.56	992.12
2018	41.58	16.13	8.46	446.95	1074.85

Source: World Bank

Even though the region of SSA Africa reduces the poverty headcount rate, the tremendous achievement of other developing countries like south Asia¹ made the world poverty level down. The world poverty headcount reduce for the last two decade which extremely contributed by south Asia (a decline of the poverty headcount rate from 47% in 1990 to 13 percent in 2015

¹The SSA region tragedy (the number of poor increment) contrasts dramatically with the great South Asian success.

which accounts for 1.15 billion people escaping poverty around the world). Despite the overall poverty rates in the world, SSA scroll down the world average in reducing poverty level than expected. By 2010, poverty rates in Sub Sahara Africa had reached close to 46.6%, while those in other developing countries had declined to less than 8 percent on average (take a look at²).

The depth and severity of poverty in SSA also have a similar trend as poverty headcount. The depth of poverty (measured by the poverty gap) recorded high in 1993 and it decreases afterward. The people who are found in the severity of poverty were more than 16% in 1993, 9.9% in 2010, and 8.56% in 2018 (which is half of the poverty level in 1993). Furthermore, the reduction of depth of poverty (28.01% to 16.13%) was as fast as the decline in the severity of poverty but the later were decline more.

Within the SSA region, poverty headcounts increased in almost all countries with the exception of Burkina Faso, Gabon, Cameroon, Tanzania, and Zimbabwe. Among countries which have a disappointing performance (countries which had a head-count ratio of 60% or above): Democratic Republic of Congo (85.4%), Burundi (75%), Mozambique (67.5%), Rwanda (63.27%), Zambia (64.4%), and countries which had a head-count ratio between 50-60%: Lesotho (59.6%), Liberia (59.18%), Nigeria (53.05%), and Tanzania (54.45%) accounted for more than half percent of their population to SSA poor in 2010. In 2015, despite the fact that Nigeria accounts for only 16.9 percent of the SSA population, it accounts for 20.4% of the SSA's poor (see figure 4.1). These results confirm the general impression that more than half of the population of SSA was in poverty during the study period.

In recent years, poverty has become an essential phenomenon in many of SSA countries even though these countries couldn't achieve poverty reduction like south Asian countries. For instance, Ethiopia's poverty rates were reduced by more than 5 percentage points between 2010 and 2018. This would be an optimistic picture if we were not counting the number of poor. Indeed, the poverty rate in Ethiopia declined from 33% in 2010 to 30.5% in 2015 and to 28% in 2018 (the headcount was about 29.7 million in 2010, 31.2 million in 2016, and 31.6 million in 2018). And even Ethiopia is the second most populous region in SSA, with 100 million people in 2010 (18 percent of the SSA population), the evolution of poverty in Ethiopia is similar to that in Senegal: the poverty rate fell from 37 percent in 2010 to 28 percent in 2018. One may infer that the decline in poverty headcount ratio achieved primarily over the last 9 years can be attributed to the success of the Ethiopian economy in the period (see figure 4.1).

In Côte d'Ivoire, poverty headcount increased by 1.1 million in one year from 2010 to 2011 but declined by 1.9 million over the following 6 years. The fraction of the SSA's poor who

²<http://iresearch.worldbank.org/PovcalNet/povDuplicateWB.aspx#>

live in Côte d'Ivoire declined from 33.86 percent in 2012 to 32 percent in 2013, 33.8 percent in 2014 to 32 percent in 2015, and 26.3 percent in 2016 to 22 percent in 2018. The next country is Zimbabwe, where around 3.3 million poor out of 12.6 million populations are found. The poverty headcount multiplied by 5 over the following five years to 1.9 million, and then doubled again to 4.4 million in 2010. Zambia, with a poverty rate of over 64 percent in 2010, had practically eliminated poverty by a 10 percentage point (but an additional of more than 8 million people added to the poor in 2018). In fact, all the countries in this region i.e. SSA experienced a reduction in poverty rates but not the number of headcount poor.

In Mauritius, the level of income was so high and poverty rates were much smaller than in any of the SSA countries analyzed up until now. The rate, which was at the already low level of 0.46 percent in 2010, had declined to 0.16 percent by 2018. But, it did change at all during 2011 (0.49%) and 2012 (0.54%). After 2012 the poverty rate is declining; 0.46% in 2013, 0.4% in 2010, 0.34% in 2015, 0.28% in 2016, and 0.22% in 2017. So, In terms of absolute numbers, Mauritius managed to almost eradicate poverty between 2012 and 2018, when the overall number of poor citizens was 2024.

Moreover, in addition to the poverty headcount ratio, looking poverty using poverty gaps index and its square helps to understand the depth and severity of poverty in the region countries respectively. To do so, table 4.1 gives the PG indices for a \$1.9 a day poverty line. The aggregate PG for 2010 is 18.6% for the \$1.9 a day line. The PG measures magnify the depth of poverty with the interregional and country differences seen in the headcount indices. The most striking measure to the severity of poverty is the poverty gap square. The severity of poverty in SSA, with a \$1.9- per-day poverty gap index of almost 10%—roughly five times than the world average (see table 4.1).

Over time, poverty has become shallower in the world relative to the SSA region as a whole (take a look at ³). The poverty gap square of SSA poor not only is higher than the world average it shows poverty is severe in SSA (table 4.1). More specifically, the highest persistence in the severity of poverty is evident in Democratic Republic of Congo (20%), Malawi (29.9%), Lesotho (18%), and Zambia (19%) though the poor have slightly higher average levels of living in these countries. The average income of Malawi has actually fallen from 2000 to 2018, even though the overall poverty rate was falling (figure 4.1).

Despite this reduction in poverty, SSA poverty found to be spread, as reflected by poverty headcount of 41.5 percent, deep, as reflected by a poverty-gap ratio of 16 percent, and severe, as reflected by a squared poverty-gap ratio of 8 percent. However, the spread, depth, and severity

³<http://iresearch.worldbank.org/PovcalNet/povDuplicateWB.aspx#>

of SSA poverty differ between countries. In terms of spread, depth, and spread, Mauritius ranks as the country with the least poverty, with a head-count ratio of 0.34%, with a poverty gap of 0.34%, and with squared poverty gap of 0.06% while the Democratic Republic of Congo ranks as the worst; with poverty headcount of 71.74%, with poverty gap of 34.12%, and with squared poverty gap of 20.02%. Further, from the sample of 27 countries, 17 countries have a poverty headcount ratio greater than the mean of SSA, 13 countries have poverty gap ratio greater than the mean of SSA, and 12 countries have the squared poverty-gap ratio greater than the mean of SSA countries.

Who performs best in the reduction of income poverty? The most successful countries in terms of poverty reduction, Ethiopia, Uganda, South Africa, Mozambique, Lesotho, Kenya, Gabon, and Nigeria managed to reduce poverty in terms of poverty headcount ratio to reasonable extents. In the cases where the spread of poverty (as measured by the poverty headcount ratio) has fluctuated up and down (Angola, Cape Verde, Senegal, Uganda) the overall reduction has been modest in most cases, but these countries have seen good and reasonable poverty reduction.

Both the depth of poverty and the severity of poverty were declined in 12 countries: Burkina Faso (depth by 8.4 percentage points and severity by 5.8 percentage points), Cameroon (depth by 4 percentage points and severity by 1.9 percentage points), Democratic Republic of Congo (depth by 19.9 percentage points and severity by 16.1 percentage points), Gabon (depth by 1.06 percentage points and severity by 0.47 percentage points), Kenya (3.67 points for depth and 2.45 points for severity), Lesotho (5.02 points for depth and 3.8 points for severity), Liberia (7.03 points for depth and 6.26 points for severity), Namibia (2.40 points for depth and 0.87 points for severity), Mozambique (6.15 points for depth and 4.65 points for severity), Nigeria (4.91 for depth and 3.04 points for severity), Tanzania (10.28 points for depth and 5.61 points for severity), and Zimbabwe (3.47 points for depth and 1.45 points for severity).

Having this, now let us see the association between poverty reduction and economic growth in SSA countries from the data set. Except for Liberia in 2015 with zero real GDP growth, no country shows zero growth in real GDP over the nine years period despite the negative growth of Angola, Cote d'Ivoire, and Senegal. Zimbabwe has the highest real GDP growth in 2010 and even it was greater than all years after 2010. Relatively sustained positive growth was experienced in Kenya, Ethiopia, and Ghana over some period. In Gabon from about 2011 onwards, real GDP growth saw a significant reduction in each year in line with the decline in poverty headcount ratio.

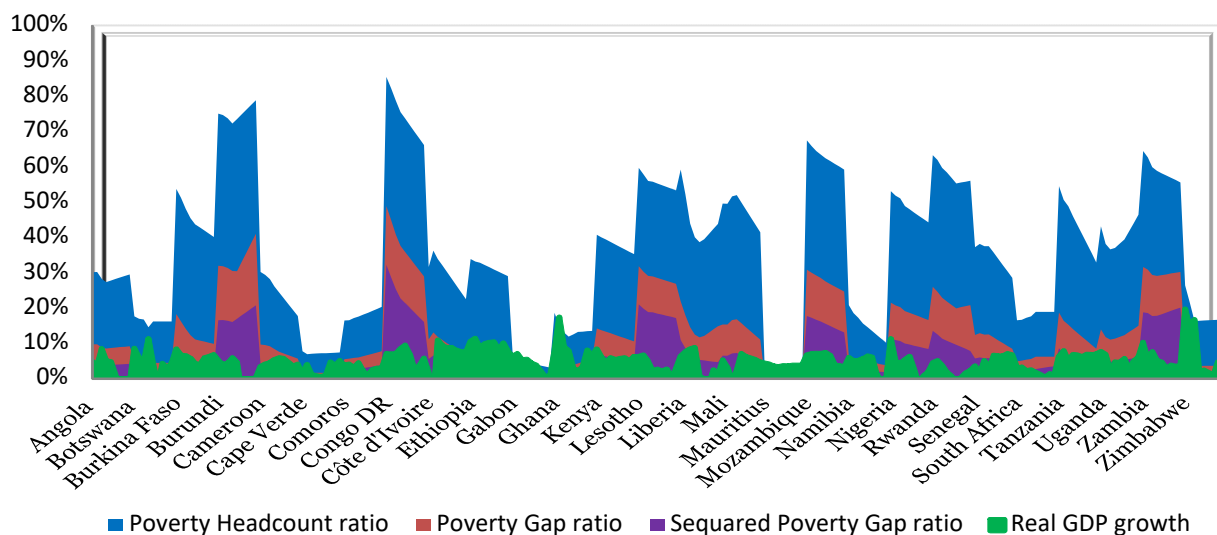


Figure 4.1: Income poverty and Real GDP growth

Source: Own computation from World Bank POVCAL and IMF data base

Burundi also showed the worst growth performance over the last nine years, at the same time the graph suggests poverty fell relatively quickly. Poverty scarcely changed in Mozambique from 2010 to 2018, over which period real growth in GDP remained largely unchanged; however, some recovery of growth in 2010 may be associated with poverty reduction. By contrast, Ethiopia grew relatively good over the period and seems to have reduced poverty substantially. Botswana and Tanzania also show relatively good growth performance over the period which accompanies progress in poverty reduction.

The measure of growth considered here is real GDP growth, not the growth in per capita income growth, but the data does generally suggest that in many cases of SSA countries with a better growth performance tend to have a better record in per capita income growth and so too in terms of poverty reduction. In general, the growth recovery has been related to progress in poverty reduction i.e. over the period of study most SSA countries economic growth was positive with high fluctuations but some poverty reduction took place, poverty headcount rate did fall between 2010 and 2018 on average.

The importance of what happens to income inequality with economic growth is clearly demonstrated in Figure 4.2; inequality appears to have the same direction as growth. Inequality has fallen to quite a large extent in DR Congo and this as much as growth performance appears to have been an important driving factor in the reduction of poverty. If this fall in inequality is a wider phenomenon across SSA then the impact of the growth on poverty reduction will be even greater. It would be expected that changes in inequality should indeed reflect patterns of

growth, moderated by what is happening to inequality by changing growth.

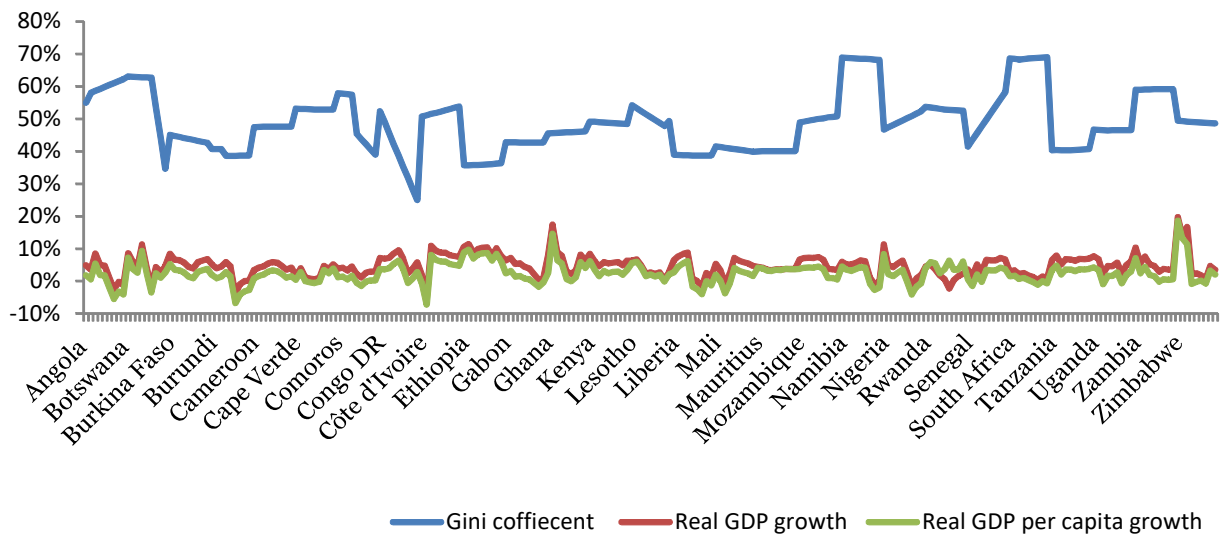


Figure 4.2: Income Inequality and economic growth

Source: Own computation from World Bank and IMF

For the cases where the above inequality and growth trend, it is in fact there is ups and downs, the growth (measured both in RGDP per capita growth and RGDP growth) goes hand in hand/positive relationship with inequality. In seven countries i.e. South Africa, Namibia, Angola, Botswana, Côte d'Ivoire, Comoros, and Lesotho, there is high-income inequality with modest growth. In contrast, DR Congo, Liberia, Burundi, Ethiopia, and Mauritius have lower inequality compared to other SSA countries which they have a Gini coefficient⁴ ranges from 25% to 40%. More importantly, the reduction of inequality and poverty was good in DR Congo despite the country has the highest poverty headcount ratio and the lowest Gini index.

Additionally, seven countries recorded a decline in the inequality of the distribution of income (Botswana, Burkina Faso, Cape Verde, Liberia, Mali, Namibia, and Zimbabwe) while south Africa and Ethiopia recorded an increase in inequality. The data set also note that the recorded changes in the distribution, as captured by the Gini coefficient, are fairly high over relatively for short periods of time: 0.33 percentage points over a 5 year period for Botswana, 2.5 percentage points over a 5 year period for Burkina Faso, 3.84 percentage points over a 9 year period for Cape Verde, 1.9 percentage points over a 9 year period for Liberia, 4.7 percentage points over a 9 year period for Mali, 0.7 percentage points over a 5 year period for Namibia, 0.8 percentage points over a 9 year period for Zimbabwe, 0.4 percentage points over a 9 year period for South Africa, and 0.6 percentage points over a 9 year period for Ethiopia.

⁴The coefficient gives us the insight into the gap between the poor and the rich.

4.2 Extending the poverty evidence to non-monetary dimensions

For looking at non-monetary outcomes, the multidimensional measure which is constructed by OPHI from the Demographic and Health Surveys (D), and Multiple Indicator Cluster Surveys (M) represent a very valuable resource. More importantly, these surveys include health, education, and standard of living. Each of the three non-monetary indicators shows the situation of poverty. But, as they are merged together they give a full image to understand poverty through a multidimensional poverty index. Hence, let us turn our eyes to the Multidimensional poverty index analysis SSA countries from Oxford Poverty and Human Development Initiative (OPHI) data bank⁵.

Table 4.2: Multidimensional Measures of Poverty

Countries	Year & Survey	MPI	Population	In	Multidimensional	Poverty	Vulnerable to MP(%)
			Headcount (%)	Headcount (thousands)	Inequality Among the Poor	In severe Poverty(%)	
Angola	2015D	0.28	51.1	15,221	0.024	32.5	15.5
Burkina Faso	2010D	0.52	83.8	16,091	0.027	64.8	7.4
Burundi	2016D	0.40	74.3	8,067	0.022	45.3	16.3
Cameroon	2014M	0.24	45.3	10,903	0.026	25.6	17.3
Chad	2014D	0.53	85.7	12,765	0.026	66.1	9.9
Comoros	2012D	0.18	37.3	303	0.020	16.1	22.3
DR Congo	2013D	0.39	74	60,230	0.020	43.9	16.8
Côte d'Ivoire	2016M	0.24	46.1	11,192	0.019	24.5	17.6
Ethiopia	2016D	0.49	83.5	87,643	0.024	61.5	8.9
Gabon	2012D	0.06	14.8	443	0.013	4.7	17.5
Ghana	2014D	0.14	30.1	8,671	0.016	10.4	22
Kenya	2014D	0.18	38.7	19,223	0.014	13.3	34.9
Lesotho	2014D	0.15	33.6	750	0.010	8.5	24.4
Liberia	2013D	0.32	62.9	2,978	0.019	32.1	21.4
Malawi	2015D	0.24	52.6	9,799	0.013	18.5	28.5
Namibia	2013D	0.17	38	963	0.012	12.2	20.3
Niger	2012D	0.59	90.5	19,431	0.026	74.8	5.1
Nigeria	2016M	0.29	51.4	98,175	0.029	32.3	16.8
Rwanda	2014D	0.26	54.4	6,644	0.013	22.2	25.7
Senegal	2017D	0.28	53.2	8,428	0.021	32.8	16.4
South Africa	2016D	0.03	6.3	3,549	0.005	0.9	12.2
Sudan	2014M	0.28	52.3	21,210	0.023	30.9	17.7
Uganda	2016D	0.27	55.1	23,614	0.017	24.1	24.9
Zambia	2013D	0.26	53.2	9,102	0.017	24.2	22.5
Zimbabwe	2015D	0.14	31.8	5,257	0.009	8	27.4
SSA		0.32	57.5	571,884	0.022	35.1	17.2
Developing	Country	0.11	23.1	1,325,994	0.018	10.5	15.3

⁵<https://ophi.org.uk/2014-2015-winter-data-tables/>

From the above data table, the Multidimensional Poverty Index (MPI) shows that the percentage of the population that is multidimensionally poor adjusted by the intensity of the deprivations. In the SSA region, nearly 31.5% of the populations are multidimensional poor which is higher than all other regions. Also MPI for the SSA region greater the developing country average by 20.1 percentage point (31.5%-11.4%). In other words, the percentage of populations that are living in multidimensional poverty in developing countries is lower than the SSA region. This might be because the phenomena of poverty reduction belong to other developing regions (e.g. the tremendous achievement of poverty reduction of China and India). Niger has the highest MPI (59%) with a multidimensional headcount ratio of 90.5%. In contrast, South Africa has the lowest MPI, 2.5% within a country from the SSA region.

In 2017, a total of 1.3 billion people are living in multidimensional poverty in a developing country; from this 571 million people are living in SSA countries. Firstly, of these 571 million people, Nigeria has 98.2 million MPI poor which is 17.1% of SSA region MPI poor people. Secondly, Ethiopia is a home of 87.6 million MPI poor; that is, 15.3% of SSA region MPI poor. Thirdly, DR Congo has 60.2 million MPI poor that is almost 10.5% of SSA MPI poor. Fourthly, about 23.6 million people or 4.1% of SSA MPI poor live in Uganda. In addition, table 4.2 shows that more than 17% of MPI poor are vulnerable to multidimensional poverty. Kenya has more than 34% of MPI poor which are vulnerable to multidimensional poverty. Furthermore, Niger and South Sudan have the highest number of MPI poor which are in severe multidimensional poverty with 74.8% and 74.3% respectively.

Following this, Mozambique is a home for 21.4 million (3.74% of SSA) MPI poor, Sudan has 21.2 million MPI poor (3.71% of SSA) MPI poor, Madagascar contains 19.8 million (3.4% of SSA) MPI poor, Niger enumerates 19.4 million (3.39% of SSA) MPI poor, Kenya count 19.2 million (3.36% of SSA) MPI poor, Burkina Faso holds 16.1 million (2.8% of SSA) MPI poor, and Angola suffers from 15.2 million (2.6% of SSA) MPI poor. Lastly, the least number of MPI poor live in Gabon 0.301 million (0.052% of SSA) MPI poor; following Comoros, 0.303 million (0.053% of SSA) MPI poor. Having this, however, most MPI poor live in rural areas⁶.

Additionally, the pattern of inequality among the poor also needs to be considered in more depth. SSA region has the highest levels of inequality among the poor compared to other developing countries (table 4.2). Specifically from SSA countries, the greatest inequality among the poor was in Nigeria (2.9%) followed by Burkina Faso (2.7%). South Africa has the least inequality among the poor themselves (0.5%) despite the high-income inequality between the

⁶ Among 462 million people 85.8% live in rural area of SSA. In the region, there were more rural poor than urban poor. However, the differences in level of poverty reduction were insignificant (see the detail in Alkire and Santos, 2014).

rich and the poor in this country (63%).

4.3 Destitution/ the poorest of the poor in Sub-Saharan Africa

There is high destitution or the poorest of the poor in Sub-Saharan Africa. In this regard, the MPI indicators shine a light on many people who face trouble disheartening hardships. The OPHI develops a measure of destitution from the section of MPI contributory factors with a cutoff. The destitution measure of poverty shows some deep disheartening and trouble issues in SSA region countries. The OPHI set the deprivation indicators and thresholds of those who are destitute. Hence, the household is destitute if the following conditions are fulfilled.

First, if there is no member of the household completed with a minimum of one year of schooling and if no one is attending at school up to 6th grade during their childhood. Second, if the household lost 2 or 3 children because of death. Third, if there is no sanitation. Fourth, if the adult is in severe undernourishment ($BMI < 17\text{kg/m}^2$) or any. Fifth, if the household has no electricity (no change). Sixth, if the households haven't safe drinking water or to have safe water the household member would walk a round trip of more than forty-five minutes. Seventh, if the household has a floor of dung with the establishment of a dirty floor and with no change at all. Eighth, if the household uses wood or dung as a cooking fuel. Lastly, if the households haven't ownership of assets like TV, Radio, etc (see Alkire et al, 2014). The increase in poverty was the result of both a decline in per capita income and an increase in inequality within countries. But the starting level was so small in magnitude that, despite its doubling, the rate remained at 0.1 percent in 2000.

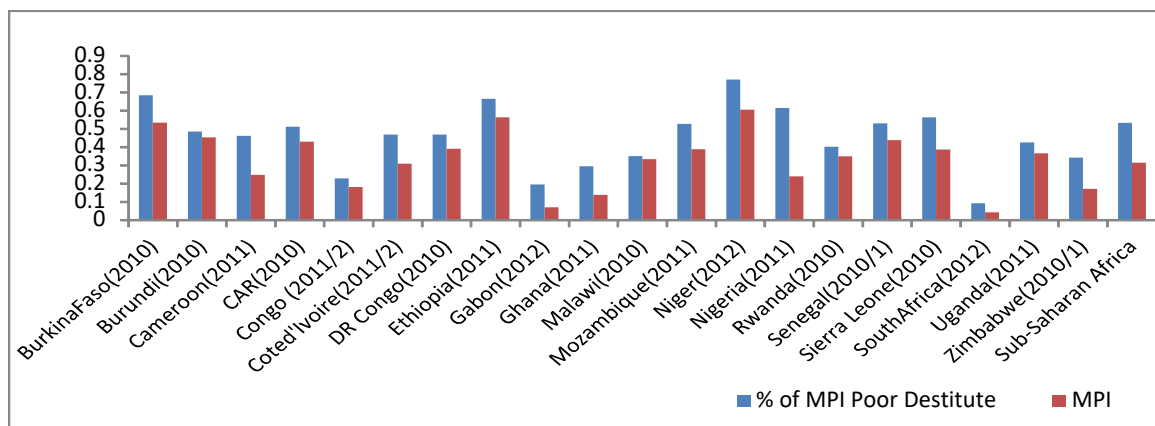


Figure 4.3: Multidimensional Poverty index and Destitution in SSA Countries

Source: Own computation from Alkire et al, 2014

Based on the OPHI data, more than 200 million people (53.3%) live in destitution across SSA countries (Fig. 4.3). Among these Niger is home of 77.1% of the population living in destitution, that is, the highest from all SSA countries. Following Niger, Burkina Faso and Ethiopia have a high incidence of destitution with 68.5% and 66.5% respectively. The most populous country, Nigeria has also a high incidence of destitution which is around 61.5%. Moreover, Serra Leone (56.4%), Senegal (53%), Mozambique (52.8%), and Central Africa Republic (51.3%) have more than half of their populations live in destitution. In contrast, the incidence of destitution is 29.5% in Ghana, 22.9% in Congo, 19.5% in Gabon, and merely 9.3% in South Africa.

More importantly, Ethiopia is a country that has the largest number of people (more than 56.8 million people) living in destitution. Following Ethiopia, Nigeria and DR Congo are home to 42.5 million and 21.6 million destitute respectively. And Gabon has less than 60 thousand destitute. The above bar graph also shows the higher levels of multidimensional poverty are more or less experiencing higher levels of destitution.

Table 4.3: A contributions of MPI Indictors to Destitutes

Country	Year	MPI			Indicators						
		YRS	SCA	NUT	CHM	DRW	IPS	ELC	CKF	FLO	ASO
Ethiopia	11	42.5	27.7	42	33	78	53	96	99	97.6	67
Malawi	10	61	21	15	63	43.5	22	99	98.8	96	34
DR Congo	10	8.6	28	21	51	78.7	30	99.2	90.8	97.6	61.3
Niger	12	88.6	38	31	49.4	60	83	95.3	99.8	93.8	32.5
Rwanda	10	79	10	33	61.5	50	3.1	99	99.2	94.3	32.1
Uganda	11	5.4	10	32.3	64.8	63	19	99.1	96.7	95	24
Gabon	12	21	15	29	54	60.3	15	67.4	73	38	30
Zimbabwe	10	13	12	32.7	28	69.9	69	97.5	99	73	60.4
Mozambique	11	24	36	14.7	39	78	63	98	98.7	94.7	40.3
Cote d'Ivoire	11	31.4	41	16	56	42	66	77.4	93	43	12
CAR	10	18.6	36	16.7	44	63	44	99.6	99.5	95.5	53
Ghana	10	9	27	15	42	64	70	88.4	97	38	19.3
Nigeria	11	37	43	27	51.2	70.2	45	84	98.4	72.5	17.6
Burundi	10	24.5	18.4	29	52.4	47.6	5.8	99.8	98.9	98	41.9
Senegal	10	44.6	51.4	55	55	38	30	73.2	82	56.5	4.5
Sierra Leone	10	35.4	26	14.3	49.6	65	49	99.4	98.6	84	53
Tanzania	10	9.8	25.6	25	44.4	79.3	33	99.8	96.5	94.2	33
Burkina Faso	10	80.5	47	25.2	49.3	36.4	84	99.1	99	74	5.6
South Africa	12	0.4	3.2	52.5	45	60.7	26	68	83.7	59.7	10.7
SSA		53	52	50	50	60.9		93	99.6	86.2	63

Source: OPHI take a look at ⁷ for keys of indicators

⁷CAR: Central Africa Republic, YRS: Years of Schooling, SCA: School Attendance, CHM: Child Mortality, NUT: Nutrition, EIC: Electricity, IPS: Improved Sanitation, DRW: Drinking Water, FLO: Flooring, CKF: Cooking

Of the 200.3 destitute people, 60.9% lost two or more children. Fifty three percent of the destitute don't have at least 1 household member who completed a minimum of one year of schooling. More than half (52%) of children of the household weren't attending school. More than 50% have a minimum of one household member who is severely malnourished. Also, around 93.3% (almost all of them) of the destitute have no access to electricity. And more than 63% of destitutes have no access to basic material assets like radio, TV, refrigerator, and etc.

Moreover, 71% of the destitute households haven't safe drinking water or to have safe water the household member would walk a round trip of more than forty-five minutes. 86.2% of the destitute doesn't have adequate flooring and also the number of people who use solid cooking fuel such as dung and wood was 99.6% (almost all of the destitute). Hence, the disheartening fact is that almost all of the destitute experiencing severe destitution (very poorest of the poor); means that they are deprived in more than halves of the above indicators of destitution.

As we see in the above table, in Burkina Faso, 80.5% of destitute people are deprived in years of schooling, 46.9% of destitute people live in households where all primary school-aged children are out of school, 49.3% of destitute people live in households that have lost two children; 99.2% (almost all) of destitute lack electricity, 83.6% of destitute have no improved sanitation, 74.2% of destitute have inadequate flooring, 99% (almost all) of destitute use solid cooking fuels (wood) for cooking, and so on. Respectively, 88.6% in Niger, 44.6% in Senegal, 42.5% in Ethiopia, 37% in Nigeria, and 35.4% in Sierra Leone of the destitute don't have any household member completed at least first grade of schooling. Moreover, 51.4% in Senegal, 38.4% in Niger, 43% in Nigeria, 27.7% in Ethiopia, and 25.9% in Sierra Leone of destitutes were not attending school in their early childhood.

Uganda has the highest child mortality (64.8%) from the destitute. Following Uganda, more than 63% in Malawi, 61.5% in Rwanda, 56.1% in Cote d'Ivoire, 54.6% in Senegal, 52.4% in Burundi, and more than 51% in Nigeria of destitute people live in households that have lost at least two children. In addition, 54.9% of destitute in Senegal and 52.5% destitute in South Africa have a minimum of one household member who is severely malnourished. Also, almost all of the countries displayed in the above table (99.8% in Burundi, 99.6% in the Central African Republic, 99.2% in DR Congo, 95.8% in Ethiopia, 99% in Malawi, 98.1% in Mozambique, 95.3% in Niger, 99.1% in Rwanda, 99.4% in Sierra Leone, 99.8% in Tanzania, 99.1% in Uganda, and 97.5% in Zimbabwe) have no access to electricity. Also, almost all of them don't use solid cooking fuels for cooking (see Table 4.3).

Moreover, most SSA countries destitute have inadequate flooring with large numbers of

Fuel, ASO: Assets Ownership.

destitute found in Burundi (98.1%), Ethiopia (97.6%), DR Congo (97.6%), Malawi (96%), Central African Republic (95%), Uganda (94.8%), Rwanda (94.3%), and Tanzania (94.2%). Furthermore, more than halves of destitute have no access to safe drinking water. And Following Burkina Faso, Niger (83.2%), Ghana (69.6%), Zimbabwe (69.1%), and Cote d'Ivoire (66.2%) have the highest number of destitute without improved sanitation respectively. Also, most of destitutes in these countries doesn't have basic assets like Television and Radio. More importantly, in every country, more than one-third of the destitute were experiencing severe destitution (very poorest of the poor).

To sum up, seeing what data says across countries gives us some interesting patterns. For instance, electricity, flooring, and cooking fuel are the most contributory factors in almost all country destitutes. However, nutritional deprivations were much lower than these, and the other health and educational deprivations. In fact, in Senegal and South Africa have over 50% of destitute people have someone at home with severe malnutrition. But in the country with the highest destitution (i.e. Niger with 77.1%, Burkina Faso with 68.5%, and 66.5% in Ethiopia) only 30.6% in Niger and 25.2% in Burkina Faso, and 42% in Ethiopia have someone at home with severe malnutrition. Hence, even though these countries have higher destitution, severe malnutrition is less of a contributory factor which is something interesting.

Another interesting figure is countries which have the same MPI or a little bit similar; one country may control destitution to a great extent. For example, Malawi has MPI of 0.34, Nigeria has MPI of 0.24, and Cameroon has MPI of 0.248; so Malawi has the highest MPI than other countries. However, Malawi has only 33.5% destitutes. In contrast, Nigeria has fully 61.5% destitutes, and Cameroon is home to 46.2% destitutes. Hence, the control in destitution is good in Malawi though she has the highest MPI poor. This may be because of the government action taken in each country on education, health, and electricity (see table 4.3).

Another compression is between MPI and income poverty. As we see in table 4.4 some countries reduced income poverty much faster than multidimensional poverty. However, most SSA countries accelerate the reduction of multidimensional poverty than the specific income poverty. Burundi, Republic of Congo, Côte d'Ivoire, Ethiopia, Rwanda, Malawi & Senegal reduced multidimensional poverty by more than double than income poverty. In contrast, the Democratic Republic of Congo, Cameroon, Zimbabwe, and South Africa have controlled income poverty to a great extent than MPI poverty. Nigeria and Uganda have an exceptional case. In Nigeria, multidimensional poverty increased from MPI of 0.24 to 0.291, while income poverty fell from 51.7% to 47%. In contrast, Uganda reduced the MPI from 0.367 to 0.29 but income poverty increased from 38% to 41.7%.

Table 4.4: Multidimensional and Income poverty

Country	Year	MPI	Poverty Headcount Ratio	Country	Year	MPI	Poverty Headcount Ratio
Burundi	2010	0.454	75.05	Malawi	2010	0.334	71.72
	2016/7	0.403	74.84		2015/6	0.243	70.21
Cameroon	2011	0.248	29.35	Nigeria	2011	0.24	51.78
	2014	0.243	24.46		2016/7	0.291	47
Republic of - Congo	2011/12	0.181	36.61	Rwanda	2010	0.35	63.27
	2014/5	0.112	34.94		2014/5	0.259	56.84
Côte d'Ivoire	2011/2	0.31	31.59	Senegal	2010/1	0.439	37.18
	2016	0.236	28.21		2017	0.288	30.32
DR Congo	2010	0.392	85.39	South Africa	2012	0.043	17.21
	2013/4	0.389	75.47		2016	0.025	18.9
Ethiopia	2011	0.564	33.16	Uganda	2011	0.367	38.14
	2016	0.489	30.26		2016	0.269	41.7
Ghana	2011	0.139	14.96	Zimbabwe	2010/1	0.172	26.38
	2014	0.138	12.54		2015	0.137	16.52

Source: OPHI, World Bank, and IMF

Moreover, Burundi reduced MPI by 0.0085 per year on average from 2010 to 2016/17. And she decreases income poverty during this period with a percentage point of 0.035 yearly on average. Ethiopia had made a reduction of multidimensional poverty by 0.015 $[(0.564-0.489)/5]$, and income poverty by around 0.58 percentage points on average yearly. Multidimensional poverty was reduced by 0.0182 percentage point in Malawi, 0.0227 in Rwanda, 0.0216 in Senegal, 0.0196 in Uganda, and 0.007 percentage point in Zimbabwe annually. However, the income poverty reduction in terms of an annualized percentage point is lower for Malawi, Rwanda, and Senegal but not for Zimbabwe with a rise in income poverty in Uganda. Indeed, if we only consider poverty reduction in terms of income poverty, only some countries would be the leaders in poverty reduction. But, if we consider poverty in terms of both Multidimensional poverty and income poverty measures, we get a holistic understanding of poverty.

From the view of multidimensional poverty reduction and economic growth measured by Real GDP per capita growth, (RPCg): countries that have had decent growth performance over the period have made pleasant progress in terms of poverty reduction. For example, Côte d'Ivoire, Republic of Congo, and Senegal have performed better in the given years despite what Nigeria did in recent years i.e. multidimensional poverty rise with a reduction in real per capita growth (see Table 4.5). In compression, Burundi, Ethiopia, Malawi, Rwanda, Uganda, and Zimbabwe have a history in the reduction of poverty but the growth of per capita GDP is lower

at the given period below in Table 4.5. In the remaining countries progress has been very little in multidimensional poverty but countries that have good growth performance (e.g. Cameroon, Ghana, and South Africa).

Table 4.5: Multidimensional Poverty, Income Poverty and Economic Growth

Country	Year	MPI	PHR	RPCg	Country	Year	MPI	PHR	RPCg
Burundi	2010	0.454	75.05	1.86	Malawi	2010	0.334	71.72	3.88
	2016/7	0.403	74.84	-4.10		2015/6	0.243	70.21	0.07
Cameroon	2011	0.248	29.35	1.58	Nigeria	2011	0.24	51.78	2.12
	2014	0.243	24.46	3.30		2016/7	0.291	47	-4.17
Republic of -	2011/12	0.181	36.61	0.87	Rwanda	2010	0.35	63.27	4.10
Congo	2014/5	0.112	34.94	4.23		2014/5	0.259	56.84	3.61
Côte d'Ivoire	2011/2	0.31	31.59	-7.27	Senegal	2010/1	0.439	37.18	0.63
	2016	0.236	28.21	5.24		2017	0.288	30.32	4.17
DR Congo	2010	0.392	85.39	3.78	South Africa	2012	0.043	17.21	0.67
	2013/4	0.389	75.47	5.32		2016	0.025	18.9	-1.11
Ethiopia	2011	0.564	33.16	9.65	Uganda	2011	0.367	38.14	3.38
	2016	0.489	30.26	6.30		2016	0.269	41.7	-0.67
Ghana	2011	0.139	14.96	14.61	Zimbabwe	2010/1	0.172	26.38	18.62
	2014	0.138	12.54	0.57		2015	0.137	16.52	0.11

Keys: PHR is Poverty Headcount Ratio, and RPCg is Real Per capita Growth

Source: OPHI, World Bank, and IMF

In conclusion, the levels of success in translating the economic growth gain into the reduction of poverty were different among SSA countries, and even differ within time (take a look at Table 4.5). For instance, Ghana secured almost the same growth rate as Zimbabwe, but Multidimensional poverty (measured by MPI) is declined in Zimbabwe by more than 35 times than Ghana. In other polar positions, despite Côte d'Ivoire has accelerated growth of 10 times quicker than Senegal, the reduction of multidimensional poverty in Senegal almost the same speed as the former country. Furthermore, even though the mean annual economic growth rate in Côte d'Ivoire reduced between 2011 and 2016, the annualized relative change in MPI remained low.

4.4 Estimation and Econometric Results

In the previous chapter, we have specified two dynamic panel models (i.e. the poverty and income inequality model). To estimate these models there are different estimation techniques. The most commonly used panel data estimation techniques are Pooled OLS (Ordinary Least Square), Fixed Effects (FE), Random Effects (RE), Generalised Least Squares (GLS), Difference-GMM, and System-GMM. However, the specified model's equations (4) and (5)) contain the lagged dependent variable together with the other regressors and so the problem of endogeneity is occurred which needs to be carefully addressed. Unsurprisingly, Pooled OLS assumes an exogeneity assumption (i.e OLS cannot be used: OLS has inconsistent estimator because of endogeneity). Moreover, applying OLS to dynamic panel models leads to biased and inconsistent estimates of the parameters (Baltagi, 2005). This is mainly because of the correlation of the lagged dependent variable and the country-specific effects violate the key assumption essential for consistency of OLS.

Fixed effects assume that the specific individual heterogeneity is correlated with the explanatory variables/regressors. It is mainly designed for static panel models, not for dynamic panels i.e. it causes dynamic panel bias. So FE can't be used even after first differencing transformation because the error term and the lagged dependent variable still correlated i.e. the problem of endogeneity (Roadman, 2009). Moreover, the Within Group or the Least Square Dummy Variable (LSDV) transformation also inappropriate for dynamic panel model estimation because it leads to biased and inconsistent estimates (Nickell, 1981). The reason is that the transformed lagged dependent variable and error term are still correlated as above.

In contrast to FE, Random Effect assumes that the specific individual heterogeneity is uncorrelated with the regressors. However, RE faces a problem of endogeneity if the model has a lagged dependent variable as a regressor. So it is difficult to apply RE to a dynamic panel model. However, FE and RE asymptotic estimators can minimize the bias if the time period is too many. The problem is, this study has only a few years to overcome the bias i.e. it is difficult to employ both estimation techniques.

Another estimation technique is the Generalised Least Squares (GLS) estimator. This method was designed to capture the problem of heteroscedasticity. But it has the same problem as above model estimation methods i.e. it failed to address the problem of endogeneity.

So what needs to be done to address the problem of endogeneity? Roadman (2009) suggested Differenced-GMM and System-GMM estimation techniques. Generally speaking GMM controls for endogeneity, unobserved panel heterogeneity, autocorrelation, omitted variable bias,

and measurement errors (Ullah and Akhtar, 2018). To solve the problems of endogeneity it uses instruments for the explanatory variables that are orthogonal to the error term but highly correlated with the regressors. GMM also designed for a large group and small year. Additionally, it is developed to control for arbitrary distributed fixed effects.

The differenced GMM approach corrects endogeneity by transforming all regressors through first differencing and removing fixed effect. However first difference transformation has a weakness because it subtracts the previous observation from the contemporaneous one thereby magnifies gaps in data loss (Ullah and Akhtar, 2018). So it affects the estimated result to some extent.

Now let us see the transformed model of poverty and inequality. The initial poverty model is $LnP_{it} = \beta_0 + \varphi LnP_{it-1} + \theta LnY_{it} + \delta LnZ_{it} + \cup_{it}$. So, after first differencing transformation, the poverty model becomes:

$$\Delta LnP_{it} = \varphi \Delta LnP_{it-1} + \theta \Delta LnY_{it} + \delta \Delta LnZ_{it} + \Delta \cup_{it} \quad (4.1)$$

Likewise, the income inequality model,

$$LnINQ_{it} = \gamma_0 + \varpi LnINQ_{it-1} + \vartheta LnY_{it} + \pi LnY_{it}^2 + \tau LnA_{it} + \varepsilon_{it} \text{ becomes:}$$

$$\Delta LnINQ_{it} = \varpi \Delta LnINQ_{it-1} + \vartheta \Delta LnY_{it} + \pi \Delta LnY_{it}^2 + \tau \Delta LnA_{it} + \Delta \varepsilon_{it} \quad (4.2)$$

Where Δ represents the first differences. By transforming the regressors through first differencing the fixed effect is removed, as it doesn't vary over time but the problem of endogeneity still remain.. For instance, from equation 4.2 & 3.6 $\Delta \cup_{it} = \Delta \rho_i + \Delta v_{it} = \cup_{it} = \cup_{it} - \cup_{it-1} = \rho_i - \rho_i + v_{it} - v_{it-1} = v_{it} - v_{it-1}$. So, we can infer that the unobserved fixed effect no longer existed. And also to solve the problem of endogeneity, the first-differenced lagged dependent variable can be instrumented with its past value. However, estimating dynamic models using Differenced GMM would results in poor precision and large finite sample bias because the past value provides a weak instrument for the first difference (Alonso-Borrego, 1996). As a result System GMM is introduced by Blundell and Bond (1998), and Arellano and Bond (1991).

The System GMM approach corrects endogeneity by introducing more instruments for the lagged dependent variable and any other endogenous variable to dramatically improve efficiency, and it transforms the instruments to make them uncorrelated (exogenous) with fixed effects. System GMM also uses orthogonal deviation instead of, what Differenced-GMM do, subtracting the previous observation from the contemporaneous one; it subtracts the average of all future

available variables observation (Roodman, 2009).

System GMM builds a system of two equations: the original equation and the transformed one (Ibid). One equation is expressed in level form and it uses the first difference as an instrument. The second is expressed in first differencing forms with level as instruments. Hence, the System GMM uses the first difference of equation 5 and its level equation form for the poverty model.

$$\Delta \ln P_{it} = \varphi \Delta \ln P_{it-1} + \theta \Delta \ln Y_{it} + \delta \Delta \ln Z_{it} + \Delta \cup_{it} \quad (4.3)$$

&

$$\ln P_{it} = \beta_0 + \varphi \ln P_{it-1} + \theta \ln Y_{it} + \delta \ln Z_{it} + \cup_{it} \quad (4.4)$$

The same is true for the income inequality model. It means that the System GMM model uses the first difference (equation 4.5) and the level form (equation 4.6) for the income inequality model.

$$\Delta \ln INQ_{it} = \varpi \Delta \ln INQ_{it-1} + \vartheta \Delta \ln Y_{it} + \pi \Delta \ln Y_{it}^2 + \tau \Delta \ln A_{it} + \Delta \varepsilon_{it} \quad (4.5)$$

&

$$\ln INQ_{it} = \gamma_0 + \varpi \ln INQ_{it-1} + \vartheta \ln Y_{it} + \pi \ln Y_{it}^2 + \tau \ln A_{it} + \varepsilon_{it} \quad (4.6)$$

System GMM uses greater numbers of moment conditions. Monte Carlo evidence also suggests that when T is short and the dependent variable is persistent there is a gain in precision and the small sample bias is reduced (Blundell et al, 2000). System GMM has asymptotic efficiency gain. It is an improvement of the Differenced GMM and studies show that System GMM is a better estimation technique in the dynamic panel model (Blundell and Bond, 1998).

4.5 Estimation Results briefing

Having specified the above theoretical model let us see the empirical results of the economic growth, income inequality, and poverty relationship. Firstly, we estimate the poverty model that mainly explores the connection between economic growth and poverty. The poverty model has three regression models based on different measurements to analyze the spread of poverty (measured by Poverty headcount ratio), the deepness of poverty (measured by poverty gap), and severity of poverty (measured by squared poverty gap), in Sub-Saharan Africa countries. Secondly, we investigate the impact of economic growth on income inequality. Thirdly, we see how income inequality affects the poor logically from the estimated models.

To estimate these models, we try to investigate most of the estimation techniques that are applicable to the dynamic panel model. More specifically, we made a lot of simulation in STATA using One-Step Difference GMM, Two-Step Difference GMM, One Step System GMM, and Two-Step System GMM estimation techniques. However, we found that models using One-Step Difference GMM and Two-Step Difference GMM can't pass most of the relevant tests. So we select the best model from System GMM estimation that fits the three poverty model and income inequality model at best accuracy. In the table below we report the result for the poverty models with the relevant tests. The test including Arellano and Bond test for second-order autocorrelation (AR (2)), Hansen J test and Sargan test for the instruments validity and efficiency test of System GMM estimator or a test for over-identifying restriction ⁸.

⁸We report Hansen and Sargan test. Hansen J test is used to test the validity of Instruments: tests the null hypothesis of overall validity of instruments, Failure to reject these null hypotheses gives support to the choice of the instruments. Sargan test assumes that the residuals or the error terms are not correlated with the instruments variables. Validity of the test is established when the null hypothesis that the over-identifying instruments are valid is accepted (Roodman, 2009). Moreover, The test for autocorrelation/serial correlation of the error term is displayed to test the null hypothesis of the differenced error term first and second order serially correlated this mean failure to reject the null hypothesis of no second order serial correlation implies that the original error term is serially uncorrelated and the moment conditions are correctly specified (that is the value of AR(2) >0.05).

Table 4.6: The Poverty Model estimation results

VARIABLES (in log form)	Poverty Headcount Model (1)	Poverty Gap Model (2)	Squared Poverty Gap Model (3)
Lag of Poverty Headcount ratio	1.141*** (0.0298)		
Lag of Poverty Gap		1.1250*** (0.0449)	
Lag of Squared Poverty Gap			1.1250*** (0.0449)
Real GDP growth	-0.0461*** (0.0127)	-0.0609*** (0.0150)	-0.1220*** (0.03)
Human Capital	0.997*** (0.244)	1.055*** (0.250)	2.1100*** (0.500)
Government Expenditure	-0.0879*** (0.0309)	-0.0831 (0.0527)	-0.209** (0.0907)
Foreign Aid	0.0302 (0.0331)	0.0115 (0.0448)	0.0230 (0.0897)
Inflation	-0.0344** (0.0144)	-0.0331* (0.0198)	-0.0663* (0.0396)
Remittance	-0.0421** (0.0181)	-0.0431** (0.0192)	-0.0862** (0.0384)
Population growth	-0.0214 (0.0485)	0.00329 (0.0755)	0.00658 (0.151)
Openness	0.0760** (0.0314)	0.0899** (0.0363)	0.180** (0.0725)
Credit	-0.0243* (0.0125)	-0.0286* (0.0166)	-0.0571* (0.0332)
Agricultural value growth	-0.00343 (0.0152)	-0.0128 (0.0192)	-0.0257 (0.0385)
Arable Land	0.0655*** (0.0249)	0.0780*** (0.0266)	0.156*** (0.0532)
year	-0.00393 (0.00246)	-0.00161 (0.00281)	-0.00322 (0.00562)
Constant	8.745* (5.097)	4.372 (5.775)	8.744 (11.55)
Number of Observations	215	215	215
F statistics	2913.43	2470.15	2470.15
Groups/Instruments	27/27	27/27	27/27
A-Bond AR(2) test	0.516	0.537	0.537
Sargan test	0.272	0.315	0.315

Note: *** p<0.01, ** p<0.05, * p<0.1 shows statistically significant at 1%, 5%, and 10% level respectively. Standard errors are in parentheses. P-value reported for A-Bond AR(2) and Sargan test statistics.

Table 4.6 presents the results of the System GMM regression of the poverty model. Specifically, it presents our results from the One-Step system GMM with instrumental variables estimation. Overall, the model is a good fit as indicated by the F statistic in all poverty models. Column (1), which uses some explanatory variables and lagged poverty as instruments, continues to find a negative and significant impact of economic growth on the countries poverty headcount ratio i.e. spread of poverty. We find a similar result when we use the poverty gap and squared poverty measure in place of the poverty headcount measure in columns (2 & 3).

Economic growth is negatively related to the spread of poverty, with a one percentage growth reduced spread of poverty by approximately 0.046% in poverty headcount, 0.06% severity in poverty gap, and 0.12% deepness in squared poverty gap models in the short run respectively at 1% level of significance. This indicates that economic growth has led to a reduction in poverty in SSA countries. This result is similar to the findings of Dollar and Kraay (2000), Adam (2004), Sala-I-Martin (2006), and Ravallion and Chen (2007). This implies that economic growth improves the income of the poor.

Table 4.7 below follows a similar instrumentation procedure but use Two-Step System GMM estimation. The remainder of Table 4.7 so experiments with Two-Step system GMM estimation uses alternatives options to estimate the result when there is the presence of heteroscedasticity and serial correlation, a Two-Step GMM should be used to exploiting a whiting matrix using residuals from the first step. However, in a finite sample, such standard errors tend to be downward biased and the conventional approach by practitioners in such circumstances to use what is known as the Windmeijer adjustment to correct for such small sample bias. Thus, using this estimation technique, together with the poverty and lagged poverty variables used as instruments, yields robust results.

We also report the tests of over-identifying restrictions for the variable instrumentation of regressions. The lagged poverty variables pass standard statistical tests of over-identification and therefore, at least on econometric grounds, would appear to be a suitable instrument for Poverty. When the instrument set for exogenous explanatory included in the instrumentation set, the picture is consistent with the patterns of results as shown in the simulation results.

Table 4.7: The Poverty Model estimation results (Using Two-Step System GMM)

VARIABLES (in log form)	Poverty Headcount Model (1)	Poverty Gap Model (2)	Squared Poverty Gap Model (3)
Lag of Poverty Headcount ratio	1.112*** (0.0346)		
Lag of Poverty Gap		1.082*** (0.0342)	
Lag of Squared Poverty Gap			1.082*** (0.0342)
Real GDP growth	-0.0497*** (0.0150)	-0.055*** (0.0132)	-0.110*** (0.0265)
Human Capital	0.973*** (0.285)	1.099*** (0.282)	2.198*** (0.564)
Government Expenditure	-0.0792** (0.0321)	-0.0831 (0.0527)	-0.166 (0.105)
Foreign Aid	0.0387*** (0.00937)	0.0192** (0.00909)	0.0383** (0.0182)
Inflation	-0.0344** (0.0144)	-0.0331* (0.0198)	-0.0663* (0.0396)
Remittance	-0.0423*** (0.0193)	-0.0506*** (0.0171)	-0.101*** (0.0343)
Population growth	-0.00347 (0.0311)	0.0472 (0.0322)	0.0944 (0.0645)
Openness	0.0624 (0.0374)	0.0356 (0.0471)	0.0711 (0.0942)
Credit	-0.0366** (0.0146)	-0.0476* (0.0247)	-0.0952* (0.0494)
Agricultural value growth	-0.0116 (0.0156)	-0.0104 (0.0188)	-0.0207 (0.0376)
Arable Land	0.0646** (0.0242)	0.0766*** (0.0176)	0.153*** (0.0352)
year	-0.00296 (0.00281)	-0.00340 (0.00382)	-0.00679 (0.00763)
Constant	6.896 (5.822)	8.057 (7.816)	16.11 (15.63)
Number of Observations	215	215	215
F statistics	76637.34	31224.23	31224.13
Groups/Instruments	27/27	27/27	27/27
A-Bond AR(2) test	0.312	0.234	0.234
Sargan test	0.272	0.315	0.315
Hansen test	0.141	0.405	0.405

Note: *** p<0.01, ** p<0.05, * p<0.1 shows statistically significant at 1%, 5%, and 10% level respectively. Standard errors are in parentheses. P-value reported for A-Bond AR(2), Sargan, and Hansen test statistics.

All Columns, (1), (2), and (3) of table 4.7 confirms our earlier results; economic growth remains negative and significant at 1% level. The lagged poverty is positively related with the current poverty at 1% level of significance. Thus, the level of current year's poverty depends on that of the levels of previous year's poverty. In other words, past poverty status is found to be significant in explaining present poverty.

It also confirms that government spending has a negative and a significant impact only on the spread of poverty. Hence, high government expenditure has reduced the poverty level down. Inflation has also a significant impact on poverty. Another important variable that reduce poverty is remittance i.e a direct transfer of income to the poor from their migrant family. It reduces poverty by 0.04% of its spread, 0.05% of its severity, and 0.1% of its deepness. Hence, the result strongly indicates that increased flow of remittance to SSA countries reduces the three forms of poverty. Once more, population growth variables are observed to be negatively associated with Poverty spread, severity and deepness.

Foreign aid has a positive impact on all forms of poverty at 1% level of significance. This means that increase in ODA has led to increase in income poverty in SSA countries. This may be the inappropriate use of aid or the assistant may not addressed to the poor. In other words, when aid is misappropriated in most countries, it does not meet its intended aim of bringing the poor out of poverty in the SSA part of earth, but rather leading to an increase in poverty. In addition, it may be because the aid may discourage workers to do their own job. On the other hand, ODA has improved deepness of poverty. Donors and development partners have always given assistance to SSA countries in order to improve severity immediate actions. As not expected, inflation has led to a decrease in income poverty.

Credit continues to exert a negative and significant impact on the poverty headcount (column (1)), poverty gap (column (2)), and squared poverty gap (column (3)). So, credit is an important engine for the poor. It is reduce the spread of poverty by 0.03% at 1% level of significant; reduce the severity of poverty by 0.047% at 5% level of significance; and it can contribute to reduce deepness of poverty about 0.09% at 10% level of significance. This implies, to reduce the poverty headcount, gaps of poverty and deepness of poverty credit is very important. Arable land increase spread, severity and deepness of poverty. Countries with more arable land are not more likely to be reducing poverty. It may be because of the more infertile land overstate the fertile arable land or perhaps the arable land occupied by the rich.

When we take a look at human capital, we find strongest positive influences on the three models of poverty. Human capital has a significant impact in spread, severity, and deepness of poverty in SSA countries. The over-identification tests for the instrument validity are also

passed. In Table 4.7, we drop human capital completely from the instrument set. We continue to obtain a positive impact of human capital on the poverty headcount (column (1)), poverty gap (column (2)) or squared poverty gap (column 3). Further, it needs more investigation which is beyond this paper.

Taken together, economic growth, arable land, government expenditure, population growth, remittance, and credit have negative and significant effect on poverty across the different instrumentation procedures and estimation techniques. On the whole, the instrumented coefficients in Two-Step System GMM estimation are displayed with the Hansen statistics as compared to the baseline results of One-Step System GMM. Overall, the Two-Step System GMM estimation is more robust than One-Step System GMM estimation results because the earlier technique is more robust in the presence of heteroscedasticity and serial correlation. The Arellano and Bond AR (2) test shows that, the null hypothesis of no second order autocorrelation is accepted at the 5% significance level in all three models.

In sum, in all poverty models with both estimation techniques, Economic growth is negatively related to the spread, severity and deepness of poverty, with a one percentage growth reduced spread, severity and deepness of poverty by approximately 0.5%, 0.5% and 0.11% respectively. This means that, the reducing poverty which is an important goal of the MDGs and PRSPs has improved as a result of economic growth in SSA countries.

Table 4.8: Estimation Results of the Income Inequality Model

VARIABLES (in log form)	One-Step System GMM	Two-Step System GMM
Lag of Income Inequality	1.417*** (0.102)	1.375*** (0.0928)
Real GDP per capita growth	0.0630*** (0.0211)	0.0507*** (0.0106)
Squared Real GDP per capita growth	0.00528** (0.00241)	0.00526** (0.00221)
Human Capital	-0.444*** (0.0952)	-0.155 (0.208)
Government Expenditure	-0.0301 (0.0218)	-0.0263 (0.0260)
Unemployment	0.0449* (0.0245)	0.0181 (0.0389)
Population growth	0.137** (0.0577)	0.176** (0.0774)
Credit	0.0275** (0.0114)	0.0352** (0.0130)
year	0.00738*** (0.00232)	0.00275 (0.00353)
Constant	-17.09*** (4.876)	-7.408 (7.478)
Number of Observations	215	215
F statistics	159.11	83.04
Groups/Instruments	27/27	27/27
A-Bond AR(2) test	0.582	0.602
Sargan test	0.134	0.174
Hansen test		0.835

Note: *** p<0.01, ** p<0.05, * p<0.1 shows statistically significant at 1%, 5%, and 10% level respectively. Standard errors are in parentheses. P-value reported for A-Bond AR(2), Sargan, and Hansen test statistics.

Table 4.8 presents the results from estimating the income inequality model using two versions of System GMM estimation techniques. In columns (1), we regress economic growth and other explanatory variables on income inequality using one-step GMM estimation techniques. Inequality is related to growth, both in a linear and non-linear way: the linear and the quadratic term of growth are positive and significant. We then introduce the Two-Step System GMM of the regression in columns (2). The coefficients of economic growth are not affected by the introduction of this estimation. In the One-Step System GMM specification, the squared term is positive and significant (Table 4.8, columns (1)). The corresponding Two-Step System regression (shown in column 2) is indeed shown the same result.

The coefficient of squared RGDP per capita (non-linearity) shows that the relationship has not the shape of an inverted U i.e didn't support the Kuznets curve, with a linear function growth is increasing and positive at initial and it continues. Changes in economic growth, in any direction, are associated with income inequality positively.

When we see the effect of Lagged Inequality in table 4.8 above, it is positive and statistically significant in both estimation techniques. Thus, the lagged inequality is strongly positively correlated with current income inequality. The coefficient of lagged inequality is 1.36% reported in One-Step System GMM (column (1)) and 1.43% reported in Two-Step System GMM (column (2)) indicating that higher inequality is associated with a larger increase in inequality. And the coefficient of lagged inequality is similar in sign in both specifications.

According to the One-Step system GMM, Human Capital has a negative and significant impact on income inequality. It may be because of the educated poor become getting a job and their income will improve i.e. inequality reduced or they converge to the rich. Unemployment has a positive relationship with inequality. As most of the poor are unemployed, Unemployment widens the gap of income between the rich and the poor. Population growth increases income inequality by 0.137% at a 1% level of significance. This may be because the poor didn't use family planning as compared to the rich. At a 10% level of significance, Credit boosts income inequality. Perhaps, when the poor get the credit from microfinance institutions, they may be in a difficult situation to repay the debt including its interest. So the poor return to the poverty trap. And the poor become poor and the richer become richer. The above result of the One-Step system GMM has the same coefficient sign but human capital is insignificant in the Two-Step system GMM. Though, the more robust result is in column (2), Two-Step System GMM estimation.

4.6 Making Sense Of The Results

Our empirical analysis suggests that poverty reduction is associated with economic growth. The role of economic growth seems to have been important to reduce poverty in the SSA countries context. The empirical analysis also covers evidence of economic growth on income inequality. The investigation supports economic growth widens income inequality. Our theoretical model focuses on two things: a model of poverty reduction and a model of income inequality. The former focuses on how poverty shifts in response to economic growth and the latter give how economic growth affects income inequality.

To sense our results, let us turn our eyes to general theory and empirics. Our econometrics results criticize the traditional theorists that they held that rapid growth is bad for the poor. however, the outputs support the theory of K. Marx's which argued that growth alone may be insufficient to left out poverty, for instance, a certain class may not reap any benefit from overall income growth. Also, the results are proponents of Dolar and Kraay (2002) & Ravallion (1997), who argued that growth is good for the poor because the lion's share of the income of the poor is what they have earned themselves. Thus, the income of the poor increases because they produce more in agriculture, get better prices for their crops, and higher off-farm wages. We also support the argument of the neoclassical theorist, A. Marshal. He argued growth is good for the poor, and he claims that income should be the first economic variable to alleviate poverty because it gives purchasing power over commodities and resources (see Davis and Martinez, 2015). Moreover, in both System-GMM results support the claim of J.M. Keynes that growth can bring poverty alleviation.

In a nutshell, when we classify countries into two groups in which countries who have a Gini coefficient below 0.5 and Countries who have above 0.5 Gini coefficients, the poor are made up predominantly of the latter group. As we discussed countries care about reducing poverty and income inequality along with boosting the economy. So their assumed preferences were $u(g)-f(p)$, where $u(.)$ is increasing and concave and $f(.)$ is decreasing and concave. And suppose that the growth of income inequality is λ . Then, a country with economic growth g , has 'the optimal minimum poverty' of

$$Pr^*(\lambda, g) = \arg \min_{Pr} \{u(g - \lambda) - f(p)\}. \quad (4.7)$$

It is straightforward to check that poverty reduction is decreasing in λ and increase in g . Hence, we expect and assert the growth of inequality is comes from economic growth. As the reduction of poverty accelerated as a result of the growth of the economy, we would expect

countries income inequality were rises. We now imagine that a country that has good economic growth performance reduces poverty more but hindered by inequality. Thus, it is the only way that policy that promotes economic growth and equal income distribution will bring a minimum level of poverty. Here one thought would be noted. In non-income poverty measure, there are some countries which has better economic growth performance without reducing poverty much. However, we are now thought about the convergence or the weight of the mass.

We assert that our empirical findings conform to the predictions of the hypothetical theory laid out above. Suppose therefore that the country has a power and can make take-it-or-leave-it offers to poverty before. We shall model the effect of economic growth as making it more difficult to evict countries if they have higher income inequality. In terms of our model, this is equivalent to a fall in poverty as growth is high. As we have already argued, this has effects on inequality too, and thus we would expect poverty to be reduced which is what we found in the data.

Moreover, As Datt- Raviloin (1998), Ali and Thorbeck (2000), and Bourguignon (2004) theorize and argued changes in poverty over time can be decomposed into growth and distribution components, we find that poverty was changed by growth and income distribution. Thus, economic growth that affects poverty reduction typically generates distributional effects. This means that growth to affect the distribution of income results in changes to the poor and the non-poor (see the income inequality model results). Regarding the quantification of the total change poverty decomposition, I try to decompose the poverty change into growth and redistribution components statistically. However, it is too broad and it needs further research especially in dynamic panel data analysis. Fujii (2015) and Grimm (2001) try to decompose total poverty to provide some flavor on quantification of the decomposition but they use OLS and fixed effect regression which have many problems. Despite the complexity of the quantification of dynamic poverty decomposition, such decomposition may be very helpful for selecting the appropriate policies to fight against poverty.

We also found a similar result with empirics of Sala-I-Martin (2006), Iradian (2005), Adams (2003), Fanta & Upadhyay (2009), and Fosu (2008) in which economic growth tends to reduce poverty by increasing incomes. In fact, the number of poor in the region increased by 9 million, with 413 million people living on less than US\$1.90 a day in 2015. Despite the world's population lived on less than US\$1.9 a day declined from nearly 36% in 1990 to 10% in 2015 (WB, 2019). "If the trend continues in SSA, by 2030, approximately 9 out of 10 extreme poor will exist in the region which will be an impediment for the sustainable development goal of 'No Poverty'".

Moreover, the rate at which the growth of income translates into a reduction of poverty

depends on the change in distribution. Even in the absence of a shift in income distribution, a given rate of growth may be associated with a range of poverty outcomes due to the effect of initial inequalities (Bourguignon's, 2004). And in countries with initial income inequality is high, growth converted to less reduction of poverty because it is more likely growth is needed to lift a person out of poverty (Ravallion and Chen, 1997). In addition, unequal income distribution is an impediment to effective poverty alleviation though the degrees were different in different countries.

So we recommend that an efficient poverty reduction strategy requires a country-specific approach to be undertaken in determining the appropriate emphasis on growth vis-à-vis income inequality. In addition, the income poverty problem can be solved by making total income bigger and allocate the total income with an equal distribution welfare system. More specifically, Sub-Saharan African countries would grow by more than 4.73 percent a year to reduce the poverty level from 41.5 % of the population in 2018 to a required level by 2030.

Notwithstanding Kuznets's hypothesis theory and investigation, we argued differently. Economic growth increase income inequality at every stage of development. The coefficient of squared real GDP per capita growth asserts that the inverted U hypothesis of Kuznets was invalid. Many researchers also criticize Kuznets inverted U hypothesis even if their reasons are different. Among them, Adams (2004), for example, found that income inequality and economic growth have no significant relationship. Ravallion (1997) also challenged the Kuznets hypothesis by investigating growth has no impact on income inequality. Piketty (2007) also question Kuznets's hypothesis by claiming that, between the end of the nineteenth and the beginning of the twentieth century, the western world witnessed an unambiguous trend i.e. no evidence of a downward trend of inequality and it is in contrast to Kuznets's prediction of declining inequality after the initial stages of industrialization. Moreover, Ravallion and Chen (1997), Ladaïque and Pearson (2001), Heshmati (2004), and Habimana (2014) also criticize the inverted U hypothesis of Kuznets.

However, it is not said that Kuznets Hypothesis is not supported by other empirical evidence; for example, Forbes (2000), Fosu (2010), and Marrero and Serven (2018) supported the Kuznets hypothesis. Chen (2003) also found an inverted-U relationship between income distribution and long-run economic growth using cross country data but not in the short-run (sighted in Heshmati, 2004). That means they support that at the initial stage of economic development, income inequality rises (premises) and the conclusion is that after a certain level of economic development, the society demand of a more egalitarian resource makes the government introduce a welfare distribution system in order to decrease income inequality between the poor and

the rich. In contrast to this, we argued that at every stage of development the government introduces a distribution system in order to reduce income inequality not after a certain level of economic development as Kuznets concluded. And so as the data and results suggest, Kuznets maybe stands from a true premise but ends with a false conclusion.

Beyond this, let us sense some other explanatory variables that affect poverty and inequality. Credit has a contribution to reduce poverty but increases income inequality. The logic behind this is that credit helps the poor to consume goods and services for a while but when they repay the debt with the interest which the principal wouldn't do. In addition, they may not repay the debt even. Then, they go to a poverty trap because the institution may not lend them again. Thus, 'the rich get richer and the poor get poorer'. This is also supported by the coefficient of lagged income inequality that increases current inequality. Our argument here is building a pro-poor credit institution which may concentrate on consumption banking to reduce the gap between the rich and the poor. The detail for building consumption banking is for further research.

Unexpectedly, Human Capital has a significant positive effect on poverty. But it has a negative and significant impact on income inequality. This paradox maybe because of the educated poor become getting or create job and their income will improve i.e. inequality reduced or they converge to the rich. But the remaining unskilled/poor may be marginalized by the transformation of the modern economy. Moreover, as most of the poor are unemployed, Unemployment widens the gap of income between the rich and the poor. Population growth increases income inequality by 0.137% at a 1% level of significance. This may be because the poor didn't use family planning as compared to the rich. Remittance has also an important contribution to reduce the disheartening and hardship of poverty.

On top of these, the historical poverty experiences of SSA countries had an elastic and significant influence on their current poverty level in all forms (take a look at table 4.6 and table 4.7 in all three poverty models). This implies that the previous spread, depth, and severity of poverty had an intense impact on the prevalent spread, depth, and severity of poverty in the region respectively. The income inequality model result also suggests that countries that have high initial income inequality continued to get worse in future income distribution. More specifically, the top society (rich) has money to burn but the poor didn't cut the mustard meaning that the bottom society doesn't meet their required basic needs. Indeed, to make the income distribution equal in SSA countries, on average, 46.8% of GDP should go to the bottom society.

Chapter 5

Conclusions and Implications

The present thesis has shed light on the test of whether economic growth is associated with poverty reduction and income inequality in SSA countries, using the recently revised World Bank data from POVCALNET, OPHI, and SWIID. The result shows that there is robust evidence of a link between poverty reduction and economic growth. Thus, economic growth has constituted the main engine for poverty reduction in SSA countries. Another important finding is that economic growth increases income inequality. Although the effects on poverty are likely to have been significant if countries economic growth had been accelerated, our results are nonetheless interesting as they suggest that almost the non-monetary measure and income poverty measures have similar result-shows reducing poverty. However, the non-income poverty data suggest that the SSA countries are poorer than we thought; it has been no less successful in the incidence of absolute poverty reduction but not the incidence of non-income poverty (e.g. the destitutes). From this perspective, there is high destitution or the poorest of the poor in Sub-Saharan Africa who face trouble disheartening hardships. Specifically, more than 200 million people (53.3%) live in destitution across SSA countries (see Figure 4.3).

One other thought, the United Nations established the SDGs. Its first main goal was Zero poverty. The deadline is 2030. Table 4.1 shows that the poverty rate in 2010 was 46.6 percent. The SDG will be achieved in SSA countries if the countries looking forward to the effort required toward achieving it. Hence, by the time the SDG was established, SSA had already gone 42.3 percent of the way toward achieving it. If the trend were continuing without any shock, SSA might just be in better shape with little poverty. However, we need more effort to reduce the poverty level because the results showed that the previous spread, depth, and severity of poverty had an intense impact on the prevalent spread, depth, and severity of poverty in the region.

This study also underlines that high levels of inequality have indeed constrained the reduction of poverty in many SSA countries. Income-enhancing (i.e. economic growth) and

inequality-reducing policies can be complementary. Hence, SSA countries would do well to promote such policies. Moreover, as the potential of income generation in SSA countries remain low, they require income-generating assistance, as they endeavor to boost their economies. More rapid growth should serve to reduce poverty by increasing income in the short run and long run. In the longer run, furthermore, the growth would bring the effectiveness with which any future progress in income and improvement in distribution are translated into poverty reduction.

Notwithstanding Kuznets's hypothesis theory and investigation, we argued differently. Economic growth increase income inequality at every stage of development. The results assert that the inverted U hypothesis of Kuznets was invalid. Kuznets argued that at the initial stage of economic development, income inequality rises (premises) and he concludes that after a certain level of economic development, the society demand of a more egalitarian resource makes the government introduce a welfare distribution system in order to decrease income inequality between the poor and the rich. In contrast to this, we argued that at every stage of development the government introduces a distribution system in order to reduce income inequality not after a certain level of economic development as Kuznets concluded. And as the data suggests Kuznets maybe stands from a true premise but ends with a false conclusion.

Lastly, the main contribution of this study is that it provides a framework of exploring the idiosyncratic features of SSA countries, which may yield country-specific policies for effective poverty reduction. More specifically, we point out that countries which have more than half of their MPI poor live in destitution. Furthermore, we find that Credit has an important contribution to reducing poverty but it increases income inequality. Our argument here is building a pro-poor credit institution which should concentrate on consumption banking to benefit the poor, and to reduce income inequality. However, each and every country requires a detailed study which is beyond the scope of the present study. Nonetheless, the study shows a roadmap for identifying such important country-specific issues that require further research.

This is true, moreover, Future efforts to quantify the empirical connection between growth, inequality, and poverty will doubtless benefit even more from a detailed specification of how particular policy are structured & implemented across countries and time. As well as being important to policy debates, such findings may help to diffuse the more general pessimism that can underestimate the effect of growth on income redistribution in developing countries specifically in SSA countries. Indeed, we recommend a fast economic growth and equal welfare distribution at every levels of development to ramp up poverty reduction and income equality.

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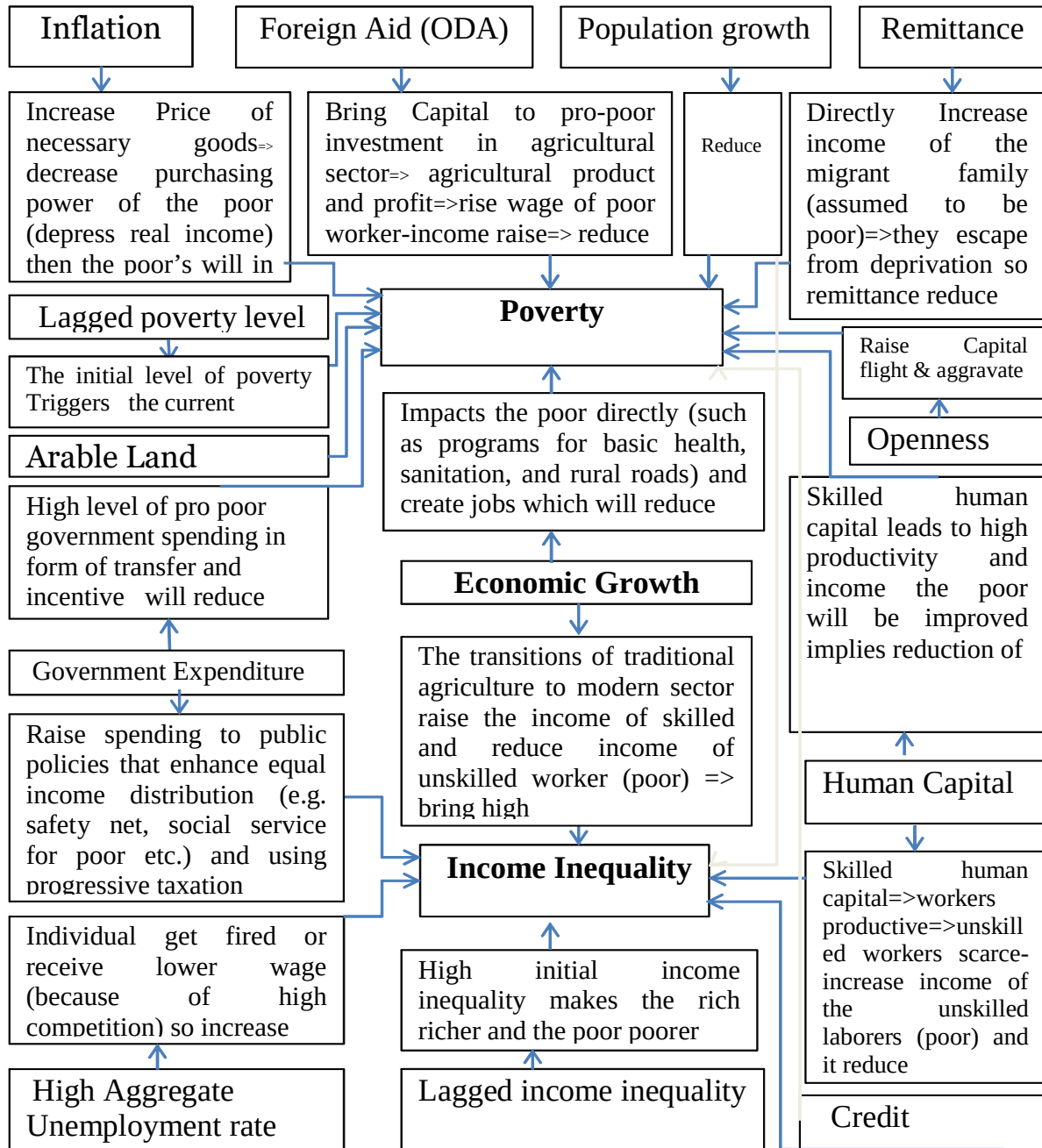
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Appendix

Appendix A: Conception of Variables under Study (Source: Author)



Appendix B: Descriptive Statistics of Variables Used in the Study

VARIABLES	MEAN	SD	MIN	MAX
Poverty Headcount Ratio (%)	35.1	20.73	0.16	85.39
Poverty Gap (%)	13.6	10.35	0.03	48.87
Squared Poverty Gap (%)	6.74	6.37	0.02	32.23
Income Inequality (Gini Coefficient)	0.48	0.089	0.25	0.69
Real GDP Growth(%)	4.732	3.32	-4.90	19.7
Real GDP Percapital Growth(%)	2.45	3.23	-7.27	18.62
Squared Real GDP Percapital Growth (%)	0.54	0.09	0.39	0.79
Human Capital (HDI)	0.54	0.09	0.39	0.79
Government Expenditure(% of GDP)	25.34	6.68	9.49	55.44
Unemployment Rate(%)	8.28	711	0.95	27.33
Foreign Aid (billion)	1.16	1.03	0.11	5.53
Inflation(%)	6.09	6.17	-2.4	35.8
Remittance (million)	1361	3950	1.42	24356
Population Growth(%)	2.41	0.83	0.055	3.789
Openness ((Import+export)/GDP)	2.79	32.13	0.037	501.5
Credit (million)	30.22	25.17	0.25	125.7
Agricultural Value Growth(%)	3.48	5.68	-22.83	23
Arable Land (% land Area)	16.14	13.75	0.46	47.93
year	2014	2587	2010	2018
Number of Countries	27	27	27	27
Number of Observations	243	243	243	243

Appendix C: List of countries included in the regression

Angola	Côte d'Ivoire	Liberia	Senegal
Botswana	Democratic Republic of Congo	Mali	South Africa
Burkina Faso	Ethiopia	Mauritius	Tanzania
Burundi	Gabon	Mozambique	Uganda
Cameroon	Ghana	Namibia	Zambia
Cape Verde	Kenya	Nigeria	Zimbabwe
Comoros	Lesotho	Rwanda	

Appendix D: Results from One-Step System GMM Estimation Technique

VARIABLES (in log form)	Poverty Headcount Model (1)	Poverty Gap Model (2)	Squared Poverty Gap Model (3)	Income Inequality Model (4)
<i>LagofPoverty</i> <i>HeadcountRatio</i>	1.141*** (0.0298)			
Lag of Poverty Gap		1.1250*** (0.0449)		
<i>LagofSquared</i> <i>PovertyGap</i>			1.1250*** (0.0449)	
Lag of Income Inequality				1.417*** (0.102)
Real GDP growth	−0.0461*** (0.0127)	−0.0609*** (0.0150)	−0.1220*** (0.03)	
<i>RealGDPper</i> <i>capitagrowth</i>				0.0630*** (0.0211)
<i>SquaredRealGDP</i> <i>percapitagrowth</i>				0.00528** (0.00241)
Human Capital	0.997*** (0.244)	1.055*** (0.250)	2.1100*** (0.500)	−0.444*** (0.0952)
Government Expenditure	−0.0879*** (0.0309)	−0.0831 (0.0527)	−0.209** (0.0907)	−0.0301 (0.0218)
Unemployment				0.0449* (0.0245)
Foreign Aid	0.0302 (0.0331)	0.0115 (0.0448)	0.0230 (0.0897)	
Inflation	−0.0344** (0.0144)	−0.0331* (0.0198)	−0.0663* (0.0396)	
Remittance	−0.0421** (0.0181)	−0.0431** (0.0192)	−0.0862** (0.0384)	
Population growth	−0.0214 (0.0485)	0.00329 (0.0755)	0.00658 (0.151)	0.137** (0.0577)
Openness	0.0760** (0.0314)	0.0899** (0.0363)	0.180** (0.0725)	
Credit	−0.0243* (0.0125)	−0.0286* (0.0166)	−0.0571* (0.0332)	
Agricultural value growth	−0.00343 (0.0152)	−0.0128 (0.0192)	−0.0257 (0.0385)	
Arable Land	0.0655*** (0.0249)	0.0780*** (0.0266)	0.156*** (0.0532)	
year	−0.00393 (0.00246)	−0.00161 (0.00281)	−0.00322 (0.00562)	0.00738*** (0.00232)
Constant	8.745* (5.097)	4.372 (5.775)	8.744 (11.55)	−17.09*** (4.876)
Number of Observations	215	215	215	215
F statistics	2913.43	2470.15	2470.15	159.11
Groups/Instruments	27/27	27/27	27/27	27/27
A-Bond AR(2) test	0.516	0.537	0.537	0.582
Sargan test	0.272	0.315	0.315	0.134

Appendix E: Results from Two-Step System GMM Estimation Technique

VARIABLES (in log form)	Poverty Headcount Model (1)	Poverty Gap Model (2)	Squared Poverty Gap Model (3)	Income Inequality Model (4)
<i>Lag of Poverty HeadcountRatio</i>	1.112*** (0.0346)			
Lag of Poverty Gap		1.082*** (0.0342)		
<i>Lag of Squared PovertyGap</i>			1.082*** (0.0342)	1.375*** (0.0928)
Lag of Income Inequality				
Real GDP growth	−0.0497*** (0.0150)	−0.055*** (0.0132)	−0.110*** (0.0265)	
<i>RealGDP percapitagrowth</i>				0.0507*** (0.0106)
<i>SquaredRealGDP percapitagrowth</i>				0.00526** (0.00221)
Human Capital	0.973*** (0.285)	1.099*** (0.282)	2.198*** (0.564)	−0.155 (0.208)
Government Expenditure	−0.0792** (0.0321)	−0.0831 (0.0527)	−0.166 (0.105)	−0.0263 (0.0260)
Unemployment				0.0181 (0.0389)
Foreign Aid	0.0387*** (0.00937)	0.0192** (0.00909)	0.0383** (0.0182)	
Inflation	−0.0344** (0.0144)	−0.0331* (0.0198)	−0.0663* (0.0396)	
Remittance	−0.0423*** (0.0193)	−0.0506*** (0.0171)	−0.101*** (0.0343)	
Population growth	−0.00347 (0.0311)	0.0472 (0.0322)	0.0944 (0.0645)	0.176** (0.0774)
Openness	0.0624 (0.0374)	0.0356 (0.0471)	0.0711 (0.0942)	
Credit	−0.0366** (0.0146)	−0.0476* (0.0247)	−0.0952* (0.0494)	0.0352** (0.0130)
Agricultural value growth	−0.0116 (0.0156)	−0.0104 (0.0188)	−0.0207 (0.0376)	
Arable Land	0.0646** (0.0242)	0.0766*** (0.0176)	0.153*** (0.0352)	
year	−0.00296 (0.00281)	−0.00340 (0.00382)	−0.00679 (0.00763)	0.00275 (0.00353)
Constant	6.896 (5.822)	8.057 (7.816)	16.11 (15.63)	−7.408 (7.478)
Number of Observations	215	215	215	215
F statistics	76637.34	31224.23	31224.13	83.04
Groups/Instruments	27/27	27/27	27/27	27/27
A-Bond AR(2) test	0.312	0.234	0.234	0.602
Sargan test	0.272	0.315	0.315	0.174
Hansen test	0.141	0.405	0.405	0.835

