Impact of Public Expenditure on Income Inequality in Some Selected East and South Africa countries: A Dynamic Panel Data Approach

A Thesis Submitted to the School of Graduate Studies of Jimma University

In Partial Fulfillment of the Requirements for the Award of Degree of

Masters of Economics (Economic Policy Analysis)

BY:

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DECLARATION

I hereby declare that this thesis entitled "Impact of Public Expenditure on Income Inequality: The Case of Selected East and South Africa Countries'', has been carried out by me under the guidance and supervision of Dr. Jemal Abafita and Mr. Jibril Haji.

The thesis is original and has not been submitted for the award of any degree or diploma to any university or institutions.

Researcher's Name	Date	Signature
Dagim Tadesse	_____	_____

CERTIFICATE

This is to certify that the thesis entitles "Impact of Public Expenditure on Income Inequality: The Case of Selected East and South Africa Countries", submitted to Jimma University for the award of Degree of Master of Economics (Economic policy Analysis) and is a record of valuable research work carried out by Mr. Dagim Tadesse Bekele, under our guidance and supervision.

Therefore, we hereby declare that no part of this thesis has been submitted to any other university or institutions for the award of any degree or diploma.

Main Adviser's Name	*Date*	*signature*
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Mr. Jibril Haji	_____	_____

Abstract

Economic growth which promotes equity is an important macroeconomic objective countries try to achieve. In achieving this objective, government policies are expected to have great role. However there is no consensus about how these policies are contribute to income inequality. In this research we tried to explore the impact of government expenditure, which is one component of Fiscal policy, on income inequality in selected East and South Africa countries. Specifically, by looking at the impact of aggregate government expenditure, which is proxied by government consumption expenditure as a percentage of GDP, on income inequality was analyzed for 18 countries using data spanning from 2000-2015. In addition to this, impact of disaggregated public expenditure by sector (education, health and agriculture expenditure) on income inequality was examined for 13 countries using the data from 2000 - 2012. Dynamic Panel Data System GMM estimation was conducted for the econometrics analysis of Dynamic fixed effect model. Accordingly, government consumption expenditure is found to have significant positive effect on income inequality in these countries. Furthermore, the finding shows that government expenditure on education as a percentage of GDP and government expenditure on health as a percentage of GDP have no significant impact on income inequality while expenditure on agriculture as a percentage of GDP is found to have significant positive effect on income inequality. From these we conclude that government consumption expenditure and government expenditure on agriculture played negative role in decreasing income inequality by aggravating its level. So, policy makers in these countries have to consider a way these government expenditures will have to be used to improve distribution of income in line with direct redistributive mechanisms.

Key Words: Impact, Public Expenditure, Income Inequality, Dynamic fixed effect, GMM

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ACRONYMS

2SLS	Two Stage Least Square
3SLS	Three Stage Least Square
AFDB	Africa Development Bank
ADF	Augmented Dicky Fuller
AH IV	Anderson and Hsiao instrumental variable
AU	Africa Union
DEA	Data Envelopment Analysis
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GLS	General Least Square
GMM	General Method of Moment
GFS	Government Finance Statistics
GAD	Inter Governmental Authority for Development
IFPRI	International Food Policy Research Institute
IPS	Im, Pesaran and Shin Test
IMF	International Monetary Fund
IV	Instrumental Variable
LDV	Lagged Dependent Variables

LDCs	Least Developed Countries
LSDV	Least Square Dummy Variable
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Square
SDGs	Sustainable Development Goals
SPPED	Statistics on Public Expenditure for Economic Development
UK	United Kingdom
UN	United Nation
UNCTAD	United Nations Conference on Trade and Development
USA	United States of America
VAR	Vector Auto Regressive
WDI	World Development Indicators

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Economic growths which promote equity become one important macroeconomic objective countries try to achieve (Heshmati and Kim, 2014). Over the past 15 years Africa has been in impressive economic growth with the average gross real domestic product (GDP) rising from just above 2% during the 1980-90s to above 5% in 2001-14. Even if the growth had been more moderate for the years 2014 and 2015, this trend was expected to continue in 2016, but strengthen in 2017. Growth remained highest in East Africa, followed by West Africa and Central Africa, and is lowest in Southern Africa and North Africa (Africa economic outlook, 2016).

In Africa, while the growth is in progress, in addition to being of the poorest regions in the world, Africa take the rank of the second most inequitable region next to Latin America. Income Inequality has not diminished over time. By 2010 out of 10 most unequal countries in the world, six were in Sub-Saharan Africa, and more specifically in Southern Africa (Mubila et al., 2012). The richest population which accounts less than five percent of the total population holds 18.8% of the total income in Africa, while the poor which account for 60.8% of Africa's population hold 36.5% of total income in Africa and the rest is middle income population (Ibid). Compared to the rest of developing world, higher level of mean and median inequality measured by Gini is recorded in the region 0.43 and 0.41 respectively while, it is 0.39 and 0.41 in the earlier case (Bohart, 2015).

The inequality level which exists in Africa countries like that of the other world shows a need to have distributional mechanism. But, this desirable distribution of income in terms of equity cannot be achieved necessarily by Market forces alone. This justifies the government intervention through policies (Niehues, 2010). The world great depression of 1929 paved the way in which public finances can be used as a tool to influence economic activity. Since then, Fiscal policy, which is the use of public spending and taxes to influence economic activity toward more expansion or contraction depending on the situation, alongside with monetary

policy has been used as one of the main tools available to public authorities to intervene and influence the real economy (Mouhamadou Ly, 2011).

It is widely accepted that public policies can play a key role in redistributing income (Niehues, 2010). Public finance has a major role, basically through distribution of income, in achieving greater equality between nations of the country (Hall, 2014). In addition to protecting the economy against fluctuations through the multiplicative effect, one of the channels, As per J.M. Keynes 1936, through which government budget considered as an economic policy tool are ensuring better distribution of income.

Market determined distribution of income can be affected by public policies, either through changes in the resources distribution and their return or through a redistribution of market income, to minimize the existed income gap between rich and poor. Therefore, government can address the conditions which lead increase in income inequality through appropriate policies (Cubero and Hollar, 2010).

Public expenditure, as a one and important fiscal policy tool and component of government budget, represents a form of government intervention designed to promote allocations efficiency through a correction of market failure, redistributive resource equitability and promote economic growth and stability. By using public expenditure, wise resource allocation and improvement on income distribution decisions can be made by the government. This is through its purchasing policy and influencing the process by which people obtain income. Higher government expenditure resulted because of higher inequality benefit the poor more (Harun et al., 2016). Also for Hall, 2014 public spending redistributes money income through social security benefits and by providing public services.

In Sub-Saharan Africa, over the past decades, total government expenditures had experienced overall growth. In 1980s total government expenditure as a percentage of GDP in sub -Saharan Africa was 18.51 percent and in the following decades it reached 22.51 and 28.83 percent respectively (Fan et al., 2009). This growth in expenditure is also observed from government sectoral expenditure. For example, the Africa region devotes 5.0 percent of total GDP of about $1.5 trillion to public education expenditure by 2015 , which is the second highest percentage

after North America with a total $32 trillion GDP per capita and Europe at 5 percent with a total $24 trillion GDP per capita (State of Education in Africa,2015).

However, beside the growth in government expenditure in different sector which improve the welfare of the society, income inequality is increasing in the region. And, unfair distribution of public investment and expenditure is found as one of the driving factors for increase income inequality in Africa. Giving much better access to essential services like education and health or infrastructures such as roads or electricity to some group of society than the others increase income inequality (Brown, 2014).

1.2 Statement of the Problem

Income inequality is one of the critical barriers most developing countries face on their journey to economic growth and development. According to Stiglitz (2012) "Inequality undermines the strength of the economy and contributes to economic instability". By recognizing this, Goal 10 in the SDGs planned to Reduce Inequality Within and Among Countries, with its key relevant target: By 2030, progressively achieve and sustain income growth of the bottom 40 percent of the population at a rate higher than the national average.

Earlier, following the trickle-down theory, researchers give great emphasis for what determine economic growth of a country. The issue of income inequality did not get much emphasis. Because of this, researchers tried to explore the role of public expenditure on economic growth. Many studies have been done, by using both a country level and cross countries data, to show what impact public expenditure has on economic growth by taking the sectoral disaggregated public expenditure and the aggregated one. But results are different and contradictory.

Like the other part of the world there are also such types of researches in East and South Africa. For example, Mose (2014) found that expenditures on health, defense and investment have positive effect on economic growth, consumption expenditure affect negatively and, education, agriculture and human capital expenditure were found to be insignificant in East Africa. A Similar study carried out by Kwendo and Muturi in (2015) in Kenya, Uganda, Rwanda, Burundi and Tanzania concludes that agriculture and defense expenditure had a negative impact on economic growth while health and consumption expenditure had a positive impact on economic

growth. In the case of South Africa , Odhiambo (2015) found government expenditure and economic growth Granger- cause each other in the short run, in long run , it is economic growth that Granger-causes government expenditure in south Africa.

However, strong emphasis on growth as the only solution for poverty and extreme inequality without determined efforts for the diminution of inequities has failed to show its beneficial outcome in much of the developing world, leaving the societies less harmonious with sharp bisectoral divisions (Mughal and Diawara, 2009). The resulted increase in income inequality between the rich and poor both as global and country level initiates researchers, international and national organization to study about this growing issue. What determine level of income inequality and the nexus between income inequality and economic growth become the basic questions researchers try to address by using a country and cross-country data. Regarding the role of public expenditure on determination of the level of income inequality, the findings by different researchers in different time are different and contradictory.

An early work by O.Odedokun and Jeffery I. (2001), found government budget and amount of government budget devoted to subsidies and transfers has positive effect on level of inequality in Africa. Østergaard (2013), also, found the degree of government expenditure as important factors which have positive impact on income inequality in sub Saharan Africa countries. On the other study , Anderson et al. ,(2015) found, for low and middle income countries, certain types of spending such as government social spending and government consumption spending have moderate negative impact on income inequality while, for the case of total government spending they found evidence of a moderate positive relationship with income inequality. Differently with the above findings Odedokun and Round (2004), Anyanwu (2011) and Anyanwu (2016) found for African countries public expenditure has no significant effect on income inequality.

The issue of inequality is continuing to be one of the major current problem countries of Africa are facing a lot. Even if researches have been carried on the issue, since income inequality and its determinants have dynamic nature there is always a need of new research. In this research emphasis has been given to impact of public expenditure on income inequality in East and Southern Africa countries by using both the aggregated and disaggregated public expenditure components. To the best of my knowledge, this is a new research especially for East Africa and

using both components makes it new for Southern Africa. Also, this research has been a new way of looking determinants of income inequality in Eastern and Southern Africa countries. While, Eastern Africa is experiencing leading economic growth in the Africa but South African region is almost on stagnant economic growth. This difference is captured by using regional dummy which can be used to compare the level of income inequality in these two regions. We also solved for the endogeneity of the social spending variables in the income inequality equation by using efficient estimators. Specifically to the disaggregated expenditure, no previous research in this issue did this. In addition, the model we used helps to show dynamics of income inequality.

1.3 Objectives

1.3.1 General objective

The general Objective of this paper is to examine the impact of government expenditure on income inequality for East and South African countries.

1.3.2 Specific objective

Specific objectives of the study are;

- Examine the impact of government consumption expenditure on income inequality.
- Examine the impact of government sectoral expenditures on income inequality

1.4 Hypothesis

Based on theories and empirical literature on public expenditure in developing countries and Sub-Sahara Africa, we propose the following relationships to hold true in our analysis.

- Aggregate public expenditure proxied by government consumption expenditure is hypothesized to have positive effect in reducing income inequality
- Public agricultural sector expenditure is hypothesized to have positive effect in reducing income inequality
- Public education sector expenditure is hypothesized to have positive effect in reducing income inequality
- Public health sector expenditure is hypothesized to have positive effect in reducing income inequality

1.5 Significance of the Study

Income inequality is a serious problem countries face to achieve their macroeconomic objectives. Even if researches were carried out in different time by different researchers (see for example Odedokun and Round (2004), Anyanwu (2011) and Anyanwu (2016)) the issue is still debatable. So knowing what determine income inequality is significant for policy makers, government, national and international organization. Specifically to the government, this study shows how its expenditure has been played the role to achieve equitable distribution of national income among its citizens. So, the findings of this research will have been a good milestone for future policies, strategies and action planes in addressing income inequality. For the international institution, this research can also be used as an indication how the government expenditure is tackling income inequality to achieve objective 17 of sustainable development goals. In addition, it is a good addition for the existed research and it will also use as a reference for further studies in the issue.

1.6 Scope and Delimitation of the study

The basic interest of the research was to explore how public expenditure in the aggregated and disaggregated form affects income inequality. In doing so, much attention has been given for expenditure components. The study covered countries only from East and South Africa regions. The time scope of the study is 2000 to 2015 for the model which is used to look the impact of the aggregated government expenditure on income inequality. While, because of lack of recent year's data for government sectoral expenditures the time scope for the model which shows the impact of government disaggregated sectoral expenditure model on income inequality is 2000-2012. The impact of Macro and socio-political factors which have been found to have impact on income inequality were used to know how they affect income inequality in these regions. But having degree of freedom problem, it is not possible to include all social, political and economic variables in the models. Since the cross country study was conducted, getting well organized and recent data had been the main problem. Because of this, we were obliged to use data up to 2012 for the second model. Only three sectoral government expenditures, namely expenditure on education, expenditure on Health and Agriculture, were used. But there might be other sectors which may have effect on income inequality.

1.7 Organization of the Study

To set the scene, the next chapter is about the theoretical and empirical review section. In first part of this section the various theories which discussed about income inequality and government expenditure, types of government expenditure and income inequality in Africa is addressed. Empirical literatures about the issue are covered in the second part of chapter two. In the third chapter, models which have been used for estimation is specified, variables in the model are defined, the estimation techniques are discussed and specification tests are consisted. Descriptive analysis and the empirical results of the estimation are covered in the Fourth chapter. Finally, chapter five dealt about conclusion and policy recommendations.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1 Theoretical Literature Review

2.1.1 Meaning and classification of public expenditure

The term "public expenditures" is defined differently by many economists and schools. According to Akrani (2011), Public expenditure can be defined as, "The expenditure incurred by public authorities like central, state and local governments to satisfy the collective social wants of the people.". Bahti (2002) as cited by Aremu et al. (2015) also define public expenditures as the expenses which a government incurs for its own maintenance, society and the economy and helping other countries.

Before the great world depression, throughout the 19th century, most governments were followed the Adam Smize principle of laissez faire and their responsibilities were restricted in maintaining peace, defending aggression and maintaining law & order. This made the amount of public expenditure very small back then. However, this was not continued for last long: the 1929 world great depression change the principle and public expenditure becomes as one policy tool to stabilize the economy. Its role in determination of level and distribution was advocated by John Maynard Keynes. Since then it has been shown significant increase (Assefa, 2014).

Different economists classified public expenditure in to different components based on different point of view. Based on the objective they have Vero(2013) broadly classified Government expenditure broadly into four categories: (i) Functional Classification or Budget Classification (ii) Economic Classification (iii) Cross Classification and (iv) Accounting Classification. Bahti (2002) as cited by Aremu et al. (2015) also classified public expenditure in to three broad categories which are; government consumption expenditure, government investment expenditure and current transfers.

Government final consumption expenditure (Current Expenditures) is expenditure by the government on goods and services which are used for satisfy current needs of individual government and members of the community. This category includes wages and salaries plus spending on current purchase of goods (that last for a year e.g. stationary, uniforms, oil) and services used for the current operation of public sectors (Hindriks and Myles, 2004) . This type of expenditure is of recurring type which is incurred year after year (Akrani, 2011).

Government Capital Expenditures (government investment) - is expenditure on goods and services which aimed at increasing the stock of publicly owned capital. This type of government expenditure has objective of increasing or generating future benefits. Examples include government expenditure on public buildings (public administration, schools, hospitals, residential apartments, firms etc.); infrastructure development (roads; power, telecommunication, transportation, construction, and mining and quarry machineries, equipment's, facilities, and spare-parts); national defense equipment's and materials; maintenance of public properties; human capital development (e.g. Scholarship payment,

salary of expatriate staff in higher education and health institutions); and consultancy, experts, and managerial expense on public .organization aimed at technological transfer (Akrani, 2011).

Transfer payments – is spending by the government without any transactions of goods and services, but instead represent transfers of money, such as social security payments, pensions and unemployment benefit. By incurring such expenditure, the government does not get anything in return, but it adds to the welfare of the people, especially belong to the weaker sections of the society. It has different components namely Transfers to households, Transfer to firms, official transfers, Capital account transfer and Interest payment (Akrani, 2011).

2.1.2 Theories about Government Expenditure

Economic policies are policies which have the goal to maximize the long-run societal well-being in an equitable and sustainable manner (Spiegel, 2006).Macroeconomic policy, which is one of economic policy, is a policy formulated by policy makers in order to achieve broad objectives/goals (ultimate targets) outlined in long-term development plans of a nation. In other words, macroeconomic policy is an attempt to stabilize the economy. The major objectives to be achieved through macroeconomic policies include Full employment, Price and exchange rate stability, Balance of payment equilibrium, and Economic growth. The main macroeconomic policies adopted by any nation in order to achieve these objectives include Fiscal policy, monetary policy, Exchange rate policy, Price policy and Income policy (Froyen, 2012).

Fiscal policy, which is among one of the macroeconomic policies, is the use of government spending and taxation to influence the economic activity toward more expansion or contraction depending on the situation. It can also be defined as, Fiscal policy is the use of taxes, government transfers, or government purchases of goods and services to shift the aggregate demand curve. Fiscal policy in developing countries is especially important in terms of macroeconomic management. The common situation in many developing countries is the huge needs in terms of poverty alleviation, output growth, investments and more generally macroeconomic stabilization. In order to achieve these objectives fiscal policy plays a great role (Mouhamadou Ly, 2011).

Public expenditure is one and important fiscal policy tool and component of government budget. It represents a form of government intervention designed to promote allocations efficiency

through a correction of market failure, redistributive resource equitability and promote economic growth and stability. Since, the period after 1929 world great depression, public expenditure has been shown significant increase in almost all world countries (Assefa, 2014).

There are many theories which try to explain what results increase in government expenditure over time. In this regard, Wagner's law (law of increasing state activity) proposed by the Germen public economist Adolf Wagner is an early work and base of many government expenditure theories. He argued that government expenditure growth is the result of industrialization and economic development. During industrialization process as a real per capita of a nation increase, the share of public expenditure in the total expenditure increases (Magableh, 2006). This is because of three factors. First, private sector activity will replaced by the public sector in the industrialization process. Second, governments are needed to provide different services like education, public health, food subsidy, pension, natural disaster aid and other programs which are commonly cultural and welfare activity. Third, technological change and monopoly firms will be resulted from the increased industrialization. So, these effects have to offset by the government by providing social and merit goods through budgetary means (UK Essays, 2015). But this theory criticized because it works only for countries where their source of national income is industrialization (Scharmer, 2002).

The Peacock-Wiseman Hypothesis (displacement effect hypothesis) proposed by Peacock and Wiseman 1961 is the other theory which deals with the growth of public expenditure. When they observed overtime government expenditure in UK, it appeared a series of smoothen trend which is separated by peaks and they found that these peaks were coincided with period of war and preparation for war. And they studied why this is happen, which led them to reach to the displacement effect hypothesis. On their study, Tolerable burden of taxation is found to be the engine that runs the displacement effect. Underling on three basic propositions which are; governments always find profitable ways to expand available funds, higher tax rate is not accepted by citizens in general and government must be responsive to the wishes of their citizens, this is because during the period of war citizens tolerate higher tax which is not acceptable in times of peace and this will persist even after the crisis subsidy. Therefore, government is able to implement previously desired but not financed programs. This results to higher government expenditure. They also argued that permanent factors like population growth,

inflation and unemployment may also have influence on the growth of government spending (Rowley and Tollison, 1993).

Musgrave and Rostow's Development Model has seen government expenditure as a prerequisite of economic development in which its level relates positively with the level of economic development that a country has reached. Spending by the government at the initial stage of economic growth and development is high, because there is a need to provide social infrastructures which are important to gear up the economy for takeoff into the middle stages of economic and social development. While the economy reaches the middle stages of growth government has to continue its spending complementarily with that of the private once. Market failures, which hinder the journey of economic growth to its maturity, exist in these development stages. So, government has to increase its involvement to deal with this issue (Maingi, 2010).

Baumol's model of unbalanced growth by Baumole (1967), analyses the increase in government expenditure by classifying the sector in the economy in to productive and non- productive. According to the model, the possibility of substitution in labour and capital in the productive sector and possibility of improvements in labour productivity matching with that of increases in hourly wage with constant cost pulls labour from non-productive sector. So, in order to prevent moving of labour in search of higher wage out of the sector the non-progressive sector would have to match the hourly wage rate increases obtained in the progressive sector. This results increase in opportunity cost of the non productive sector. From this prepositions the model infers that, if public sector is the non-productive one and wages of public sector employees move in line with wages in other sectors of the economy, then ceteris paribus, public expenditure will rise. In other words, it will cost the public sector more just to stand still (Mthethwa, 1998).

Critical-Limit Hypothesis, which is among theories deals about public expenditure, states that the public sector expenditure must be less than quarter of the total expenditure in the economy. Unless this happens, it necessarily results inflation even in the balanced budget. This idea on public expenditure is associated with the idea of tax tolerance (Irshad, 2015).

According to Pure Theory of public Expenditure by Samuelson, to achieve growth in labour the government expenditure is required to increase. Similarly with that of Musgrave and Rostow's Development Model, this model suggest that government share in capital formation has to decline over time when the economy is developed. While at earlier stages of development, there is a need for initial capital such as roads, education and others (Samuelson, 1966).

Keynesian view government spending and revenue as a tool government use to regulate the economy. They believe that the economy without government involvement, with by its policy, and lead by classical principle of supply creates its own demand, and the automaticity of the economic system to generate full employment and growth by itself without interference is not function well. There is always concept of market faller. Thus, to maintain income, employment and growth it is necessary to offset the effects of reducing demand for outputs by a corresponding increase in public expenditure. Hence, if undesirable economic conditions are to be avoided the gap between the income and expenditure must be filled either by increasing propensity to consume in the economy or by increasing government expenditure.

2.1.3 Definition and Concept of Income Inequality

One of the concept in which social justice theories is dealing much is inequality. Inequality is the state of not being equal, especially in status, rights, and opportunities. Among the inequalities Economic inequality, skewed distribution of income and wealth, is the one which is increasing from time to time. For example, According to 2014 Oxfam research 85 richest individuals in the world have as much wealth as the poorest half of the global population. McKay (2002) defined Economic inequality is ''the fundamental disparity that permits one individual certain material choices, while denying another individual those very same choices''.

Economic inequality has been discussed in two views; inequality of outcomes and inequality of opportunities. Inequality of outcomes chiefly concerned with the inequality of outcomes in the material dimensions of well-being and that may be the result of circumstances beyond one's control (ethnicity, family background, gender, and so on) as well as talent and effort. This view takes an ex-post or achievement-oriented perspective. The second view is concerned with the inequality of opportunities, that is, it focuses only in the circumstances beyond one's control, that affect one's potential outcomes. This is an ex-ante or potential achievement perspective.

Inequality of outcomes occurs when individuals do not possess the same level of material wealth or overall living economic conditions. Income inequality is one of the inequalities of outcome in which most developmental research give great emphasis (Afonso et al., 2015).

Income inequality refers to the inequality of the distribution of individuals, household or some per capita measure of income among the population of a country (Heshmati, 2004). Inequalities in income are the result of the overall relationships between capital and labour and of changes taking place in production systems, labour markets, and social variables and in the redistributive activity of the welfare state (Franzini and Pianta, 2011).

2.1.4 Theories of Income inequality

Income distribution is interpreted in two principal ways in economic analysis. These are the functional distribution of income and the personal or size distribution of income (Cowell, 2007). The functional distribution shows how much income is received by each factor of production. This is how total income is distributed between land, labour and capital. On the other hand, the personal or size distribution of income shows how many individuals (or households) receive how much income. This is how total income, from all sources, is distributed among individuals or households. These two principal ways have been the focused area for the theoretical debate about income inequality (Gallo, 2002). While, in this part we discuss theories about the personal or size distribution of income which is the interest of the research.

There are various theories of personal income distribution. Sahota (1978) based on taxonomy on historical order and closeness of arguments of school though, broadly classified these theories as follows: ability theory, the stochastic theory, the individual choice theory the human capital theory, theories of educational inequalities, the inheritance theory, the life-cycle theory, Public income redistribution theories, more complete theories and the theories of distributive justice. For this research Specifically, Human capital theory of income, the theories of Distributive Justice and Stochastic theory of distribution will have been covered.

The basic idea by Human capital theory of personal distribution of income stated that individuals are able to increase their future income through making of forward-looking investments.

Accordingly, individual's current income is a sign for his or her past investment decisions. Individual's prior choices decision can have determination role on an individual's current income (Goldfarb and Leonard, 2005). Investment on training or education is the ideal decision by individuals which allowed them to gain new skills and made them productive, consequently determined their income (Nichols, 2013).

The theories of Distributive Justice is the other personal distribution theory and Theories under this category are many in number but what make them similar is that all are tried to balance three views. Desert or merit: Theory of Deserts which argued that that recognition of deserts is necessary to ensure efficiency as people is rewarded for effort since a person has acted in condition that increases their resource allocation. Entitlement: a person is entitled to an allocation of resources. This concept is related to deserts because a person who deserves an allocation will also be entitled to those resources. However, it also encompasses holdings that may be accumulated through other legal means, such as inheritance or market purchase. Needs: in contrast to deserts and entitlements, a needs based allocation of resources will give priority to ensuring that a person is allocated sufficient resources to meet their needs. It raises the problem of determining the base level of resources that a citizen needs to support a useful life, either as a class or in the case of a particular individual. The needs principle is inherent in income support systems (Hodgson, 2010).

Stochastic theory of distribution, according to Sahota (1978), describes chance, luck, and random occurrences are the main or only cause of different income distribution. Inequality of the degree of Pareto distribution could result because of these stochastic forces even in the condition where a generation started from a state of strict equality of incomes and wealth. For this theory the current inequality is not a result of other factors, rather it is because of chance, luck, and random occurrences people gat in their life.

2.1.5 Income Inequality Measurement

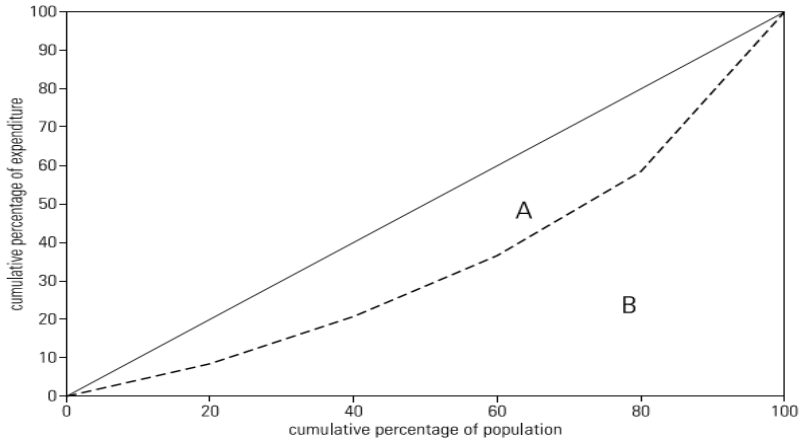
Inequality measurement is an attempt to give meaning to comparisons of income distribution in terms of criteria which may be derived from ethical principle, appealing mathematical constructs or simple intuition (Cowell, 1998). An inequality measure is often a function that ascribes a value to a specific distribution of income in a way that allows direct and objective comparisons

across different distributions (Afonso et al., 2015). The following measures differ with regards to the properties they satisfy and information they present.

2.1.5.1 Gini coefficient of inequality

It is most commonly used measure of inequality which is based on the Lorenz cumulative frequency curve. Lorenz cumulative frequency curve compares the distribution of a specific variable (e.g. income) with the uniform distribution that represents equality. The horizontal axis graphs the cumulative percentage of households (from poor to rich) and the vertical axis graph cumulative percentage of expenditure (or income) to calculate the Gini coefficient in the Lorenz curve. The Gini coefficient is defined as A/ (A+B), where A and B are the areas shown on the graph. The diagonal line shows perfect equality. We can say there is perfect equality when A=0 and Gini coefficient becomes 0, whereas complete inequality is when B=0 the Gini coefficient becomes 1.

Figure 1 Lorenz curve



Source: Heshmati (2004)

Having many desirable properties, including mean independence, population size independence, symmetry, and Pigou-Dalton Transfer sensitivity, the Gini coefficient cannot easily be decomposed to show the sources of inequality (Poverty Manual, 2005).

2.1.5.2 Deciles Dispersion Ratio

A ratio which presents the average income (or A simple measure of inequality, it presents the ratio of the average consumption (or income) of the richest 10 percent of the population to the average income (or consumption) of the poorest 10 percent. It can also be calculated for other

percentiles. Even if it is a simplest measure of inequality, ignoring information about incomes in the middle of the income distribution is its major limitation (Inequality Measurement, 2016).

2.1.5.3 Atkinson's Inequality Measure (or Atkinson's index)

It Measures how many percent of total income in a given society would have to forego in order to have more equal shares of income between its citizens. It depends on the degree of society aversion to inequality, where its value is higher it means individuals have higher social utility or willingness to accept smaller incomes in exchange for a more equal distribution. This measure of income inequality can be decomposed into within and between-group inequality. Differently with the other inequality measures, Atkinson's inequality measure provides welfare implications of alternative policies and allows including some normative content to the analysis (Inequality Measurement, 2016).

2.1.5.4 Theil index and Generalized Entropy Measures

Is Other measure of income inequality in which its class of measures value vary between zero and infinity, with zero representing an equal distribution and higher values representing higher levels of inequality. It is fully decomposable, which makes it useful to policy makers. In using this measure researchers can choose a parameter α that assigns a weight to distances between incomes in different parts of the income distribution. α can take any real value but the most common values are 0, 1, and 2. When α=0, the index is called "Theil's L" or the "mean log deviation" measure. When α=1, the index is called "Theil's T" index or, more commonly, "Theil index". When α=2, the index is called "coefficient of variation". Similarly to the Gini coefficient, when income redistribution happens, change in the indices depends on the level of individual incomes involved in the redistribution and the population size (Inequality Measurement, 2016).

2.1.6 Theoretical Links between Public Expenditure and Income Inequality

Theoretically the involvement of government expenditure in to the economy is supported by the market faller principle. According to Theorem of Welfare Economics (Steven, 2001) even if a competitive market might generate a Pareto-efficient allocation of resources, there are still the cases for government intervention, because an efficient allocation of resources might entail great inequality (Harun et al, 2016).

In public expenditure and inequality relation there exist two contradictory theoretical literatures. The median voter hypothesis, following Meltzer and Richard's (1981) seminal paper, is the one and dominant theory which deals about the relationship between government expenditure and income inequality. According to this hypothesis more income inequality is associated with higher government spending on redistribution. The higher public expenditure will lower income inequality because a high level of inequality leads to redistributive fiscal policy in the form of higher government expenditure, the poor normally benefit more from a given government expenditure (Osberg,2003).

On the other side, Bénabou (2000) developed a stochastic growth model in which more income inequality is associated with less, not more, redistributive government spending. . If capital markets are imperfect, investment opportunities differ among individuals with low and high initial wealth, generating income inequalities that persist over time. He showed that the relationship between inequality and redistribution is nonlinear; that is, more inequality tends to result in less government spending on redistribution because the consensus for ex ante efficient redistributive policies breaks down, at least up to some level, beyond which the standard effect eventually dominates. He also concluded that there can be multiple steady states because of the nonlinearity, in particular when human capital accumulation is constrained by capital market imperfections. Finally, Bénabou found that a negative relationship is expected to prevail between redistribution and inequality in the long run (Mello and Tiongson, 2003).

There are also other many literatures which focus on political economy factors to explore the theoretical relationship between public expenditure and income inequality .Because of rent-seeking and political influence, Rodriguez (1999) showed that inequality may be negatively associated with redistribution (Ibid).

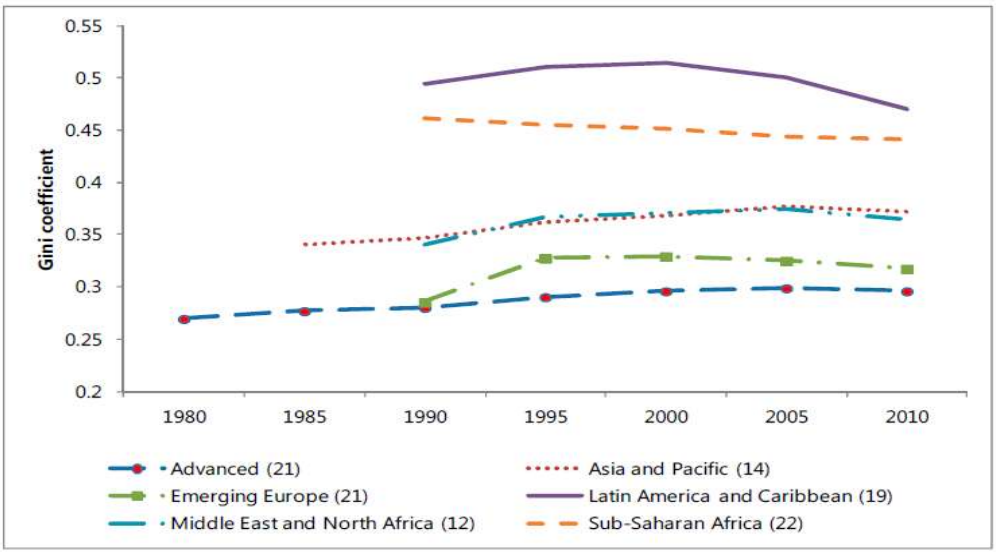
2.1.7 Income Inequality Sub Saharan Africa

Sub Saharan Africa has been in high economic growth during the recent years which is accompanying by income inequality. Inequality, overall, is unchanged. While, there is quite a bit difference across country experiences. Significant decline in income inequality has been experienced in Countries such as Sierra Leone, Niger, and Lesotho. However, inequality as measured by the net Gini during 1995–2011 increases in one-third of countries for which data

are available, such as Rwanda, Uganda and Ghana. Compared to countries at similar income levels in other regions, higher levels of income inequality at all levels of per capita income is observed in Sub-Saharan Africa (Sembene, 2015).

In Africa as a whole, while the growth is in progress, In addition to being of the poorest regions in the world, Africa take the second most inequitable region next to Latin America. Income Inequality has not diminished over time. By 2010 out of 10 most unequal countries in the world, six were in Sub-Saharan Africa, and more specifically in Southern Africa (Mubila et al., 2012). The richest population which accounts less than five percent of the total population holds 18.8% of the total income in Africa, while the poor which account for 60.8% of Africa's population hold 36.5% of total income in Africa and the rest is middle income population (Ibid). Compared to the rest of developing world, higher level of mean and median inequality measured by Gini is recorded in the region 0.43 and 0.41 respectively while it is 0.39 and 0.41 in the earlier case (Bohart, 2015).

Figure 2 comparison of income inequality between regions



Source: IMF policy paper, 2014

This is because inequality more than 0.55 Gini exists in countries Angola, the Central African Republic, Botswana, Zambia, Namibia, Comoros, and South Africa. When we exclude these African outliers, inequality level in Africa approximates to other developing economies. Second,

on average inequality levels have been declined in Africa since the mid-1990s. Finally, there is strong relationship between economic growth and income inequality in countries where high inequality exist (Bohart, 2015).

2.2 Empirical Literature Review

The increase in income inequality between the poor and rich both as global and country level initiates researchers, international and national organization to take a study about this growing issue. Different researchers tried to explore the impact government expenditure on income inequality with different methodology and data. But results are different and contradictory. In this section we looked at previous studies in the area starting from developed countries case and then developing countries. The last section of this part gave special attention for the case of Africa, specifically Sub-Saharan African countries.

Finding by Wolff and Zacharias (2007) shows overall income inequality declined significantly in line with net government expenditures in USA for the period between 1989 and 2000. They suggested that government expenditure, as compared to taxes, yield greater inequality-reduction. Thompson and Smeeding (2013) explore trends in inequality and poverty using both market and after-tax and transfer income during and after the Great Recession. Using market income, inequality and poverty rose sharply between 2008 and 2010. The primary exception is measures for the top of the distribution, where tax and transfer policies lowered inequality and poverty, but those policies were not the same across the entire population. Inequality fell across the total population, but there was no change among working-age households.

Study conducted by Afonso et al (2008) examined the impact of public spending, education, and institutions on income distribution in advanced economies. By using a DEA (Data Envelopment Analysis) nonparametric approach they also assessed the efficiency of public spending in OECD countries. They found that income distribution was significantly affected by public policies, notably via social spending, and indirectly via high quality education/human capital and via sound economic institutions.

Muinelo-Gallo and Roca-Sagalés (2011) found larger current expenditures reduce inequality for 43 upper-middle and high-income countries over the period 1972–2006. A similar study result

for 21 high-income OECD countries during the same period by these two researchers shows distributive expenditures decreases net income inequality for the period 1972-2006.

Muinelo-Gallo and Roca-Sagalés (2014) also worked on the title "Is the Fiscal Policy Increasing Income Inequality in Uruguay?" Over the period 1981-2010 by using VAR model. They found that significant long term distributional effects associated to public spending, showing that an increase in current and social security expenditures both increase disposable household's income inequality (post tax and government cash and in-kind transfers), while a raise in public investment reduces it. A deeper analysis on the distributive effects of these fiscal policies per income quintiles show that the low and middle class are negatively affected by social security expenditure and current public spending respectively, while the richer accumulates the benefits, being the public investment the only fiscal policy that breaks this tendency.

Using a panel dataset from 1980 to 2000 Ospina (2010) analyzes the determinants of income inequality in Latin American countries with special attention paid to education, health, and social security public expenditures. The study used 2SLS and GMM methods in order to control for the correlation of some of the regressors with the disturbance term. Results show that social spending variables are endogenous with income inequality index. By controlling endogeneity Education and health expenditures were found to have a negative effect on income inequality, while social security expenditures have no effect on income inequality. She also found that models that do not take into account endogeneity of social spending variables overestimate the effects of education and health spending.

The study by Claus et al., (2012) assessed the impact of government fiscal policies on income inequality in Asia. By Using Panel data of 150 countries the research compared the Asia countries with others. Data over the period 1970–2009 is used and the estimation was carried out by using GMM model in Asia. Government expenditures were found to be a more effective tool for redistributing income. Government expenditures on health and education were found to reduce income inequality in Asia. Social protection expenditure and government expenditure on housing were found to increase income inequality.

Cornia and Martorano (2013) on their study " Development policies and income inequality in selected developing regions" founds, for the period 1980-2010 the ratio of public social expenditure to total public expenditure in selected developing countries had no significant impact on income inequality in 104 countries by using Least Square Dummy Variable estimator(LSDV) and 3SLS.

Ali Bhatti et al, (2015) by using simple computable general equilibrium model tried to analyze the link between fiscal policy and income distribution in Pakistan economy. Their Results had shown that a policy mix of sales tax, income tax and government expenditure help to reduce income inequality while at the same the lessen economy's financial dependency.

Giving focus for low and middle income countries research by Anderson et al., (2015) found that government spending can have moderate negative impact on income inequality, but only when considering certain types of spending such as government social spending and government consumption spending. For the case of total government spending they found evidence of a moderate positive relationship with income inequality. A meta-regression analysis was presented to explore the effects of government spending on income inequality.

In the case of Africa, An empirical investigation of determinants of income inequality and income distribution the effect of inequality on economic growth and the channels through which inequality affects growth by Odedokun and Jeffery. Round (2001) for 35 countries found size of government budget and the amount of it devoted to subsidies and transfers have effect on income distribution in Africa.

Based on panel dataset covering 41 Sub--- Saharan countries for the period between 1980 and 2010 Østergaard (2013) empirically test how various factors are related to the high Levels of income inequality that continues to plague Sub---Saharan African countries. Random effects regression was employed and several factors are found to influence Income distribution, some more controversial than others. The level of education, the degree of government expenditure, and the existence of democracy were found as important factors which have positive impact on income inequality. While, government expenditure has more reducing impact on income inequality in democracies than non---democracies Furthermore, foreign aid is found to not

benefit the poor In terms of bringing down income inequality. The Kuznets U relationship was not supported.

Study by Anyanwu (2011) using panel regressions estimated by a two-step (IV) efficient generalized method of moments (GMM) estimation method, using five eight-year non-overlapping windows for the period 1960-2006 found that government expenditure has insignificant effect on income inequality in Africa. Similarly, Anyanwu (2016) by using the dynamic system GMM estimation procedure empirically Analyses of the Main Drivers of Income Inequality in Southern Africa over the period of 1970 – 2011. He found that government expenditure have no significant relationship with income in-equality in Southern Africa.

CHAPTER THREE

3. MTHODOLOGY

In this chapter, we discuss the data and methodology which is applied for this study in a detailed manner. The chapter has two main parts. In The first part, source and type of data and Sampling procedure to select sample countries of East and South Africa countries is addressed. The second part of the chapter discusses model specification, variables definitions, estimation issues and panel diagnostics tests. In this part the econometric (empirical) model is specified and definition of variables in the model discussed, our next concern in that part is Estimation method: The Dynamic Panel Data Estimator. Lastly, different panel diagnostics tests are also be discussed.

3.1 Data and sampling technique

3.1.1 Source and Type of Data

This study used secondary data, panel in nature, obtained from various institutions. The increase in availability of international and national Panel data results wide use of it for economics research in recent decades. By using panel data; we can control for individual heterogeneity, more variability, less co-linearity among the variables, more degrees of freedom and more efficiency, able to study the dynamics of adjustment, able to identify and measure effects that are simply not detectable in pure cross-sections or pure time-series data, controlling the impact of omitted variables (See for example Barrington, 2006 and Wooldridge, 2011).

Different international sources were used to get the required data for this research. Data for the dependent variable (gini coefficient) were collected from 2016 United Nation Human Development Index. Data for economic growth, Government consumption expenditure, inflation, foreign direct investment and population growth rate were taken from latest World Development Indicator which was released on May 2017. For the disaggregated model getting up-to-date data was a problem. In many data sets, many of the observations for sectoral government expenditures are missing which are not suitable even for unbalanced data analysis. We could not be able to use imputation techniques because many of the observations are missed, it might results biased finding. Martinez-Vazquez, 2014 stated that unavailability of uniform data for public spending across countries is a main problem which hampered researches not to give much attention to analyze the effect of the variability of public spending composition on the distribu-

tion of income as a whole. We also faced this problem. Because of this, the second model which analyzes the impact of government sectoral expenditure on income inequality used the data span from 2000-2012. It is batter to use recent data but in case when data is not available researches is carried out using the existed ones. Look for example, Kwando and Muturi (2015) and Anyanwu (2016). So, we collected the data for government education expenditure as a percentage of GDP, government health expenditure as a percentage GDP and government expenditure on Agriculture as a percentage of GDP from IFPRI SPEED data set which was released 2015.

3.1.2 Sampling Technique

Sample countries from East and Southern Africa countries were selected by using purposive sampling technique. The availability of required data for variables in the model was used as criteria. The number and types of sample countries is not the same from one dataset prepared to estimate a model to another organized for another specification. For example, our two models require different type government expenditure. Thus, independent samples were considered for each model specified above. For the first model, 18 countries were selected of which six are from the East Africa while others are countries in South Africa. In the second model 13 countries from these regions were selected. In this case three of them are from East Africa and the rest is from South Africa. Sample countries which included in either of the sample is listed in Appendix, details regarding the observation generated for each model is discussed during estimation in the next chapter.

3.2 Model Specification and Estimation Issues

3.2.1 Econometrics model specification

Most macro variables and economic relations are dynamic in their nature. Income inequality, also, has a dynamic nature in which current level has likely been affected by the previous period(s). Since, it changes very slowly (Anyanwu, 2016). To capture this characteristic, true state dependency, it is better to use Lagged Dependent Variables (LDV) models often known as dynamic panel data model (Brüderl, 2015). It can be created by introducing the lagged dependent variables to either fixed or random effects models.

According to Judson and Owen (2006), forming dynamic panel model on the fixed effects model is more appropriate than a random effects model for many macro datasets because of two

reasons. One, if the individual effect represents omitted variables, it is highly likely that these country specific characteristics are correlated with the other regressors. Two, it is also fairly likely that a typical macro panel will contain most of the countries of interest (which is also the case of this research) and, thus, will be less likely to be a random sample from a much larger universe of countries. Because of these reasons our dynamic panel models was formed on the fixed effect model and it looks;

$$Y_{it} = \beta_i + \beta_1 Y_{it-1} + \beta_2 X_{it} + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.4a$$

Where Y_{it} is dependent variable of individual country i at a period t and Y_{it-1} lagged dependant variable of individual country i at a period t-1. While, X_{it} is other Explanatory variables and ε_{it} is the error term. In our case the variable Y_{it} and Y_{it-1} are income inequality measured by Gini coefficient of individual country i at a period t and t-1 respectively. X_{it} is other socio economic factors which are expected to have effect on the income inequality of individual country i at a period t. Based on this, the econometric working (dynamic fixed effect models) models to estimate the impact of aggregated and disaggregated public expenditure on income inequality for this research was specified respectively us follows;

$$GIN_{it} = \beta_i + \beta_1 GIN_{it-1} + \beta_2 GDP_{it} + \beta_3 GE_{it} + \beta_4 FDI_{it} + \beta_5 INF_{it} + \beta_6 PGR_{it} + \beta_7 REG_{it} + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots 3.4b$$

And

$$GIN_{it} = \beta_i + \beta_1 GIN_{it-1} + \beta_2 GDP_{it} + \beta_3 GAE_{it} + \beta_4 GEE_{it} + \beta_5 GHE_{it} + \beta_6 FDI_{it} + \beta_7 INF_{it} + \beta_8 PGR_{it} + \beta_9 REG_{it} + \varepsilon_{it} \dots\dots\dots\dots\dots 3.4c$$

Where GIN_{it} is Gini of country i at a period t which is a measure income inequality

GIN_{it-1} Is Gini of country i at a period t-1 which is a measure of previous year income inequality

GDP_{it} is Gross Domestic Product of country i at a period t which is a measure for economic growth.

GE_{it} is government consumption expenditure which is a proxy for aggregate government expenditure country i at a period t

FDI_{it} Is the amount of foreign direct investment country i received at a period t

INF_{it} The rate of inflation country i experienced at a period t

PGR_{it} Is population growth rate of country i at a period t

REG Is regional dummy and it takes 1 when a country is in Southern Africa, 0 if it is in East Africa

ε_{it} *is the error term*

While in equation 3.3c

GAE_{it} Is government expenditure on Agriculture sector of country i at a period t

GEE_{it} Is government expenditure on Education sector of country i at a period t

GHE_{it} Is government expenditure on Health sector of country i at a period t

3.2.2 Description of Variables and Expected Sign

Gini coefficient (GIN_{it}) is measure for income inequality whose value ranges between 0, where there is perfect equality, and 1, where there is perfect inequality. Having many desirable properties including mean independence, population size independence, symmetry, and Pigou-Dalton Transfer sensitivity makes it the chosen measure for inequality in this research.

Past year Gini coefficient (GIN_{it-1}) the measure of countries previous year inequality level whose value ranges between 0, where there is perfect equality, and 1, where there is perfect inequality.

Growth Rate of Gross Domestic Product ($RGDP_{it}$) is the rate at which total value of final good and service a country produces in its territory is increasing given period of time. It is a measure for countries level of economic growth. The relation between economic growth and income inequality is one of controversial research area in which the impact of growth on income inequality is hard to be determined prior.

Government consumption Expenditure (GE_{it}) is the total expenditure by the government on goods and services which are used for satisfy current needs of individual government and members of the community. This category includes wages and salaries plus spending on current purchase of goods (that last for a year e.g. stationary, uniforms, oil) and services used for the

current operation of public sectors (Hindriks and Myles, 2004) . This type of expenditure is of recurring type which is incurred year after year (Akrani, 2011).

Foreign Direct Investment (FDI_{it}) is a type of investment that reflects capital transaction(s) between the 'direct investor' and 'investment enterprise' resident in an economy other than that of a foreign direct investor (UNCTAD, 2006). It is as a percentage of GDP. FDI inflows increase the amount of capital in the host country, thus leading to a rise in the marginal physical product of labour which leads to a rise in both nominal and real wages. Not only these, FDI create job opportunity for the unemployed and become the source of income. FDI is of importance to this study because it can capture the potential effects of the increasing openness to the international market.

Inflation (INF_{it}) consumer price index is included in this analysis because changes in prices not only impact the country's economy as a whole but also the livelihood and wellbeing of its citizens. The expected effect is a positive relationship with the Gini coefficient so an increase in inflation would mean an increase in income inequality.

Government expenditure on Agriculture sector(GAE_{it}) is a total amount of government expenditure addressed to agricultural sector in the form of provision of inputs, research and development sector of country. It is as a percentage of GDP. Its coefficient is expected to have negative sign.

Government expenditure on Education sector (GEE_{it}) is a total amount of government expenditure addressed to the education sector of country at a period. Expenditure of this type includes government expenditure for primary, secondary, tertiary and vocational education of a country. It is as a percentage of GDP.

Government expenditure on Health sector (GHE_{it}) is a total amount of government expenditure addressed to the health sector of country at a period . Expenditure of this type includes, for example, construction of hospitals, health centers, provision of human and physical material for this centers and etc….. It is also as a percent of GDP. Health is the other important human capital development program which has great role on country's economic growth.

Healthy people work more and generate income. It is expected to have negative effect on income inequality.

3.2.3 Estimation issue

In the above models, it is highly likely that there are endogenity issues because of the variables which are used as regressors for the income inequality may have common determinant with the income inequality, the dependant variable, which may be omitted from the model. For example, Ospina (2010) explore social spending is potentially endogenous in the inequality regression as a result of increase in inequality is related to social, economic and political changes that can also affect government expenditures, $E(\varepsilon_{it}/GE_{is}) \neq 0 \; for \; t \leq s$. The endogenity problem also rises from the correlation between the lagged dependent variable GIN_{it-1} and the fixed effect β_i ,$E(\beta_i/GIN_{it-1}) \neq 0$, (Lindner, 2010). Having with endogenity in the models, the common approach, like OLS and GLS, to estimate fixed- effects models 3.3b and 3.3c -- the least squares dummy variable estimator (LSDV) -- generates a biased, inconsistent, estimate of the coefficients in the above models . There are several alternative estimators to solve for this problem. These estimators can be grouped broadly in to class of instrumental estimators and the class of direct bias corrected estimator (Behr, 2003).

Instrumental variable estimator proposed by Anderson and Hsiao (1981) is one of the proposed estimation methods which recognize the presence of omitted variable (unobserved heterogeneity) which results endogenity and gives consistent estimator with the existed problem. This method solves these problems by first differencing and avoiding the individual effect from the system and appropriate instruments are also employed to eliminate the problem of endogenity. According to Islam (2000), AH IV estimators use further lagged values of the dependent variable as instruments. For the variable to use as an instrument must satisfies certain properties; instrument exogeneity and instrumental relevance. Instrumental variables estimation can be combined with panel data methods, particularly first differencing, to estimate parameters consistently in the presence of unobserved effects and endogenity in one or more time-varying explanatory variables (Wooldridge, 2012).

We can see how the propose two instrumental variable procedures by Anderson and Hsiao (AH IV) estimator works as follows;

First difference equation 3.3a to avoid individual fixed effect and obtain

$$(Y_{it} - Y_{it-1}) = \beta_1(Y_{it-1} - Y_{it-2}) + \beta_2(X_{it} - X_{it-1}) + (\varepsilon_{it} - \varepsilon_{it-1}) \dots\dots\dots\dots\dots\dots 3.5$$

But now $E(Y_{it-1} - Y_{it-2}, \varepsilon_{it} - \varepsilon_{it-1}) \neq 0$, to avoid this correlation they recommend for instrumenting with either Y_{it-2} or$Y_{it-2} - Y_{it-3}$. Arellano (1989) as cited by Behr (2003) found that using the level instrument Y_{it-2} is superior because of having small variance and no point's singularities. Also it has an advantage of losing only one year which can be relevant for practical uses, especially using data files with a large number of individual and few years. However, this estimation technique which takes first differences to eliminate the individual specific effects and use lagged instruments to correct for endogeniety has got some problems that arise due to a possibility of using weak instruments or even completely uninformative instruments in the regressions (Ibid). Difficulty of finding data for exogenous instrumental variables is also problem (ospine, 2010).

According to Shin (2014), if the additional moment conditions are valid, imposing more moment conditions increases the efficiency and solve the problem raised with that of using instrumental variables. Arellano and Bond, (1991), also, show that the list of instruments can be extended by exploiting additional moment conditions and letting their number vary with t. In particular, they argue that additional instruments can be obtained if one utilizes the orthogonality conditions that exist between lagged values of $Y_{it}$and ε_{it}. Their estimator is similar with that of Anderson and Hsiao IV but exploit additional moment restrictions (Behr, 2003). This allows them to gain efficiency by their GMM procedures. They use all available lagged values of the dependent variables plus lagged values of the exogenous regressors as instruments (Ruth A. Judson and Ann L. Owen, 1996).

First, similarly with the AH estimator, difference equation 3.3a to avoid individual fixed effect and obtain

$$(Y_{it} - Y_{it-1}) = \beta_1(Y_{it-1} - Y_{it-2}) + \beta_2(X_{it} - X_{it-1}) + (\varepsilon_{it} - \varepsilon_{it-1}) \dots\dots\dots..3.5b$$

For each year we now look for instruments available for instrumenting the difference equation. For T= 3 the estimated

$$(Y_{i3} - Y_{i2}) = \beta_1(Y_{i2} - Y_{i3}) + \beta_2(X_{i3} - X_{i2}) + (\varepsilon_{i3} - \varepsilon_{i2}) \dots\dots\dots\dots\dots\dots\dots 3.5c$$

For T= 4 the estimated

$$(Y_{i4} - Y_{i3}) = \beta_1(Y_{i3} - Y_{i2}) + \beta_2(X_{i4} - X_{i3}) + (\varepsilon_{i4} - \varepsilon_{i3}) \dots\dots\dots\dots\dots\dots\dots .3.5d$$

And the instruments $Y_{i1}, Y_{i2}, X_{i1}, X_{i2}\ and\ X_{i3}$ are available. As can be seen the time period for instrumentation enlarge and for the equation for the final period T

$$(Y_{iT} - Y_{iT-1}) = \beta_1(Y_{iT-1} - Y_{iT-2}) + \beta_2(X_{iT} - X_{iT-1}) + (\varepsilon_{iT} - \varepsilon_{iT-1}) \dots\dots 3.5e$$

Instruments available are $Y_{i3}, Y_{i3}, \dots, Y_{iT-2}$ and $X_{i1},\ X_{i2}, \dots,\ X_{iT-1}$

The estimation procedure has two stages, first cross section auxiliary equation

$$Y_{it} - Y_{it-1} = \alpha_{1t}Y_{it-2} + \alpha_{2t}Y_{it-3} + \dots + \gamma_{1t}X_{it-1} + \gamma_{2t}X_{it-2} + \dots + \varepsilon_{i3} \dots\dots\dots\dots .3.5f$$

is estimated. In the second stage the resulting estimates are used as an explanatory variable at equation of the original interest.

Even though the GMM developed by Arellano and Bond (1991) is a means to avoid problems that arise when dealing with dynamic models, there is also a possibility of using weak instrument or even completely uninformative instruments in our regressions. This estimator is inefficient when instruments are weak because making use of information in differences only (Behr, 2003). As stated by Bond (2001) argued that this leads to the estimator having poor finite sample properties, giving imprecision and bias. According to them, this problem may be worsened if the variance of the individual effects increases relative to the variance of the transient shocks. In order to avoid these problems, we can instead look at the system GMM estimator which is fully developed by Blundell and Bond (1998) that estimates both the levels equation and the difference equation.

Blundell and Bond estimator (system GMM estimator) is a result of moment restrictions both for the differences and level instruments. They add extra moment conditions and this estimator work as follows

Having assumption, $E(\varepsilon_{it}/Y_{it-1}, X_{it}, \beta_i) = 0\,; t = 1, \dots, T \dots\dots\dots\dots\dots 3.6$ our basic dynamic model after differencing becomes;

$$\Delta Y_{it} = \beta_1 \Delta Y_{it-1} + \beta_2 \Delta X_{it} + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.6b$$ and available unconditional moment conditions are;

$$\begin{cases} E(Y_{it-2}, \Delta\varepsilon_{it}) = 0 \\ E(X_{is-1}, \Delta\varepsilon_{it}) = 0 \end{cases} \quad t = 2, \dots, T \dots\dots\dots\dots\dots\dots\dots\dots\dots 3.6c.$$

Since the first assumption rules out any correlation between the fixed effect, β_i,and the group error, ε_{it} additional moment condition set of T-3

$$E[(\beta_i + \varepsilon_{it}), \Delta\varepsilon_{it-1}] = 0 \; t = 3, \dots, T \dots\dots\dots\dots\dots\dots\dots\dots 3.6d$$

is available to the model. Under assumption 3.6, we can get efficiency for 3.6b by using 3.6d in addition with 3.6c. However, according to Bun and Sarafidis (2013), this GMM estimator of the first-differenced model can have poor finite sample properties in terms of bias and precision when the series are persistent. One reason for this is that in this case lagged levels are weak predictors of the first differences. The instruments used in the standard first-differenced GMM estimator become less informative in two important cases. First, as the value of the autoregressive parameter β_1 increases towards unity; and second, as the variance of the firm-specific effects (β_i) increases relative to the variance of the transitory shocks (ε_{it}) (Blundell and Bond, 2000).

In order to solve this problem and get good estimator Blundell and Bond (1998) proposed extra moment conditions that rely on certain stationarity restriction, which is commonly known as mean stationary assumption, on the time series properties of the data. The assumption

$$E(\Delta Y_{it} \,/\, \beta_i) = 0, \qquad E(\Delta X_{it} \,/\, \beta_i) = 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots 3.6e$$

Results additional conditional moments

$$E[(\beta_i + \varepsilon_{it}), \Delta Y_{it-1}] = 0 \; and \; E[(\beta_i + \varepsilon_{it}), \mathrm{Y}\varepsilon_{it-1}] = 0 \; for \; t = 2, \dots, T \dots\dots\dots\dots 3.7f$$

Which implies lagged changes can be used as instruments for current levels, with regards to endogenous variables. Combining these two moment condition with unconditional moment conditions for the first assumption leads to system GMM estimator for our models where X_{it} is endogenous. The system GMM estimator thus combines the standard set of equations in first-differences with suitably lagged levels as instruments, with an additional set of equations in levels with suitably lagged first-differences as instruments. So, our two models have been estimated by using system GMM in which lagged first differences and lagged levels were used as instruments. In du process, the validity of the additional instruments is tested by using Sargan/Hansen tests of over-identifying restrictions.

Relatively Short time periods and highly persistent time series is common characteristics of country level panel data used in empirical growth analysis (Kamara, 2013). Having such characteristics also in this research, System GMM gives efficient estimator with a lower bias and highest efficiency (Bond, Hoeffler and Temple, 2001).

3.2.4 Panel Diagnostics Test

3.2.4.1 Panel unit root test

There are different unit root tests for panel data. Their basic difference emerges on the assumption about dynamics of the autoregressive coefficients for all panel members. Based on this they can be classified in to two. The first assumes homogeneity in the autoregressive coefficients while the second allows heterogeneity (Nell and Zimmermann, 2011). Allowing such heterogeneity in choosing the lag length in ADF tests is reasonable. Especially this assumption is important; when cross-country data is used, heterogeneity arises because of differences of country context. This gives the second group highest power than the other tests (Jelta, 2011).

IPS, which is among the second group and the test used in this research, start with specifying separate augmented Dickey-Fuller (ADF) for each cross-section on the equation:

$$\Delta Y_{it} = \alpha_i + \beta_i Y_{it-1} + \sum_{j=1}^{p_i} \rho_{i,j} \Delta Y_{i,t-j} + \varepsilon_{ij} \quad \text{.....3.7}$$

Where Y_{it} (i=1, 2,…..,N; t=1,2,…….,T) is the series for panel member (country) i over period t,P_i is number of lags in ADF regression. And ε_{ij} satisfy the common assumption zero mean and constant finite heterogeneous variance $\sigma^2 for\ all\ i's and\ t's$.in the above equation both $\beta_i$and ρ are allowed to vary across countries, since it allows for heterogeneous coefficients. Hence, the null hypothesis is that all individuals follow a unit root process:

$$H_0: \beta_i = 0, \forall_i$$

Against the alternative hypothesis

$$H_1: \begin{cases} \beta_i = 0 \quad for\ some\ i's \\ \beta_i < 0\ for\ at\ least\ one\ i \end{cases}$$

The alternative hypothesis, H_1,allows at least some of the individuals to have unit roots. The test is based on the average individual unit root tests.

3.2.4.1 Panel Co-integration Test

The co-integration test is performed to determine the existence of the long run relationship between the variables of interest (Guajarati, 2004). Residual-based and maximum-likelihood-based approaches are the two main approaches for panel co-integration tests (Orsal, 2007) .panel co-integration test recently developed by Pedroni (1999, 2004), which is residual based co-integration test, provide a technique that allows for using panel data and thereby, overcoming the problem of small samples, in addition to allowing for heterogeneity in the intercepts and slopes of the co-integrating equation. Having such characteristics made the pedroni co-integration test preferable for this research.

He proposes several residual-based null of no co-integration panel co-integration test statistics. The test starts with the following panel regression.

$$Y_{it} = \beta_i + \sum_{j=1}^{p_i} \beta_{ij} X_{ijt} + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.8$$

$$\varepsilon_{it} = \rho \varepsilon_{it-1} + \omega_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.9$$

Where, ε_{it} represents the disturbance term from the panel regression; $\beta_i$allows for the possibility of country-specific fixed effects and the coefficients of β_{ij}allows for the variation across individual countries. X_{ijt} is a vector of explanatory variables. In equation (3.9), ρ andω_{it} are the coefficient and error terms of the equation.

He classified the hypothesis of no co-integration based on the Within-dimension-based (panel test) and Between-dimension-based statistics (group test). The nulls for no co-integration are;

$$H_0: \rho_i = 1 \; \forall$$

$$H_1: \rho_i = \rho < 1$$

This is the null hypothesis, no co-integration, of the within-dimension estimation. Here, under alternative hypothesis, the within-dimensional estimation assumes a common value for cross sectional units. That means it does not allow an additional source of possible heterogeneity across individual country members of the panel.

The null hypothesis, no co-integration, of the between-dimension estimation is given as follows:

$$H_0: \rho_i = 1 \; \forall$$

$$H_1: \rho < 1$$

Here, under alternative hypothesis, the between-dimensional estimation does not assume a common value for$\rho_i = \rho$. That means it allows an additional source of possible heterogeneity across individual country members of the panel.

According to Jelta, 2011 two types of testes were suggested by Pedroni to cheek for the existence of co-integration vector. The test based on the within-dimension approach (panel test) is the first one. In these test four statistics namely panel v-statistic, panel rho-statistic, panel pp-statistic and panel ADF-statistics are included. In these statistics different members autoregressive coefficients are pooled for the unit root tests on the estimated residuals. Between- dimensional

approaches (group test) are the other type which includes three statistics such as group -statistic, group PP-statistic and group ADF-statistic.

These statistics are based on estimators that simply average the individually estimated coefficients for each member. These tests are able to accommodate individual specific short-run dynamics, individual specific fixed effects and deterministic trends as well as individual specific slope coefficients (Pedroni, 2004).

CHAPTER FOUR

4. RESULTS & DISCUSSION

Under this chapter, which is the heart of the investigation, we present all the statistical and econometric results of the study accompanied with their interpretations so as to achieve the main and specific objectives discussed in the first chapter. The chapter has two broad sub-sections. The first broad sub-section discusses about the descriptive statistics of the two models which dealt about the impact of aggregate and disaggregate government expenditure on income inequality. This sub-section further contains two specific sub-topics.

The first specific sub-topic deals about the descriptive statistics of the variables in the regression model. Summary statistics, the mean, standard deviation and the number of observations for each variable under study are given. In addition to these, the maximum and minimum values of the observations across time period and cross sections are also provided. In the second specific sub-topic, the correlation and the graphical relation between the dependant and the main interest variables are also discussed.

In the second sub-section of the chapter, the panel diagnostics tests and Dynamic panel data system GMM estimation results of both the aggregated and the disaggregated models have been covered. In line with this, the findings are discussed comparing with empirics.

4.1 Descriptive Analysis

4.1.1 Description of Variables in the Models

The table one below shows summery statistics of variables in the estimated models. In the first table descriptive statistics for variables in the aggregated government expenditure model is presented while the second table presents the descriptive results of variable in the disaggregated government expenditure model is presented. Since we have two different numbers of sample countries and the data span for the second period is less than that of the first by three year, the

descriptive values for the same variable in the two models is different. Each row depicts summery statistics of respected variables. In the second row the income inequality summery is indicated. The variable shows cross sectional variation with a maximum of .765 in Seychelles during the year 2012 and a minimum of .268 Burundi during the years 2000 and 2001 in both cases. According to the table 1 the average value of income inequality in these countries during the study period are .50 and 0.53 respectively.

Table 1: Descriptive statistics of variables in aggregate and disaggregated government expenditure model

Variable	Observation	Mean	Standard dev.	Min value	Max value
Gini	237	.5005823	.1160816	.268	.765
RGdp	237	4.423132	4.062139	-12.67379	22.59305
Gex	237	17.34423	6.794593	2.047122	47.19156
FDI	235	4.544123	6.574002	-5.977515	54.0621
INF	232	126.678	1603.487	-2.404639	24411.03
Pgr	237	2.655348	2.274551	-2.628656	16.78138
Descriptive statistics of variable In the case of disaggregated model					
Gini	169	.5299527	.1175697	.283	.765
RGdp	169	4.998014	4.226812	-7.65231	22.59305
Exg	165	4.844045	3.350723	.0029039	16.2197
Hxg	165	2.463489	1.707823	.0009873	9.779079
Axg	165	1.402661	1.0405	.0021705	5.858886
FDI	169	4.258663	5.940044	-5.977515	54.0621
INF	166	13.40409	29.69146	-9.616154	324.9969
Pgr	169	1.987351	1.078251	-2.628656	3.555304

Source: own computation, 2017

In both cases, Compared to the Sub-Sharan average level of inequality from United Nation Human development index, which is 43%, average level of inequality is higher in these countries. This might be resulted because of many of highly unequal countries, most likely South Africa countries, in the sub-sharan region exist in these two regions.

GDP growth rate, which is a proxy for economic growth, is illustrated next. With maximum value 22.59 percent in Angola 2007 and a minimum value -12.67 percent Madagascar 2002. As per the table the average economic growth, which shows the mean growth of these countries economy, is 4.42 percent in the aggregated case. In the disaggregated model the growth rate of GDP has maximum value 22.59 percent in Angola 2007 and a minimum value -7.65% in Botswana 2009. A mean value 4.99 percent economic growth is also recorded. From this we can observe that in the aggregated case average level of economic growth achieved in these two regions in combined is less than that of the 5% growth in average real gross domestic product the whole Africa had achieved during the period. The case is similar also with that of sub-sharan Africa where the growth rate is 5.05%. While the growth is highest in East Africa more than that of the any regions in the continent, again this could be resulted because of the minimum growth South Africa countries experienced during the study period(Africa Economic outlook, 2016). When we look at the disaggregated the average growth is almost equal with that of the whole Africa and less with very small amount than that of sub-sharan case.

Next in table 1, descriptive statistics of Government consumption expenditure per GDP which is a proxy for the aggregated government expenditure is presented with a maximum value 47.19 percent recorded in Seychelles during 2002 and minimum value recorded 2.04 percent in Zimbwuabwa in 2008. We can also observe the average value of this variable is 17.34 percent. Looking this value compared to the average of Sub-Sharan Africa 14.85 percent, it depicted that average government consumption expenditure of these two regions is high than the sub sharan case.

The forth row shows the descriptive statistics of foreign direct investment. In the study, for both the aggregated and the disaggregated model, period the maximum value of 54.06 percent recorded in Seychelles during 2012 while the minimum value -5.97 percent is in Angola within the same year. This shows Seychelles attract many foreign investment while their exist capital out flow in Angola. Also, the average amount of foreign direct investment directed to these

countries is 4.54 percent in the aggregated case while the average value of this variable for the disaggregated model is 4.25. These average values are higher than average value of foreign direct investment, 2.79 percent and 2.86 percent, attracted by the whole Sub-Sharan countries during the study period.

The other Macroeconomic variable, inflation, descriptive statistics is presented in the sixth row. During the study period of this research 24411.03 percent, which is the maximum, value of inflation is recorded Zimbwuabwa in 2007. This period was the period of hyperinflation in Zimbwuabwa which results many disaster on the county's economy. On the other side, minimum value -2.40 is recorded in Seychelles 2010. The average value 126.678 percent is recorded in the study period. It is by far more than that of the Sub-Sharan average which is 5.88 percent. This high value of average inflation may resulted from the existence of out layers in the data of Zimbwuabwa while many of the counties had an inflation level less than 25 percent according to the data. But the average inflation rate of these two regions, 10.77 percent, is still higher than that of the Sub Sharan even we control the Zimbwuabwa case. That means the average inflation level is high which accounts double digit. Looking at the descriptive statistics of inflation in the disaggregated case during the study period 324.99 maximum, value of inflation, is recorded in Angola 2000. On the other side, minimum value -9.61 is recorded in 2001 Lesotho. The average value 13.40 is recorded in the study period. Like that of the first case this value is more than two fold of the inflation level sub sharan Africa recorded which is 6. 25 percent.

The last row in table 1 of the aggregated model illustrated the descriptive statistics for the demographic variable population growth rate. The highest value of population growth rate, 16.78138 percent, is recorded in Mozambique during 2002 while Seychelles had a minimum population growth rate in the study period with the value -2.628656 percent in 2011. Population growth rate has a mean value of 2.65 percent during the study period. It is a bit smaller than the average population growth rate 2.73 percent sub sharan countries registered during this period. The last row of table 1 in the disaggregated case also illustrated the descriptive statistics for the demographic variable population growth rate. The highest value of population growth rate, 3.55percent, is recorded in Angola during 2004 while Seychelles had a minimum population growth rate in the study period with the value -2.628656 in 2011. Population growth rate has a

mean value of 1.98 percent during the study period. It is also less than 2.73 which is the average of sub sharan Africa.

Descriptive statistics of Government education expenditure per GDP, which is a one of the govt expenditure in this research, is presented on the third row with a maximum value 16.21 percent in Lesotho during 2005 and minimum value recorded is .0029 Zambia in 2005. It has a mean value of 4.84 percent. When we compare this level with that of the sub sharan average 4.14 percent, the average government spending on education from the total GDP is higher in these countries.

The fourth row of table 1 in the disaggregated model shows descriptive statistics of Government Health expenditure per GDP, which is a one of the govt expenditure in this research, with a maximum value 9.77 percent in Swaziland during 2005 and minimum value .00098 percent recorded is Zambia in 2007. The average values 2.46 percent shows that these countries spend more on Health out of their total gross domestic product than that of the level of sub sharan as a whole where 2.16 percent of total GDP is addressed to health spending. Looking to the descriptive statistics of Government Agriculture expenditure per GDP, which is the other government sectoral expenditure in this research, Malawi is a country which registered a maximum value5.85 percent during 2008 and while the minimum value of .0021 percent is recorded in Zambia during 2007. The average value of government expenditure on this sector accounts 1.40 percent. Like that of the other government sectoral expenditure we discussed above, in this case also the average value is found to be more than that of sub sharan average 1.24 percent. Overall, the descriptive statistics of the variables in the models shows on average countries under consideration in this research have been registered higher value, except for the population growth rate, than that of the Sub-Saharan Africa average.

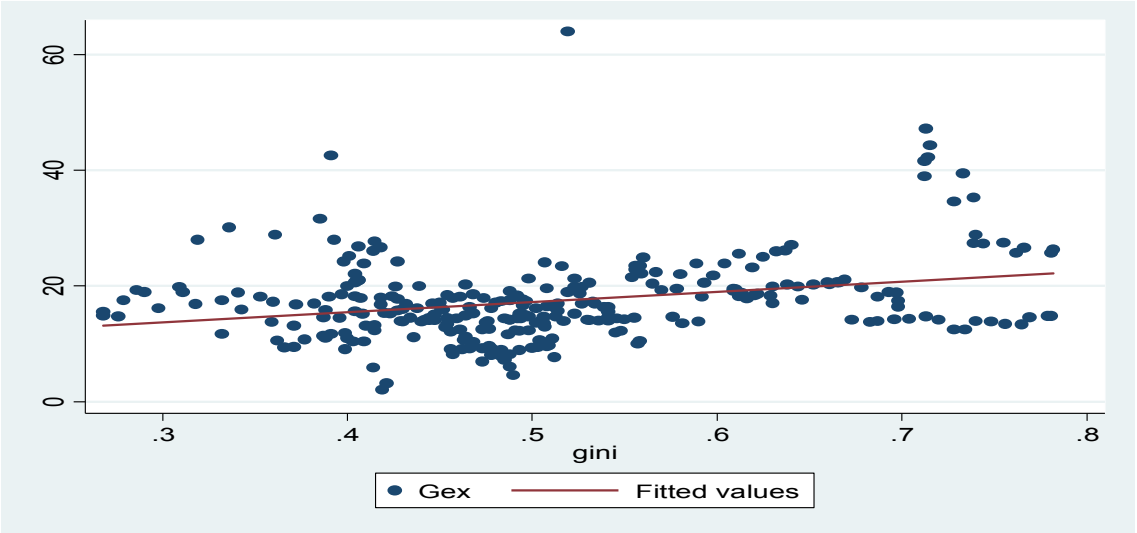
4.1.2 Correlation between Income Inequality and Government Expenditures

Before we explore the econometric regression results of our model equation, we have to analyze the correlation and graphical association of earlier summarized economic variables. In doing so, special attention is given for the correlation and graphical association of government expenditure and income inequality.

From the correlation matrix we can infer that 0.9986 is the highest level of positive correlation which is found between the current and previous year income inequality. Regarding the sign of individual correlation our interest variable government expenditure is related positively with that of income inequality. Also, previous year level of income inequality, foreign direct investment and dummy of region have positive correlation with income inequality while, economic growth, inflation and population growth are negatively correlated with income inequality. The correlation matrix for both models presented in the appendix part.

Correlation graph between income inequality and government expenditure support the positive sign of the correlation matrix. From this the Figure 3 can observe that

Figure 3: Simple Scatter Plot of government expenditure as a percentage of GDP against income inequality



. Source: own computation, 2017

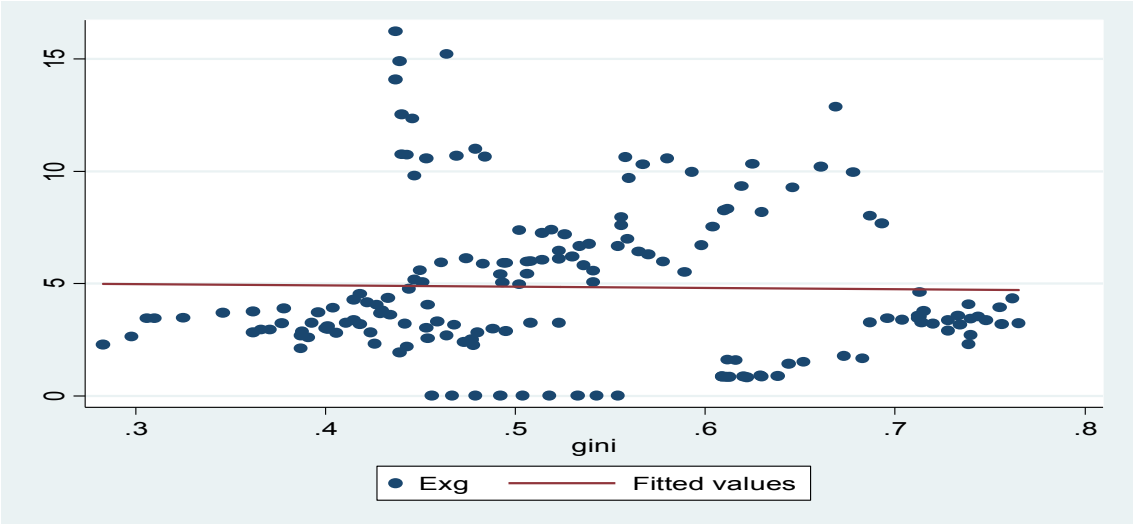
In East and South Africa countries income inequality is high where government expenditure as a percentage of GDP is high. And, the correlation seems a bit strong as the scatter plots are close to the trend line.

Looking for the correlation between income inequality and sectoral government; the government sectoral expenditures included in the second model have different correlation with that of income inequality. Specifically, Government expenditure on education as a percent of GDP and

Government expenditure on agriculture as a percent of GDP are negatively correlated with income inequality with the value -0.0352 and -0.3620 respectively. Besides, government expenditure on Health as a percent of GDP is found to have positive correlation with income inequality with the value of 0.1149. This relation may depict from the simple correlation graph of the variables under consideration respectively.

The graph below supports there exist very slight negative relationship, proximate to zero, between government expenditure on education as a percent of GDP and income inequality. This implies that in countries where government expenditure on education as a percentage of GDP is increasing, income inequality has been decreased in a very small amount. From the correlation graph we can also infer where income inequality is in small level it is not be affected by the level of government expenditure on education sector.

Figures 4: Simple Scatter Plot of government expenditure on education as a percentage of GDP against income inequality



Source: own computation

On the other hand the correlation graph between government expenditure on agriculture as a percent of GDP and income inequality show us there exist a negative relation between these two variables. Essentially, the higher the government expenditure on the agriculture as a percent of GDP the lower will be the income inequality. It is almost a tautology to expect such associations, agriculture is being among the dominate sector , as much of these countries gross

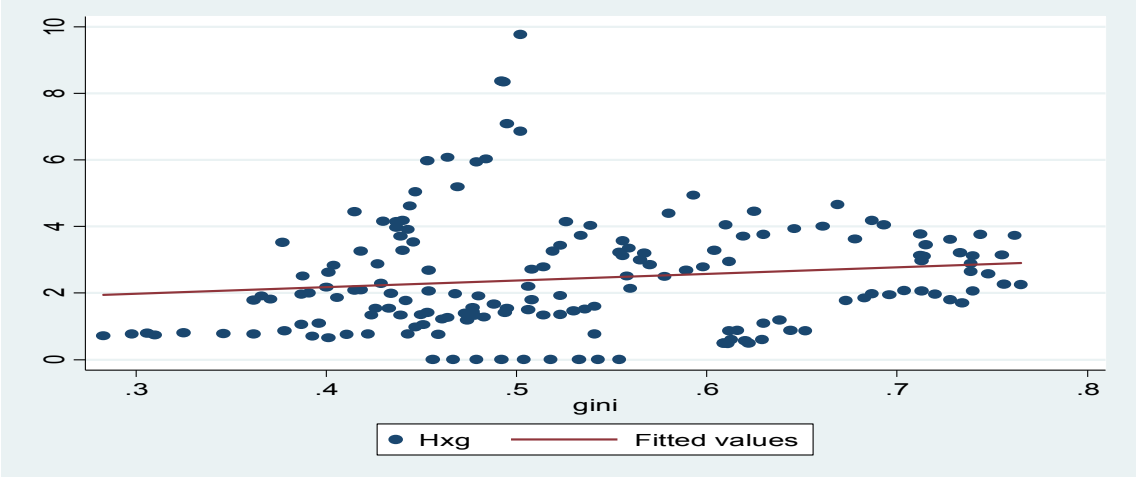
domestic product, national income and employment opportunity are from this sector, expenditure which improves production and productivity will improve income inequality.

Figures 5: Simple Scatter Plot of government expenditure on agriculture as a percentage of GDP against income inequality

Source: own computation

Coming to the correlation of government expenditure on health as a percentage of GDP and income inequality the simple scattered graph shows existence of positive relation. That means income inequality is high in countries where government expenditure on health sector as a percent of GDP is high.

Figures 6: Simple Scatter Plot of government expenditure on health as a percentage of GDP against income inequality



Source own computation

However, the relations we get from the correlation could be misleading for various statistical reasons. One and the important is that , the simple correlation above may reflect the effect of other factors which can influence both income inequality and government expenditure as whole and in the disaggregated form simultaneously than the influence government expenditures alone on income inequality levels in East and South Africa countries. Thus, an econometric analysis which controls other factors is needed in order to make sure that the pattern shown by the correlation above is not spurious. To do so, the dynamic panel data system GMM is used and the result from this econometrics analysis is discussed next

4.1.2 Panel Diagnostics test result

4.1.2.1 Unit root (stationary) test result

In this research, unit root test developed by Im Pesaran and Shin (2003) is used to test the existence of unit root or not in the variables. As we discussed in chapter three, this method of unit root test allows heterogeneity across the panel members. Therefore, the null hypothesis of this test is that all countries have a unit root for the variable against the alternative hypothesis that at least some panel members are without unit root. The test is applied for two models in two different scenarios where, first we consider only the individual effect and then we looked at the case of both individual and time effect. Based on this method, the result of the test is given in the following tables.

Table 2: Panel unit root test for the level variable in the aggregated government expenditure model

Variable in level	With only individual effect	With individual and time effect
GINI	-2.1548***	-1.5656
GDPR	-3.2006***	-3.3125***
Gex	-1.9141**	-2.2672
FDI	-1.8371*	-2.6869***
INF	-1.8831*	-1.7007
PGR	-3.2331***	-4.2729***

Note: *The values of 1%, 5% and 10% significance levels for with only individual effects are 2.020 -1.870 -1.790 respectively.*

The values of 1%, 5% and 10% significance levels for individual effects and time trend are-2.670 -2.520 -2.440 respectively.

*The signs ***, ** and * denote significances at 1%, 5% and 10% levels, respectively.*

As can be seen from table (2), variables like economic growth, foreign direct investment and population growth are stationary at level both under with only individual effect and with individual effect and time trend. While income inequality, government expenditure and inflation are stationary at level in the case of only individual effect but they shows the presence of unit root in the case of individual effect and time trend having no strong evidence for rejection of the null. Looking for stationarity of variables in the second model the table below report the result

Table 3: Panel unit root test for the level variable in the disaggregated government expenditure

Variable in level	With only individual effect	With individual and time effect
GINI	-1.2509	-1.4016
GDPR	-2.8449***	-2.8898***
EXG	-1.6511	-2.0356
HXG	-2.2739***	-2.8838***
AXG	-1.6355	-1.6530
FDI	-2.9007***	-3.8291***

INF	-4.5831***	-4.3621***
PGR	-2.5240***	-3.8877***

Note: *The values of 1%, 5% and 10% significance levels for with only individual effects are -2.100 -1.920 -1.830 respectively.*

The values of 1%, 5% and 10% significance levels for individual effects and time trend are -2.740 -2.570 -2.470 respectively.

*The signs ***, ** and * denote significances at 1%, 5% and 10% levels, respectively*

from the table 3 we can observe economic growth, government expenditure on health as a percent GDP, Foreign direct investment a percent of GDP, inflation and population growth rate rejects the null of existing unit root even at 1% level of significance both only individual effect and With individual and time effect. While, income inequality, government expenditure on education as a percent GDP and government expenditure on Agriculture as a percent GDP are fall to reject the null in both cases.

In a unit root test, if a variable is non stationary at level, the next step is to difference the variable and undertake a unit root test in first difference. Having non stationary variables in our model, which are income inequality, government expenditure and inflation in the aggregated government expenditure model and income inequality, government expenditure on education as a percent GDP and government expenditure on Agriculture as a percent GDP in the disaggregated case, we go to this step of testing unit root test by differencing the variables. Therefore, the unit root for the first difference of variables is reported in the following table.

Table 4: panel unit root test for differenced variables for the aggregated model

Variable in level diff	With only individual effect	With individual and time effect
DGINI	-2.3917 ***	-3.1812***
DGDPR	-5.0868***	-4.9025***
DGEX	-3.4704***	-3.6203***
DFDI	-4.0081***	-3.9886***
DINF	-3.1621***	-3.0855***
DPGR	-6.6134***	-6.7596***

Note: *The values of 1%, 5% and 10% significance levels for with only individual effects are -2.020 -1.870 -1.790respectively.*

The values of 1%, 5% and 10% significance levels for individual effects and time trend are -2.670 - 2.520 -2.440 respectively.

*The signs ***, ** and * denote significances at 1%, 5% and 10% levels, respectively.*

In the case of the first difference, variable which were not stationary in level in the case of the individual and time effect became stationary. All of the variables of concern are stationary even at 1% level of significance under both cases: only individual effect case and individual effect and time trend case. Thus, the null hypothesis of existence of unit root is rejected for income inequality, economic growth, government expenditure, foreign direct investment, and inflation and population growth for the first differences of the variables.

Table 5: Panel unit root test for the difference variable in disaggregated govt expenditure

Variable in level	With only individual effect	With individual and time effect
DGINI	-2.8328***	-2.8522***
DGDPR	-4.4642***	-4.3379***
DEXG	-3.5789***	-4.1272***
DHXG	-3.8649***	-3.8002***
DAXG	-3.3876***	-3.5791***
DFDI	-5.4813***	-5.2977***
DINF	-5.2183***	-5.0409***
DPGR	-5.9625***	-6.2938***

Note: *The values of 1%, 5% and 10% significance levels for with only individual effects are -2.100 -1.920 -1.830 respectively.*

The values of 1%, 5% and 10% significance levels for individual effects and time trend are -2.740 -2.570 -2.470 respectively.

*The signs ***, ** and * denote significances at 1%, 5% and 10% levels, respectively.*

In this step all variables including those which were not stationary in level became stationary in both only individual effect and with individual and time effect. Thus, the null hypothesis of existence of unit root is rejected for income inequality, economic growth, government

expenditure on education, government expenditure on health, government expenditure on Agriculture foreign direct investment, and inflation and population growth for the first differences of the variables. Generally, the unit root test shows that variables which are stationary at level are integrated of order zero, I(0) at level, whereas the variables which become stationary after first differencing are integrated of order one, I(1) at level but become I(0) after first differencing.

4.1.2.2 Panel Co-integration Test Results

The next step after testing unit root is that testing either there is long- run relationship between the explanatory variables and income inequality or not. This can be tested using panel co-integration tests. As discussed in the previous chapter, in this section using Pedroni panel co-integration test, we checked the co-integration between these variables. This test allows heterogeneity across panel variable. It has seven test statistics among these four are based on the within dimension (i.e. panel co-integration tests) and three are based on the between dimension (i.e. group mean panel co-integration tests). Group mean panel co-integration test statistics are more general since the autoregressive coefficients are allowed to vary across individual members of the panel.

According to Pedroni (2004) finding all the above proposed statistics do fairly well for T >90. Similarly, for small time span (T<20) Pedroni (1997) simulations showed, the between group parametric-t statistic is the most powerful. In particular, the group-adf statistics plays a pivotal role among the between group parametric t-statistic in the case of small samples (Drine I.and Rault C., 2003). Accordingly, in this research having relatively short time span, which is T=16 for the first model and T=13 for the second model, in deciding the co-integration of income inequality and government expenditure vital attention will be given for Group co-integration test. The results of Pedroni panel co-integration tests for the two models are presented in the following tables as follow.

For the first model, from the table below among the seven statistics three of them support the existence of long run relation between government expenditure and income inequality. Namely, the panel v-statistic, Panel ADF-Statistic and Group ADF-Statistic shows the existence of long run relationship between income inequality and government expenditure by reject the null of no

co-integration. While, Panel rho-Statistic, Panel PP-Statistic, Group rho-Statistic and Group PP-Statistic are shown this two variables does not have long run relationship.

Coming to Group ADF- statistic, which the most important in our case, supports the existence of long run relation between government expenditure and income inequality variables. Since its value is less than that of the critical value proposed. So, even if out of seven statistics four of them did not support the existence of long run relationship we can say the variables have long run relationship depending on Group ADF.

Table 6: Pedroni Panel Co-integration Test Results for income inequality and government expenditures.

Test Stats.	Aggregate	Disaggregated
	Statistic	Statistic
Panel v-Statistic	21.25	5.439
Panel rho-Statistic	1.197	2.184
Panel PP-Statistic	-1.302	-3.491
Panel ADF-Statistic	-2.296	-3.077
Group rho-Statistic	2.473	3.474
Group PP-Statistic	-.3831	-4.072
Group ADF-Statistic	-1.832	-2.669

Note: *The Pedroni (2004) statistics are one-sided tests with a critical value of -1.64 (k < -1.64 implies rejection of the null), except the v statistic that has a critical value of 1.64 (k > 1.64 suggests rejection of the null).*

Looking in to the disaggregated case among the seven statistics five of them support the existence of long run relation between government expenditure on education as a percent of GDP, government expenditure on Health as a percent of GDP and government expenditure on Agriculture as a percent of GDP with income inequality. Only panel rho and Group rho statistics are fall to reject the null of no co-integration. Specifically looking Group ADF, having short time data span, similarly with that of the aggregated government expenditure case, statistic also

supports the existence of long run relationship between government expenditure and income inequality variables. So, we can conclude that income inequality and sectoral government expenditures has long run relationship in the study area within the research period.

4.1.3 Econometric Results and Discussions

This section presents the results of empirical income inequality and government expenditure econometric models. Table below shows the estimation results of a system GMM econometric technique for the aggregated and disaggregated government expenditure models. In the reported models gini coefficient is used as a dependent variable

Table 7: Dynamic panel Data system GMM result for impact of government expenditures on income inequality.

Estimated coefficients	Model one	Model two
L-gini	.9976281*** (0.000)	1.013231***(0.000)
GDP	.0003986***(0.000)	.0006364***(0.000)
GEX	.0003386* (0.064)	-
FDI	.0003231 (0.353)	-.0000369(0.522)
INF	1.08e-06* (0.051)	.000075**(0.001)
PGR	.000098 (0.554)	.0009305*(0.095)
DREG	-.0017815* (0.075)	-.001304(0.164)
EXG	-	.000227(0.420)
HXG	-	-.0004085(0.250)
AXG	-	.001438***(0.001)
Hansen test of overid Prob > chi2 = 1.000		Hansen test of overid Prob > chi2 = 1.000
Number of observations Number of obs = 270		150= Number of observation
Number of group=18		13= Number of group
Number of instruments = 123		88=Number instrument
AR(1) Pr > z = 0.009		0.000 = AR(1)
AR(2) Pr > z = 0.582		0.429 =AR(2)

Note *the signs ***, ** and * denote significances at 1%, 5% and 10% levels, respectively.*

Coming to the specification of the model and the issue of autocorrelation, the results of Hansen test and autocorrelation test of order one and order two are given at the bottom part of the above

table in this section. For both models, the Hansen over identification test shows the instruments used in the model are not over identified since it p-value are 1.000 which are greater than 0.05. In the regression, the null of no autocorrelation is also tested using the AR (1) and AR (2). The first order autocorrelation test for the models reject the null. But, according to Roodman (2007) giving conclusion depending on this test is not advisable since depicts the presence of autocorrelation and hence, there is a need to undertake a second order autocorrelation test which is dependable. This initiates the undertaking of second order Autocorrelation. There for, the results of second order autocorrelation show the models have no serial correlation problem since they have high p-value.

Looking at the significance of the regressors, in the two models the first lag of the dependent variable is statistically significant at 1 level of significance with the expected positive sign. This implies that the past level of income inequality has great impact on the current income inequality. That means the previous inequality level in these countries has an impact of increasing the current income inequality. Thus, in East and South Africa countries income inequality is characterized by a situation in which previous level hinder a rapid and dramatic change. This finding is in line with that of Calderon and Chong (2001), Dincer and Gunalp (2012), Mahmood and Noor (2014), Anyanwu et al (2016) and Anyanwu (2016).

Economic growth variable is also found to have positive and significant effect on income inequality in both models even if its value of coefficients is different. Accordingly, for the first model keeping other variable constant a 1% increase in countries economic growth in these countries on average results .0003986 percent increase in countries income inequality on average. While its increase in 1% in the second model on average results .0006364 percent increase holding other factors constant. In this research , Having countries which have been in economic growth in recent decades this may support the initial stage of Kuznets curve where income inequality is expected to increase in the initial stage of economic development. This result is also observed in O. Odedokun and I.Round (2001), Ospina (2010) and Anyanwu (2016).

Specifically looking the first model, Government expenditure as percent of GDP, the main interest variable of this research, the result shows it has positive and marginally significant effect on countries level of income inequality measured in Gini. Exactly speaking, on average 1%

increase in government expenditure per GDP results .0003386 percent increase in level of income inequality in these countries keeping other determinates of income inequality constant. This result has supporting background of theories which explore the relation of income inequality and government expenditure by giving focus on political factors. It might be resulted because of high level of corruptions and rent-seeking behavior existed in these countries. This idea is also exposed by Brown (2015) where in countries like Kenya government expenditure is found to have an aggravating role on income inequality. This finding of the research is confirmed to the results of Østergaard (2013), Anderson et al., (2015) and Dabla-Norris et al (2015).

The macroeconomic variable inflation is the other variable in the models which is found positive but significant impact on income inequality. On average its increase in 1percent results 0.0000001percent increase in level of income inequality in countries keeping other factors constant. In the second model, on average its increase in 1prcent results .000075 percent increases in level of income inequality in countries keeping other factors constant. This finding is in line with that of Østergaard (2013).

The other macroeconomic variable Foreign Direct Investment, found to be insignificant in both cases. While population growth is insignificant in the first model but it is found to be positive and significant at 10% significance level in the second case. The positive impact has supporting empirical evidence like Ospina (2010) and Anyanwu (2016).

For the first model, the region dummy shows significant difference between in countries of East and South Africa. From the result we can conclude on average holding other factors unchanged income inequality in South Africa countries is less than from that of East Africa countries by .0017815 %. This is result of the research which contradicts with the data which shows countries in South Africa faced high value of income inequality. This may be resulted because of the current high economic growth recorded in East African countries which is found to have an increasing impact on income inequality in this research. But in the second model, it is insignificant. This means is difference in income inequality level between East and South Africa.

In the second model, Government expenditure on education as percent of GDP and Government expenditure on health as percent of GDP are found to have insignificant effect on countries level of income inequality measured in Gini. Expenditure on education is with positive value while the health expenditure is with the expected negative value. Differently with the above expenditure components, government expenditure on agricultural sector is found to be significant with positive sign. Exactly speaking, keeping other determinants constant a one percent increases in the level of government expenditure on agriculture sector per GDP can results an increase in income inequality with .001438 percent. This finding can also be supported by theories which explore the relation of income inequality and government expenditure by giving focus on political factors. It might be resulted because of high level of corruptions and rent-seeking behavior existed in these countries.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

In Africa, despite the growth in economy, income inequality also has been shown growth trend in recent decades. Some people out of a nation's population are enjoying the benefit of this economic growth while the majority is still suffering in bad living condition. This initiates a need to have a good distributional mechanism. In this instance, government can play a great role through its policies since desirable distribution of income in terms of equity cannot be achieved necessarily by Market forces alone. Fiscal policy is among one of the policies which has been applied by government to insure fair distribution of national income within citizens. In Africa having poor tax system, much is expected from government expenditure in this regard. But its effect on the level of income inequality is controversial.

In this research we tried to answer how government expenditure affects income inequality empirically for selected East and South African countries. In doing so, we used both the aggregated and disaggregated government expenditures. Countries were selected based on the availability of data and two models were employed, where the first model was used to show how aggregated public expenditure affect income inequality in the period from 2000 to 2015 and the second was for sectoral public expenditure in the period from 2000 to 2012. For the analysis both descriptive and econometric techniques were used. Among other things, the correlation and graphical relationship of income inequality and government expenditures were highlighted in the descriptive part. Econometrically, dynamic panel data system GMM technique has been used.

Regarding the econometric output, in the first model government consumption expenditure as a percentage of GDP which is used as a proxy for the aggregated government expenditure is found to have significant positive effect on the level of income inequality. That means an increase in the level of consumption expenditure as a percentage of GDP in these countries result an increase on level of inequality. Income inequality in these countries is also found to be affected significantly and positively by its previous year level even 1% significance level. From this we can conclude that countries struggle to escape from high level of income inequality is hindered by the level of income inequality they recorded in the past.

The result which supports the initial stage of Kuznets hypothesis is found between economic growth and income inequality. Accordingly, economic growth is found to have positive and significant impact on the level of income inequality. Recently, having countries which have been in high economic growth in these regions, this may be robust result. The macroeconomic variable inflation is other which is found to have positive and significant effect on income inequality in these countries. However, Foreign Direct investment as a percentage of GDP and Population growth are insignificant.

Lastly, from the first model, the most result of this study observed in the Region dummy which shows the existence of marginally significant difference in level of income inequality between these two sub regions in Africa. It shows income inequality in South Africa countries is less with that of the Eastern once. This may be resulted because of the recent high economic growth east African countries have recorded in recent decades which is found to have a positive and significant effect on income inequality.

Coming to findings of model two, where sectoral government expenditure as a percentage of GDP is used to empirically answer how government expenditure affects income inequality we can observe that this expenditures have different impact. Two of the government expenditure, namely Government expenditure on education as a percent of GDP and Government expenditure on Health as a percent of GDP, are found to be insignificant. Expenditure on education is with positive value while the health expenditure is with the expected negative value. Differently with the above finding, like that of the aggregated Government expenditure, Government expenditure on Agriculture as a percent of GDP is significant with positive value.

Again like that of the first model, pervious year level of income inequality and economic growth are positive and significant at small level of significance. That means this model, in line with that of the first, support countries previous level of income inequality is the main challenge for their struggle to decrease income inequality. It also supports the initial stage Kuznets hypothesis where economic growth results income inequality. The other variable inflation and population growth also have positive and significant impact on the level of, while the dummy for region and foreign direct investment to GDP is insignificant.

5.2 Recommendation

The empirical findings from the two models have implications for the concerned bodies. As per these findings we recommend the following:-

- It is the day light fact that countries of these regions are in economic growth track. Government through its policies has played the big role in this economic growth, but much is expected to do in trickling down of the benefit of the growth to the mass of the population. In this regard, a better way of using consumption expenditure in a way which promotes equity in income distribution will have to be considered.
- As infrastructural development, much emphasis has been given by governments for construction of health and education institutions and for their capacity building. And Spending in Health and Education as a percentage of GDP is increasing but their role in the level of income inequality is insignificant. There for, emphasis will have to be given to use expenditures in these sectors to address the issue of income inequality.
- Agriculture is being among the most dominate sector in contributing for the national income in these countries; governments have been given great attention to improve this sector. Expenditure addressed to this sector as a percent of GDP is also increasing, while it results increase in income inequality. So, policy makers in these countries have to consider a way this should be changed to contribute to improve distribution of income.
- Much focus will have to be given to achieve sustainable development objective, since there is a stage where economic growth will contribute in reducing income inequality. Regarding to objective of income inequality, fighting today income inequality means transferring a country where equal distribution of income is exist to the next generation.
- Maintaining macroeconomic stability through lower inflation rate could also be a powerful tool to reduce the level of income inequality. Also, these countries will have to create favorable conditions for foreign investors to create employment opportunity for their nation and play significant role in equitable distribution of national income.

5.3 Future Research Direction

The issue of income inequality and government expenditure is continued to be debatable. Since income inequality has dynamic nature and government expenditures may have many ways to affect income inequality; researches carried on the issue using country level and cross country data will have to be continued by using different methodology. For example, a new research can be carried out in relation to this issue using more diversified government expenditure components to look how it affect income inequality. Also, country level research will be conducted using different methodology, like CGE, to look the exact relationship between government expenditure and income inequality.

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APPINDIX

Appendix 1: List of countries in the model 1

Country	Region
Kenya	East Africa
Uganda	East Africa
Tanzania	East Africa
Rwanda	East Africa
Sudan	East Africa
Burundi	East Africa
South Africa	South Africa
Angola	South Africa
Botswana	South Africa
Congo	South Africa
Maursious	South Africa
Namibia	South Africa
Malawi	South Africa
Madagascar	South Africa
Mozambique	South Africa
Seychelles	South Africa
Swaziland	South Africa
Zimbwuabwa	South Africa

Appendix 2: List of countries in the model 2

Country	Region
Ethiopia	East Africa
Kenya	East Africa
Uganda	East Africa
South Africa	South Africa
Zambia	South Africa
Namibia	South Africa
Swaziland	South Africa
Seychelles	South Africa
Malawi	South Africa
Mauritius	South Africa
Lesotho	South Africa
Botswana	South Africa
Angola	South Africa

Appendix 3: Correlation matrix of the first model

	gini	L.gini	gdpr	Gex	Fdi	Inf	pgr	dreg
gini								
--.	1.0000							
L1.	0.9986	1.0000						
gdpr	-0.0892	-0.1063	1.0000					
Gex	0.3393	0.3350	-0.1619	1.0000				
Fdi	0.2242	0.2237	0.0237	0.2360	1.0000			
Inf	-0.0821	-0.0797	-0.0292	-0.2233	-0.0569	1.0000		
pgr	-0.5199	-0.5254	0.2301	-0.0829	0.0706	-0.0628	1.0000	
dreg	0.4404	0.4492	-0.0321	0.1632	0.2390	0.0820	-0.0739	1.0000

Appendix 3: Correlation matrix of the second model

```
. corr gini l.gini gdp exg hxg axg fdi inf pgr dreg
(obs=150)
```

	gini	L.gini	gdp	exg	hxg	axg	fdi	inf	pgr	dreg
gini										
--.	1.0000									
L1.	0.9987	1.0000								
gdp	-0.2590	-0.2838	1.0000							
exg	-0.0352	-0.0312	-0.1417	1.0000						
hxg	0.1149	0.1228	-0.1621	0.6341	1.0000					
axg	-0.3620	-0.3727	0.1649	0.2559	0.2012	1.0000				
fdi	0.2538	0.2524	-0.0595	-0.0762	0.0588	-0.1262	1.0000			
inf	-0.2371	-0.2380	-0.0735	-0.1333	-0.1120	-0.0783	0.3598	1.0000		
pgr	-0.6160	-0.6274	0.3439	-0.3176	-0.4248	0.0860	-0.0816	0.2924	1.0000	
dreg	0.4464	0.4519	-0.2109	0.1065	0.3540	0.0255	0.1638	0.0282	-0.4689	1.0000

Appendix 5: Pedroni co-integration test result

```
. xtpedroni gini Gex , notdum nopdols trend lagselect(aic) adflags(2)

Please Wait: Calculating Statistics

Pedroni's cointegration tests:
No. of Panel units: 18       Regressors: 1
No. of obs.: 288             Avg obs. per unit: 16
Data has not been time-demeaned.
A time trend has been included.
```

Test Stats.	Panel	Group
v	21.25	.
rho	1.197	2.473
t	-1.302	-.3831
adf	-2.296	-1.832

```
All test statistics are distributed N(0,1), under a null of no cointegration,
and diverge to negative infinity (save for panel v).
```

```
. xtpedroni gini  Exg Hxg Axg, nopdols trend lagselect(hqic) adflags(2)

Please Wait: Calculating Statistics

Pedroni's cointegration tests:
No. of Panel units: 13       Regressors: 3
No. of obs.: 169             Avg obs. per unit: 13
Data has been time-demeaned.
A time trend has been included.
```

Test Stats.	Panel	Group
v	5.439	.
rho	2.184	3.474
t	-3.491	-4.072
adf	-3.077	-2.669