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TITLE: THE LONG RUN RELATIONSHIP BETWEEN GOVERNMENTS EXPENDITURE AND ECONOMIC GROUTH IN ETHIOPIA

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THE LONGRUN RELATIONSHIP BETWEEN GOVERNMENT EXPENDITURE AND ECONOMIC GROWTH IN ETHIOPIA

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LIST OF ACRONYMS

ADF……..…..…Augmented Dicky Fuller

AFDB……African Development Bank

CPI……Consumer Price Index

ECM ……..……Error Correction Mechanism

EEX…… Economic Expenditure

EU ……..……European Union

EPRDF…… Ethiopian People Revolutionary Democratic Front

GDP……..…..…Gross Domestic Product

GSEX……Expenditure on General Service

GTP ……..…..…Growth and Transformation Plan

IMF ……..…..…International Monetary Fund

MDA……Ministries Development Agencies

MDGs ……..… Millennium Development Goals

MEX……. Mislanious Expenditure

MIDA ……..…Malaysia Investment Development Authority

MOFED ……..…Ministry of Finance and Economic Development

NEM ……..…..…New Economic Model

OECD ……...…Organization for Economic Co-operation Development

OLS ……..…..… Ordinary Least Squares

PASDEP ……. A Plan for Accelerated and Sustained Development to End Poverty

SDPRP …….Sustainable Development and Poverty Reduction Program

SSEX……. Social Services Expenditure

VAR ……..…..…Vector Autoregressive

VEC…….Vector Error Correction

ABSTRACT

This study examined the long run relationship between government expenditure and economic growth in Ethiopia using VAR co-integration and error correction model for the period 1974/75 -2014/15. A time series data was obtained from the Central Bank of Ethiopia and Minster of Finance and Economic Development for the analysis. The outcome of the unit root test in the ADF and PP test indicated that all variables included in the model were non- stationary at their level and first difference but integrated of order two, I(2). From the long-run analysis,(co-integration) the results revealed a positive and significant linear relationship between these government sectoral expenditure and economic growths in Ethiopia (measured by real GDP).Granger causality is one a use full technique for determining whether one time series has a long run relationship with another .The result of Pair wise Granger Causality test in a Vector Correction Model indicated unidirectional (one-way) causality, running from government expenditure on general services to economic growth ,(real GDP) while there is no causality runs from other sectoral government expenditure to economic growth (real GDP) and vice versa.

On the other hand causality also can check jointly by using Granger Causality (Block exogeneity Wald test) the outcome indicates that government Expenditure on general services (GSEX) and government Expenditure on Social Services(SSEX) jointly has unidirectional(one-way) causality to economic growth,(real GDP).And also from the result we can understand all other things remain constant one unit change in GSEX brought 4.05 unit change in real GDP; one unit increase in SSEX resulted in87816.37 unit change in real GDP per capita and a one unit change in EEX and MEX real GDP per capita change changes 0.207663 and -1.474983 times per unit respectively in the short run Therefore, the study recommended the need to stimulate economic growth by allocating appropriate proportion sectoral government expenditure in the national budget.

Keywords: Ethiopia, Stability, Normality, public Expenditure, Sectorial Expenditure, Economic growth, Stationarity, Augmented Dickey Fuller, Unit root, Phillips-Perron, Cointegration, Granger Causality.

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Government expenditure is simply refers the value of all goods and services provide by the government. That is, 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. This kind of expenditure is directed towards accelerating economic growth and economic development with ultimate aim of transferring the nation in to an industrialized economy as well as raising standard of living of the people. In general government expenditure classified as capital and recurrent expenditure. The capital expenditures are expenditure spending by government on capital project like: road, dams, electricity, education, health, and soon. While recurrent expenditure includes expenditures of government on administration such as wage, salaries, interest, maintenance, loan and so on (Obinna, 2003; Okoro, 2013).

The relationship between government expenditure and economic growth has, since many decades, received much attention by economists. Economists have two opposing views about the nature of this relationship. On the one hand the growth of government expenditures causes' growth of national income or real GDP and a long-run balanced relationship between them exist. On the other hand, higher spending undermines economic growth by transferring additional resources from the productive sector of the economy to the government, which uses them less efficient (Wagner, 1883).

According to Musgrave (1989), explained public spending as tool used to reach three separate objectives which contain allocation, distributive and stabilization purpose. Hence the public expenditure is a large position of expenditure policy measures considered to get definite set up macro-economic goals counting sustaining balance between the aggregate demand and aggregate supply (IMF, 1993). According to Keynesian economist also empirical finding and agreement an increase government expenditure on socio economic and physical structure improve economic growth. And also Mulhearn and Vane (1999) are argue that government expenditure is an enjen or power to reinforce or upgrading the retardation of infrastructure. However according to classical economists opinion increased government expenditure can worse of an economic retardation by transferring factors of production from the private sector. Hence this attachment

again higher source allocation by government may have a negative impact on the private sector and logically consistence.

As a result of this debate, there exists a wide empirical literature with the objective of testing the validity of each hypothesis. Several empirical studies investigated the relationship between government expenditure and economic growth for both developed and developing countries by using different econometric methods, but the results are not the same. Some of these studies state that government expenditure leads to decrease economic growth, and some of other studies indicate that government expenditure can improve economic growths. And also some studies show that the relationship between government expenditure and economic growth has both negative and positive relation in some countries.

According to the survey of IMF country desk officers on government either capital or recurrent expenditure ,fiscal out come and social expenditure of 41 sub Saharan African countries from 2000 to 2010 found that the plan and implemented of fiscal policy have indeed been countercyclical and social expenditure have protected. However before the crises of all sub Saharan Africa county increasing of health and education expenditure established. Capital expenditure generally was significant, disparities among the countries.

One of the major objectives of governments on every developing country is to bring economic growth within a short period of time. Over the past decades, government expenditure has been increasing continusly through government different actions and interactions with its Ministries, Departments and Agencies (MDA's), (Niloy.et.al.2003). Although, the general observation is that public expenditure either recurrent or capital expenditure, especially on social and economic infrastructure can be growth. The value of all types' of goods and services produced by the public sector or government expenditure is used to accelerate economic growth and development with transferring the nation in to industrialize economy and increasing the living standard of the people.

An increasing government expenditure of countries are derivative amore developmental advance to collective protection, focusing of on government works, and food security, especially through agricultural input like fertilizer, seed and pestsid subsidies, (Regional Economic Outlook, 2010). The recent recovery of interest in growth theory has recharged interest among researchers in large number of focusing and understanding the linkages between government spending and

economic growth especially in developing country like Ethiopia. According to annual report of Ministry of Finance and Economic Development of Ethiopia (MoFED, 2010/11) the main targets of economic growth in Ethiopia is to reduce poverty. But there are many challenges in the country primary to public disagreement and there was increasing cheating (highly corrupted) in government behavior resulting from wrong public finance preparation and achievement in Ethiopia. Banks and businesses were collapsing which lead to crises in the external and internal activity of the economy.

According to the development plans strategies documents such as GTP, SDPRP and PASDEP of Ethiopia, government expenditure has continued to increase and is designed to rise in the next years. And, in recent times, in order to achieve the objective of growth and transformation plan (2010/11to 2014/15)the larger amount of resource constraint of Ethiopia Birr 690.90 billion has been expected compared to the preceding year's plan period Ethiopia Birr332.57 billion in GTP2010. For the time being, this paper will suggest that the increased government expenditure without expected reflection for impact of these changes in the future has certainly helped increase the interest. So that identifying the long run relationship between government expenditure and economic growth can be a big help effective use of the countries limited resource competently (MoFED, 2010/11).

There are different criteria to classify public expenditure such us recurrent and capital, development and non development and also some experts classify expenditure on the basis of function it has been incurred. In this paper according to the function government expenditure classified in to four. Therefore this thesis will examine the long run relationship between government expenditure and economic growth in Ethiopia through sectorial aggregate:

i. Economic expenditure is the sum of: agriculture, natural resources, mining and energy, trade, industry and tourism, road construction, transport and communication expenditure,
ii. Expenditure on social services including :education and training, health, urban development and housing, social welfare and culture and sport expenditure,
iii. Expenditure on general services including: organ of the state, justice, defence, public order &security and other expenditure,

iv. Expenditure on miscellaneous expenses like famine and any unexpected government expenditure by using multivariate analysis, econometric methodology of co-integration and Granger causality in order to identify empirically whether government expenditure has positive or negative long run relation with economic growth. Generally to provide common clarification for further researcher, in line with one of the view raised above and to make concluding remarks with policy implication.

1.2 Statement of problem

Economists identify several factors that contribute economic growth, such as growth in labor force, amount of capital assets, like (plant and equipments) and sectoral economic productivity. Additionally, endogenous growth models states that, the level of output per workers depends on both the amount of physical capital input per worker and human capital per worker input. Unfortunately, nations with little human capital cannot expect to hold up manufacturing nations basically by accumulating physical capital. So, different levels of investment in human capital through training and education assist to clarify lack of convergence of per capital income levels and growth rates over time (Mulhearn and Vane, 1999).

As a result there is a need for increasing government expenditure along with requires for human capital so as to attain definite goals and objectives to stimulate economic growth and development. In other words government must spend wealth to implement contract, maintain national safety, keep against criminals and give important "public goods" such as education, health, communication and infrastructure.

On the other hand some of the economists also argue that increased government expenditure away from these has a diminishing effect on the growth of the economy. Of course, if the government is to be helpful in bringing about a faster rate of growth, it has to do this by discouraging the allocation of recourses to non productive users. And may be more importantly, the government must always be on guard not to be, itself, a major source of misallocation (Tanzi, 1994).

According to (CSA, 2013) Ethiopia is one of the poorest countries in the world with a population of more than 88 million with subsistence agricultural sector. Alemayehu and Befekadu, (2005) also states that Ethiopia is a full of conflict, harsh policy change and reversals (annulment of judgment made by authority). In other words the relationship between government expenditure

and economic growth in Ethiopia is different along the three distinct regimes (imperial, Derg and EPRDF) because expenditure policies, physical capital or skilled man power and performance of growth largely correlated with the nature of the regime.

The huge public investment which focuses on infrastructure such as road and real way construction, explained much of the economic performance from the expenditure side. Similarly the expenditure on socio- economic sector (expenditure on education, health, water supply, communication and electrification) has been increasing from time to time, which are predictable to have a positive relationship to the economy growth in the long run. Generally economic theory generates different suggestion but does not routinely create strong conclusion about the relationship between government expenditure and economic growth. Really, there are conditions in which lower level of government spending will improve economic growth and other circumstances in which higher level of government expenditure will be attractive. Additionally even empirical studies have not the same conclusion on the relationship between economic growth and government expenditure.

There are many studies about the relationship between government expenditure and economic growth. But they investigate fraction of government expenditure, or not included all types of government expenditure. Example: government expenditure and economic growth in Nigeria employed co-integration and error correction modeling, (Ojonugwa Usman and Esther Abdul Agbede, 2015) in eastern Mediterranean University focus only capital and recurrent expenditure separately, the impact of public expenditure component on economic growth in Kenya (John Nienga Muthwi, 2013) also focus on infrastructure, education, health, defense and public order and security and etc. But government expenditure must be expressed in the form of:

$$\mathbf{Y= C + I + G + X.E}$$

Where Y: Expenditure, C: consumption, I: investment and X.E net export.

In Ethiopia also there are many researcher to examine the relationship between government expenditure and economic growth; such as Teshome ,(2006) emphasizes on the impact of various components of government spending including investment, consumption and human capital expenditure on the growth of real GDP by using Johnson Maximum Likelihood Estimation procedure, the result was only human capital has significant positive impact on real GDP .Endale (2007) also assessed the effect of defense expenditure on economic growth based on the

Hauseman ,(1978) test. The empirical result showed that defense expenditure has a negative relationship to real GDP. While Kidanemariam, (2014) investigated the impact of human capital development on economic growth in Ethiopia; tested by ARDL approach to co-integration. The result was human capital (expenditure on health and education) has positive relationship with real GDP in Ethiopia or the same result to Teshome, (2006).

However, these studies do not focus on aggregate government expenditure like economic expenditure is equal to the sum of expenditure on agriculture, natural resource, mining and energy, road construction, trade, industry and tourism and transport and communication; government expenditure on general service includes: organ of the state, justice ,defence, public order and security and government expenditure on social service also include: education and training, public health, urban development and housing and culture and sport and Miscellaneous Expenditure . All these are government expenditure. Not only the above researcher but also other many researchers does not focus total expenditure approach in Ethiopia and come up with widely different conclusions.

Due to the limitation of time and budget this thesis will fill the time gap and the above limitation and attempts to examine the long run relationship between sectorial aggregate government expenditure and economic growth within four categories. I.e. Economic Expenditure(EEX), Social Services Expenditure(SSEX),General Service Expenditure(GSEX) and Miscellaneous Expenditure(MEX) from 1974/75 and 2014/15 at the same time by using multivariate time sires analysis, econometric methodology of co-integration and Granger causality in order to identify empirically whether government expenditure has positive or negative relationship with economic growth and to assess and identify the long run relationship between these sectorial spending by the government and economic growth (real GDP) , to provide common clarification to further researchers and to make concluding, remarks with policy implementation.

1.3 Research Questions

This research answers the following questions:

1. Do aggregate economic expenditure, aggregate social service expenditure, aggregate general service expenditure and aggregate miscellaneous expenditure have a significant long run relationship on aggregate economic growth in Ethiopia?

2. Is there a causal relationship between government expenditure and economic growth in Ethiopia and what will be the direction of the relationship between them in the long run?
3. Which government expenditure or variable have strong relationship with economic growth in the long run in Ethiopia.

1.4 Hypotheses of the study

By combination of the Keynesian views and Wagner's law as a whole with GTP and previous documents, in Ethiopian case; resource allocations have been guided by the government's pro-poor growth policy where by the lion's share of available resources are allocated to main concern infrastructure and services that improve pro-poor economic growth and social development. It is broadly through that the policy encourages and holds up investment, and therefore promotes quick and broad based economic growth. This study defines the general null hypothesis is that?

1. Sectorial aggregate government expenditure has a negative significant long run relationship towards economic growth in Ethiopia.

2. Real gross domestic product has not casual relationship with sectorial aggregate government expenditure in Ethiopia.

1.5 Objectives of the Study

1.5.1 General Objective

The general objective of this study is to provide a comprehensive study and critical overview of the long run relationship between government expenditure and economic growth in Ethiopia over a specific period of time; (1974/75 to 2014/15).

1.5.2 Specific Objectives

Specifically, this research aims the following specific objectives:

1 To identify which aggregate sectorial government expenditure has significant long run relationship with economic growth in Ethiopia,
2 To examine the direction of causal relationship among government expenditure and economic growth in Ethiopia,
3 To identify which government expenditure has more contribution to economic growth.

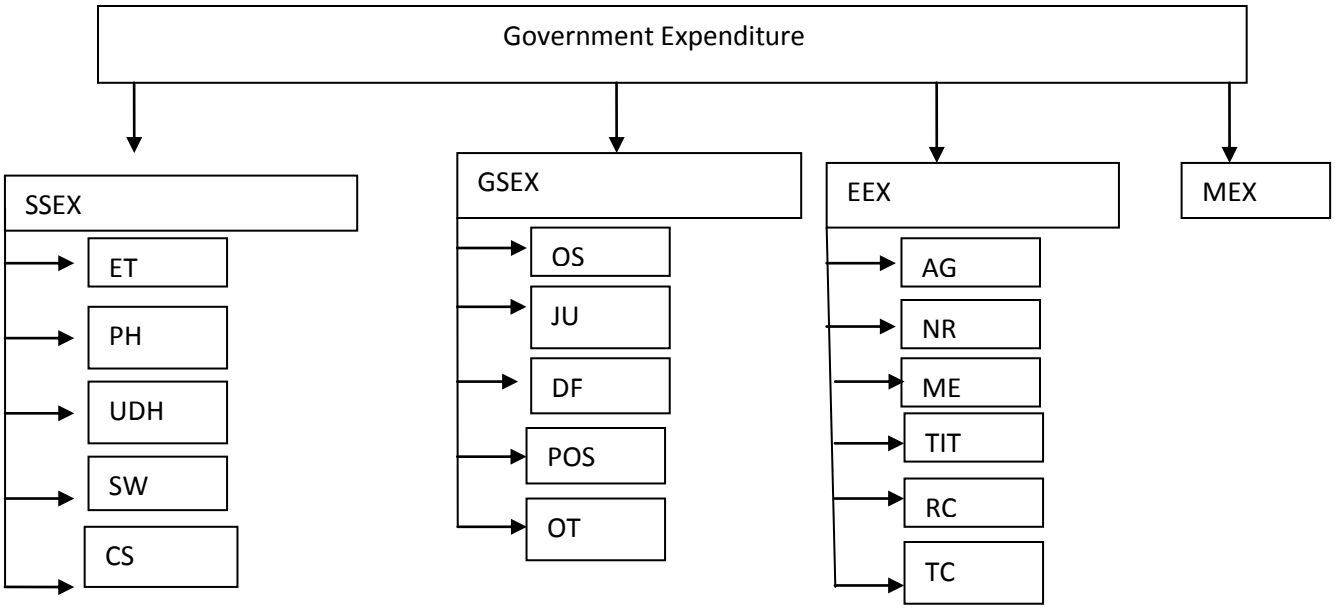
1.6 Significance of the study

The lack of a consensus or agreement on the relationship between government expenditure and growth of national income (real GDP) is enough for the importance of this study to ask whether the government expenditure causes economic growth and vice versa in Ethiopia and long run equilibrium relationship exists between them. The purpose of this study is to empirically investigate the causal relationship between the government expenditure and economic growth in Ethiopia. And also to determine the long run relationship between government expenditure and economic growths, estimate as well as lead a path for further studies in the field and incorporate the most recent data and employed advanced econometric techniques and the immediate outcome is use as benchmark for policy maker.

1.7 Scope of the study

Due to the limitation of time and budget this study will focuses on the hypothesis testing about the long run relationship between government expenditure components on economic expenditure (EEX), social services expenditure (SSEX), general service expenditure (GSEX) and expenditure on mislanious expense (MEX) and economic growth in Ethiopia. And the study will use 41 years annual data covering over the period (1974/75t02014/15 E.C).

Figure 1.1 The general focuses of the study.



Where

ET: Education&Traning OS: Organ of the State AG: Agriculture

PH: public health Ju: Justice NR: Natural resource

UDH: Urban dev't& housing DF: Defence ME: Mining& Energy

SW: Social Welfare POS: Public order &Security RC: Road construction

CS: Culture &Sport OT: Other TIT: Trade Industry &Tourism

TC: Transport &communication

*source authored preparation.

1.8 Limitation of the study

The study is based on quantitative approach analysis and it examines the long run relationship between government expenditure and economic growth in Ethiopia. One major limitation of the study arises from lack of clear agreement on the causes of economic growth (or how to measure its constituents). Economists are not yet certain about the relative importance of elements which clearly, or perhaps not so clearly, influence (or constitute) economic growth. Without such knowledge the area of disturbing doubt is uncomfortably large.

The data used for the empirical analysis was permeable fragmented. Besides, the study should faced in the case of time factor; the time frame of my work is going to hinder me from gathering as much information needed for proper analysis of the relationship between aggregated government expenditure and economic growth in the form of RGDP. Another limitation to my study is the location of the adviser and finance, lack and insufficient finance for finding sources of data, information and acquisition of material for my study. But not withstanding of these limitations the study would serve its purpose.

1.9 Organization of the research paper

The thesis is organized in to five chapters. Chapter one is the introductory parts of the paper; it includes the background, problem of the statement, research question, hypothesis formulated, objectives of the study ,significance of the study, scope, limitation and organization of the research paper. Chapter two is review of related literature and it has two parts: theoretical literature and empirical literature. Chapter three is about methodology and data description. Chapter four is the empirical analysis; it is divided in to two the first part is the descriptive analysis and the second part is econometric analysis with model and causality relationship analysis. Chapter five is the major findings and conclusions.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Theoretical literature

In developing country, through economic stabilization, motivation of investment action and etc, government expenditure maintain a speed of growth which is a flat one. In developing county, government expenditure has an energetic role to play in reducing retinal disparities ,developing social expenditure, construction of infrastructure of economic growth in the form of transport and communication facilities, education and training ,growth of capital goods, basic and key industries, research and development and so on(Bhatia,2002). Government expenditure on infrastructural facilities has a great role to play in the form of motivating the economy. The instrument in which government spending on public infrastructure is predicable to affect the speed of economic growth depend mostly up on the definite form and amount of total government expenditure billed to economic and social development project in the economy.

When expenditure is incurred, by itself it may be going to particular investment or may be competent to bring about re-allocation of invisible resources in the private sector of the economy. This result is essentially in the nature of re- allocation of resources from less to more attractive appearance of investment. A significant means in which government expenditure can speed up the rate of economic growth is by reduction the difference between social and private insignificant productivity of positive investments. At this time, government expenditure on social economic infrastructural like education ,health ,transport, communication, water disposal, electricity, water and sanitation etc has the potential of contributing to the performance of the economy based on encouragement.

The theoretical foundation of the study will be the Keynesian model, in the period of recession, a policy designed by the government is the expansion of budget used to increase the aggregate demand in the economy thus also increase gross domestic product (GDP). Increase in government expenditure results in increased employment in the public and the private sector and increase the supply of the product from the supplier and the producer or firms in the business sector. On the other hand employment increases, income and profits of the supplier either the

whole seller or the retailers and firms increase. The jobless ,who have now create work, whether in the government sector or the production (private sector) take satisfaction increase in income ,and there demand and purchase of goods and services increases. Better income, also rise the purchasing power of the consumer, firms owner and suppliers or producers and the overall growth results in an increase demand for consumption, saving and investment. According to the Keynesian model, if demand increases, business sector or firms produce large amount of goods and services, and the result is a significant increase in real GDP in a country, in the long run grater then the increase in government expenditure. The expansion of budget by the government act as enzyme to rise in demand and production (output) with in the sector that does not have direct relation with the community or government services (Deverajan,1996).

On the anther hand John Maynard Keynes advocates government deficit expenditure as element of the fiscal policy response to an economic reduction. In Keynesian economists, increased government expenditure is considered to raise aggregate demand and increase consumption, which in turn leads to increased production. According to the Keynesians view, a severe recession or depression can never end if the government does not intervene. In line with this school of thinking, many scholars argue that increase in government expenditure on socio-economic and physical infrastructures encourages economic growth. For example, government expenditure on education and health raises the productivity of labor force and increase the growth of national output. Similarly, expenditure in infrastructure such as roads, communications, power etc, reduces production costs, increase private sector investment and profitability of firms; thus promote economic growth. Additionally, Barro, (1990) has indicated that financial budgetary expansion using government expenditure is able to improve economic growth.

According to Barro and Salai Martin, (1992) categorize expenditure as productive and unproductive and assume that productive expenditure has a direct impact on the rate of economic growth and then unproductive expenditure has an indirect or no effect. Following Barro' approach Bleaney, (2001) classified general government expenditure services, such as; education, health, transport and communication, general government service spending and defense expenditure as productive expenditure. Health and education is treated as investment because of the addition to human capital they might demand. Classical economists and Austrian economists on the other hand, consider that increased government expenditure magnify an

economic contraction by shifting resources from the private sector, which they think about productive, to the public sector, which they consider unproductive.

The basic monetary units of the government, try to finance increasing expenditure, government may increase tax and /or borrowing. Higher income tax discourages producers, suppliers and individuals from working for long hours or even searching different jobvs.This in turn or goes round reduce income, aggregate demand and aggregate supply. In the same element, higher profit tax tends to increase production cost and reduce investment expenditures as well as productivity of firms. Moreover, if government increases borrowing especially from the banks in order to finance its expenditure; it will try to win (crowds-out) away the private sector, thus reducing private investment.

2.1.1 Review of Economic Growth

Economic growth is described as continuing expansion of the economy productive potential. Continued economic growth shall have impact on higher real living standards and reducing unemployment rate. World Bank, (2013) defined as GDP is the value added amount by the entire producers .Values added is equal to the value of gross output after deducting the value of the product in the processing used in production, before counting for predetermined capital expenditure in the production. GDP at price of purchaser is defined as gross value added amount by the entire resident producers in economy and any taxes of the products and any subsidies deduction which is excluded in products values.GDP calculation is not admitting fabricated assets depreciation and natural resources reduction.

To measure GDP growth is calculated by the increase in goods and services values which are produced by an economy with in one accounting year in the country. Economic growth normally calculated in real terms to eliminate the impact from changes on the product prices. There are three different approaches to determine GDP which generating the same result. These three approaches are the income approach, the expenditure approach, and the product approach. In addition, per capita GDP growth is defined as the annual GDP per capita growth rate based on constant local currency in percentage while cumulative are constantly used based on USD World Bank, (2013).

Economic growth assumption deals with long-run movements of the economy, or prospective pathway. The center of attention is a factor that lead to economic growth over time and

investigation of that allocate some economies to grow quickly, some slowly and others not at all. Early growth theories emphasized on different aspects of the economy. These theories can be expressed as follow:

Table 2.1 Economist theorists and their assumption (view).

Theories	Their agreement (assumption) on economic growth
Mercantilist	Emphasized, economic growth obtained by the surplus balance of trade.
Physiocrats	Emphasized, agriculture is the source of all capital or wealth
Cameralist	Economic growth approved by taxation and stat regulation
Classical A.Smith and Malthus	Economic growth Emphasized, in terms of fixed land and rising of population

- Source prepared or organized by Author

In parallel to the above; the Keynesians perceive demand as a precondition for growth. As a result, their analysis concludes that aggregate demand management policies should be improving economic performance. In the Keynesian model assumption, increase government expenditure on infrastructure leads to higher economic growth. Contrary to this view, the neo- classical growth models argue that government fiscal policy does not have any effect on the growth of national output. But, it has been argued that government fiscal policy or involvement helps to improve break down (lack of success) that might arise from the in efficiencies of the market. In order to the Keynesian agenda, Harrod Domar model pointed out some concerns of growth. For, example, to determine balanced growth rate in the economy, the balance between supply and demand for country outputs should be maintained. On the supply side, saving is a function of the level of GDP. Investment is central part of the demand for output of an economy as well as increase in capital stock. As result, the stability rate of growth is given by identical proportionate change in output within the ratio of savings output to the capital output. Solow,(1956) and Zerihun, (2014).

2.1.2 Review of Government Expenditure

Government spending (or government expenditure) includes all government consumption, investment and transfer payments made by a state. Government final consumption expenditure is an expenditure spending by the government achievement of goods and services for current use directly satisfy individual or collective needs of the members of the community. Government expenditure can be financed by; profit made by the government by issuing currency, especially the difference between the face value of coins and their production cost, taxes or government borrowing .Government gaining of goods and services to the society will plan to create future benefits such as: infrastructure investment; human capital, agriculture or research spending is classed as government investment. In the beginning economic literatures had recognized goods and services variety which the government has purchased. Increasing any kind of government expenditure will increase aggregate demand.

However, government expenditure improvement will increase the borrowing cost which will damage the several private investments and moderating aggregate demand growth. This will guide to the decline in investment expenditure as result diminished the private capital shares.

The decline in share of private capital will reduce the long run productivity so does the output capacity. According to Tang, (2009), Keynesian view has theorized that the government expenditure on public is an exogenous cause which can be utilized as a policy variable to manipulate the short run growth. According to Keynesian point of view, aggregate demand curve will be shafted by the expansionary fiscal policy from left to right. Thus, existing equilibrium of market will move to the new equilibrium which will result in a higher level of real GDP. However, the literature of the relationship between the economic development and government expenditure had produced ambiguous results.

Generally there are two important theories of increasing government expenditure: the Wagner theory and Wiseman and Peacock. Therefore, according to the activities of Wagner showed that there are different layers of governments such as: central, stat, local to increase both aiming to achieve maximum production within limited area and obtain a relatively small product from large area with a minimum of capital and labor. He keeps that there was a useful relationship between the growth of an economy and government activities with the result that the government sector grow faster than the economy .How ever Backhaus (1997) not only supported Wagner's

assumption, but also conclude with empirical evidence that it was equally applicable to a number of other governments which differed broadly from each other. All kinds of governments, regardless of their levels say, the central or the state, plans (peaceful or war), and, etc had exhibited the same trend of increasing government expenditure. But on the other hand Peacock and Wiseman's study is most likely one of the most excellent known analysis of the time model of government expenditures. This theory dealing with growth of public expenditure was advanced by Peacock and Wiseman in their study of government expenditure in the United Kingdom for the period 1890-1955. They founded their analyses up on a political theory of public purpose namely that governments like expend more money but people do not like to pay taxes, and that government wants to give some attention to the needs of their citizens. In other words the peoples are obviously tax averse.

However, the government has naturally hunger for expenditure. Because, taxation as setting a constraint on government expenditure. During the times of sudden or shock like calamities and war ,the government would quick and efficient increase the public expenditure ,this necessitates moving taxes up wards, the researchers argued that the peoples or tax payers would allow and approve such an increase in tax. This development of event is referred to as displacement effect, thought it's meant to be short term phenomenon it normally assume a long term trend.(Wiseman& peacock, 1961). Therefore, democratic elected governments will try to pleas this representative voter, enlarging her endowments, especially through current transfers. Consequently, a very suggestive explicative variable of the growth of public outlays should be identified with the government of real current transfers.

This can attempt to explain how government expenditure in Ethiopia has taken not elastic in strength upward surface. Every time Ethiopia has experience deferent shocks like, 1984/85 famine, resettlement and upsizing of the government structure to contain the many ministries intended to serve the citizens, the taxes strength and range more in a quick in racing bike with the public expenditure. One of the frailer of this theory is that an activity the fact that government can finance an upward displacement in public expenditure using other sources of finance such as donor ,fund ,external borrowing or even sale of government fixed asset and this pointless declare may not affect taxes in an upward trend.

2.1.3 Theoretical explanation of the Wagner's law

Wagner advanced his 'law of increasing public expenditures' by analyzing a general direction in the growth of government expenditure and in the size of public sector in many countries of the world. Wagner's law or the law of increasing public expenditure postulates that:

1. The expansion of the activity of the state leads to increase in government expenditure on administration and regulation of the economy,
2. .The development of modern industrial society would give rise to increase political pressure for social progress and identify for increased allowance for social consideration in the conduct of industry; and
3. The rise in public expenditure will be more than a proportional increase in the national income and will thus result in relative expansion of the public sector (Teshome Ketema, 2006).

The law of Wagner proposes that there is a long- term trend on government spending to increase relative real GDP. To sate it differently, "the causality of the link between public expenditure and national income runs from national income to public expenditure". According to Abizadehand Yousefi, (1998), the size of government grows as an effect of industrialization, in other words, the richer a society becomes, the more the government spends in order to alleviate social and industrial stress.

Thus, Wagner was emphasizing long-term trend rather than short- term changes in the public expenditure. Moreover, he was not concerned with the method of increase government expenditure. Because it is based on historical practice, the price quantitative relationship between the extents of increases in public expenditure and time taken by it was not fixed in any way, and could not be used to predict its rate of increases in the future. The first stage of economic growth, the stat finds out that it has to increase its activities quite fast in several field like education, health, civil services, transport ,communication, and soon. But when he initial deficiency is removed, then the increase in sate activities maybe slow down. The factors, which contribute, to the trend of increasing public expenditure relate to a growing role of the state in ever- increasing socio –economic complexities of the modern society.

According to his hypothesis the demand side also supports the relationship between economic growth and government expenditure .The demand side economic theory advocates the activities of intervention of the government in the economy through government expenditure, money supply in order to stimulate the demand for goods, and services and insure economic growth and stability. However, this view is contradiction with the supply side approach. The government expenditure in the supply side approach of public finance involves bureaucratic waste and considered as a distortion to economic growth, inflation that it causes, if not directed to infrastructure action and investment (Brown, C.V. and Jackson, P.M, 1996).

2.1.4 Keynesian approach of government expenditure and economic growth relationship

Keynesian unlike Smith's concepts of saving (frugality) is a prerequisite important for economic growth they emphasis to the demand approach. Keynesians, states that government expenditure has a great important of economic activities as well as act as machine to stabilize the short run fluctuations in aggregate expenditure (JU-Haung,2006)and also some empirical studies like (Omoke ,2009)shows that government expenditure and economic growth have positive relation. The Keynesian macroeconomic model advocates an active government involvement in the economy through raise in government spending, money supply in order to motivate the demand for goods and services during the period where there is lack of demand and put unemployed back to work. In other words Keynesian theories of growth, states demands from consumer were the prerequisite for economic growth. In other words change in income, especially disposable income is a primary influence on consumption expenditures. If consumers have more income in the case of economic growth or expanding, then increase consumption expenditures. While consumers has less income because of the economy is contracting reduce consumption expenditure and a large group of workers or peoples are unemployed.

According to Ram, (1986) government expenditure can help to develop the level of productive investment, hence economic growth and development can be secured. Thus, government expenditure has appositive relation on economic growth. However the other followers of Keynes's general theory in 1936 like Harrod,(1939, 1948) and Domar, (1946, 1947) were developing the growth model independently that relate an economy's rate of growth to its capital stock. However, the assumption and results are not the same .while Keynes emphasized the impact of investment on aggregate demand and Harrod and Domar emphasized how investment

spending also increased an economy's productive capacity. Similarly these models argued that saving, investment, and population growth as the major causes of growth.

2.1.5 Neo-Classical Growth Models

In the 18th and 19th C school of thoughts and theories on economic growth can be design back to the classical economists, whose works for a short time reviewed at the same time as transition to neo-classical growth theories. (Solow and Swan1956) was first developed the basic frame work of neoclassical growth model. The model confirmed that, at anything or point in time: I.e. The total product of the economy depends on the quality and quantity of physical capital employed; (the quantity of labor employed and the average levels of skills of the labor force).

In other words economic growth comes: increasing the labor supply, capital stock and productivity, if land is fixed. However, economy reaches at equilibrium level or full equilibrium level; additional growth in the stock capital per work will only takes place. And diminishing marginal productivity of capital, exogenously determined technical progress, constant and substitability between capital and labor are the basic assumptions of Solow model. Solow was criticized by the Roy Harrod and Ersey Domar (Harrods, 1939 and Domar, 1946) for his weakness. Based on this growth model, high investment rate or saving rate, high level of technology, skilled human capital, low level of population and low level of capital depreciation are the most determinants of economic growth in the long run. Solow, (1956) extended the Harrod –Domar model by adding labor as a factor of production by: Requiring diminishing returns to labor and capital separately, constant returns to scale for both factor combinations.

In addition to that Solow assume only capital and labor are a factors of production but technology is constant returns to scale. As a result the declining of output with respect to physical capital and possibly labor is augmenting technical progress. He also assume that investment is equal to saving will the equilibrium on the labor market yields that there is always full employments of labor. And also Barro, (1990 and1991) have opposite view with Keynesian i.e. government expenditure is generally assonated with the higher taxation. If there is a too much intervention of government in economic activities through government expenditure and higher taxation, this can result in distortion of economic incentives, such as incentives to save and invest, incentive for innovation and enterprises, and hence retarded the process of economic growth and development.

2.2 Empirical literature

Unlike the above theoretical literature review several researcher have investigated sources of growth for cross country differences, time series and panel data approach in both developed and developing economies using a large number of explanatory variables. Some studies examine aggregated data of government expenditures to test either the Wagner law or Keynesian hypotesies.Whil others take legal disaggregated data in order to get the long run relationship and direction of causality between individual components of government expenditure and economic growth. In addition different researchers use different indicators to estimate the economic growth. For instance there are some studies that uses per capita gross domestic product while other use gross national product ,RGDP logarithm and percentage terms.

As the result of this, studies that are empirically test the long run relationship and the indicator of causality between government expenditure and economic growth by using different methodological approach and techniques. For instance, most of the studies apply the co-integration and Granger causality techniques, on time series data and find contradicting result. Whereas only few studies using cross-section and panel data regression and still the result are contradictory. Take an example as follow:

Landau, (1983) conducted the study of 104 developing and developed countries the share of government expenditure on government consumption to GDP reduce economic growth which means, government expenditure retard economic growth. Whereas, economic growth was also; positive related with total investment on education. And also Landau, (1986) confirms the negative relationship between government expenditure and economic growth and extended the analysis to include human and physical capital, political, international condition as well as three years lag on government expenditure in GDP. Government expenditure was disaggregated to include investment, transfers, education, defense and other government consumption. The result in part mirrored to the earlier studies, the general government consumption was significant and had negative influence on growth. Education expenditure was positive but not significant .It was nucleated why lagged variables were included given the channels through which government expenditure influence on economic growth suggests the relationship at the same time. Ram (1996) investigated the impact of government expenditure to economic growth through the use of production function, for both public and private sector. The data used a sample of 115

countries to drive broad generalizations for the market economic investigated .Ram founds that government expenditure have significant positive external relationship with economic growth, in developing countries. But total government expenditure had negative relationship with growth. In (1994) Lin use the data spanned 62 countries from (1960-1985)or for 25 years he proved that non productive expenditure had no relation or no effect on economic growth in the highly developed countries, however positive relationship in LDCs. Other studies like Deverajant, et.al (1993) investigate the impact of the particular categories of public expenditure by using a sample of 14 OECD countries found that expenditure on health, transport and communication have a positive relationship where as expenditure on education and defense did not have positive relation.

In addition to the above Seymour ,et.al.(1997) and Josaphat,et.al.(2000) investigated by disaggregated approach the impact of government expenditure ,on economic growth in OECD and the impact of government expenditure in Tanzania with in time period (1965-1996) using time sires data analysis for 32 years respactivelly.They formulate a sample growth accounting model, adopting (Ram,1986)which is total government expenditure is disaggregated expenditure on investment, consumption expenditure and human capital. The result was when productive expenditure or physical investment increases economic growth become declined(both have negative relationship) and consumption expenditure relate positive to growth and which is particular appears to be associated with increases private consumption. While spending on human capital investment have negative relationship with economic growth.

Contrary to the approaches in Landau, (1983 and 1986) Biswal, et.al.(1991) use aggregated and disaggregated data on government expenditure to test both Wagner's law and the Keynesian hypothesis confirm government expenditure on investment has positive marginal effect or relationship with GDP growth.

Kweka and Morrissey (1999) also use OLS method for a sample of time series data between the years 1965-1996 the same time period to the above on Tanzania, examined the relationship between government expenditure and economic growth .They found the negative relationship between them in Tanzania. The negative association between total government expenditure and growth indicate the unproductive effect of government investment expenditure to growth but

appears to be associated with increased private consumption .They also found there is positive relation between growth and human capital including education and health.

Furthermore Kalio,(2000) also investigate by using OLS method the effect of different components of government expenditure ,on GDP in Kenya between the year (1970-1992),the conclusion was government spending on capital expenditure had positive effect where as recurrent expenditure had negative effect (negative relationship)on GDP growth. Bose, et.el. (2003) examined the growth effect of government expenditure with in 30 developing countries during 1970's and 1980's with a particular focus on sectorial expenditure the initial result has two branches:

1. The relationship between government capital expenditure and economic growth with GDP is positive and significant correlation but recurrent expenditure is insignificant.

2. In sectorial level, government investment and total expenditure on education are the only outlays that are significantly associated with growth once the bud get constraint and omitted variables are taken in to consideration, but Karman and Bahmasran, (2007) found out the relationship between government expenditure in Toyland .There founding's were expenditure and economic growth are not co-integrated (had not long run relationship) but they have unidirectional.

Like other developing countries there are numerous studies in Ethiopia. Example: Teshome Ketema, (2006), WendewesenTsadiku, (2012), KidanemariameGeday, (2014) and Zerihune Assefa, (2014).

Teshome Ketema, (2006) investigated on his master thesis in Addis Ababa University on the impact of government expenditure on economic growth in Ethiopia. He employed both quantitative and economic analysis to study the impact of government expenditure and economic growth .The study tries to analysis the government expenditure along Imperial, Derg and EPRDF (post, 1991).Because expenditure policies and performance are directly correlated with the nature of the regime. Based on the co-integration analysis, his finding indicates that there is long run relationship among the variables. Meaning that expenditure on human capital has a very significant positive relationship on the growth of real GDP; particularly private consumption expenditure has significant positive relation on economic growth, whereas government investment expenditure is not significant to explain the growth of real GDP.

According to Kidanemariam, (2014) finding on the impact of human capital on economic growth in terms of health human capital and education human capital the result was similar to that of Teshome, (2006). While Wendewesen investigated sectorial spending on economic growth particularly human capital including (health and education) and agriculture; the result confirm that government expenditure on education and agriculture sectors have positive relationship to economic growth while health sector was insignificant with the growth of real GDP.

Furthermore Zerihun Assefa, (2014) examined government expenditure trends, by employing time series data; the result was strongly support the Keynesian's view that government expenditure affects the growth of real GDP.

Most of the studies do not focus on all types' of aggregate government expenditure like economic expenditure is equal to the sum of expenditure on agriculture, natural resource, mining and energy, road construction, trade, industry and tourism and transport and communication; government expenditure on general service includes: organ of the state, justice ,defence, public order and security and government expenditure on social service also include: education and training, public health, urban development and housing and culture and sport. All these are government expenditure. Not only the above researcher but also other many researchers focus on only limited or fraction of government expenditure in Ethiopia and any other countries and come up with widely different conclusions.

Due to the limitation of time and budget this thesis will fill time gap and the above limitation and attempts to examine the long run relationship between all the above government expenditure and economic growth within four category. i.e. Economic Expenditure(EEX), Social Services Expenditure(SSEX),General Service Expenditure(GSEX) and Miscellaneous Expenditure(MEX) cover the period from 1974/75 and 2014/15 at the same time by using multivariate time sires analysis, econometric methodology of co-integration and Granger causality in order to identify empirically whether government expenditure has positive or negative relationship with economic growth and to assess and identify the long run relationship between these sectorial spending by the government and economic growth (real GDP) per capita, to provide common clarification to further researchers and to make concluding, remarks with policy implementation.

2.3 Conceptual framework

The long run relationship between government expenditure and national income or economic growth presents an overview of theoretical and previous empirical studies that test either the Wagner's law of government size or the Keynesian paradigm in which government expenditure constitutes a stablisation policy tool. Theoretically Keynesian economist's emphasis, increase in government expenditure on socio economic and physical infrastructure encourage economic growth example education and health. Similarly infrastructures such as roads, communication, power etc reduce production cost, increase private sector investment and profitability of firms, therefore promote economic growth. In addition to the above, government expenditure has administration and regulation of the economy. Arise in government expenditure will more than proportional increase in real GDP results relative expansion of public sector in the long term trend on government spending to increase relative real GDP. Generally Keynesian emphasizes "recession or depression can never end if the government does not intervene in the economy".

Many empirical studies that use the co-integration and Granger causality economical procedure to test the aforementioned hypothesis, from these some studies examine aggregated data of government expenditure and others some are use disaggregated data. Example Landu, (1983 and1986) conducted the study of 104 developed and developing countries employed that consumption government expenditure reduce economic growth but economic growth has positive relationship with total investment on education. In addition to Landu, Ram (1996) investigated the impact of government expenditure to economic growth through the use of production function, for both public and private sector; he found that total government expenditure had negative relationship with national income (real GDP).

Contrary to the approaches in Landu, (1983 and1986); Biswal, et.al (1991) use aggregated and disaggregated data on government expenditure to test both the Wagner's law and the Keynesian hypothesis. Using aggregate data, the Engle-Granger co- integration test supports both Wagner's and Keynesian hypothesis. In addition, the growth of total current expenditure and current expenditure on goods and services exhibits a long run equilibrium relationship with the economic growth (real GDP). The Wagner's law as well as the Keynesian hypothesis concerning the direction of causality are satisfied for both total current expenditure and the current expenditure on goods and services towards real GDP and vice versa.

Therefore, this study finds that the long run relationship between aggregate government expenditure and economic growth to test both Wagner's law , Keynesian hypothesis and practical observation using co-integration test and econometric model to prove the positive long run relationship between sectorial aggregate government expenditure and national income. On the following categories:

i. Economic expenditure is the sum of: agriculture, natural resources, mining and energy, trade, industry and tourism, road construction, transport and communication expenditure,

ii. Expenditure on social services including :education and training, health, urban development and housing, social welfare and culture and sport expenditure,

iii. Expenditure on general services including: organ of the state, justice, defence, public order &security and other expenditure,

iv. Expenditure on miscellaneous expenses like famine and any unexpected government expenditure.

CHAPTER THREE

3. METHODOLOGY

This section presents a simple growth model that attempts to lock away some of the major macroeconomic factors moving economic growth in Ethiopia. Macroeconomic theory has recognized different factors that manipulate the growth and the relationship between government expenditure and economic growth of a country from the classical, Keynesian, neo classical and the new growth theories. These factors includes socio cultural factors, international frame work, technology , economic policies ,land settlement, political factors, foreign direct investment and other many factors.

Empirically investigate the relationship between government expenditure and economic growth in Ethiopia, economic regression approaches is developed and use to estimate elasticity of gross domestic product with respect to aggregate government expenditure with a particular focus on the lag value of expenditure on social services, expenditure on general services including un lagged value of economic expenditure and other misllanious expenditure are explanatory variables. Understanding characteristics, determinants of economic growth and their relationship with government expenditure requires an empirical structure that can be applied to a relatively long time frame (time series).

3.1. Data source and methods of Analysis

3.1.1 Data source

The study is based on a country level annual macroeconomic data covering the period from 1974/75 to 2014/15 for (41) years. The choice of the period is based on the availability of relevant data for the study. The study is relying on quantitative data in order to answer the research question and arrive at valid and reliable conclusions. As far as the source of data are concerned; secondary source of data is used. The annual data on real DGP and government expenditure are obtained from MoFAD and NBE. The expenditure collected in both organizations is divided in two major groups that is capital and re- current expenditure. But the paper focuses on the aggregate data or the sum of capital and re-current expenditure.

3.1.2 Methods of Analysis

Methods of data analysis and estimation techniques

Variables in the VAR model→ stationary test using ADF and PP→ If the variable are stationary at level→ Estimate VAR in level → Granger causality test.

Variables in the VAR model → stationary test using ADF and PP→ If the variable are non-stationary in level → Estimate simple VAR model and determine appropriate lag length based on AIC and SIC → Co-integration using Johansen approach → Variables are co-integrated → Estimate VCM long run and short run relationship→ Granger causality test (Innovation accounting) the latter is optional. But when variables are not co-integrated→ Estimate VAR in first difference (short run dynamics relationship) → Granger causality test (Innovation accounting) the latter is optional. Source: (Alemayehu Kebede, 2011)

3.2 Model Specification

This section also presents a simple growth model that attempts to capture some of the major macroeconomic factors affecting the long run relationship between government expenditure and economic growth .As we have discussed in the theoretical literature review. There are no generally accepted models of the growth process and hence no standard analytical frameworks that are appropriate for studies such as this one (Abramovitz, 1983).

Not only that theory offers little guidance, there is also no consistent evidence as to the relationship between government spending and growth. Besides, economic growth may depend on factors that change over time. On the top of these, simultaneity, multicollinearity, and crude proxies are important practical problems. Such constraints make the empirical study on the impact of government spending very challenging. The empirical approach to regression in this study will be then not simply to maximize the goodness of fit of the model but to include only those variables inherently plausible in the context of this study. On account of these facts and data availability as well as in view of its relevance to Ethiopia, in this study, a model developed by Kweka and Morrissey, (1999) is adapted for the econometric analysis.

$$Y1t = c1 + \Pi 11\ (1)\ Y1,t-1 + \Pi 12\ (1)Y2,t-1 + \ldots + \Pi 1n\ (1)Yn,t-1 + \Pi 11\ (2)\ Y1,t-2 + \Pi 12\ (2)Y2,t-2 + \ldots + \Pi 1n\ (2)Yn,t-2 + \ldots + \Pi 11\ (p)\ Y1,t-p + \Pi 12\ (p)Y2,t-p + \ldots + \Pi 1n\ (p)Yn,t-p + \varepsilon 1t$$

………………………………………..[3.0]

Where; Y_{1t} represent real GDP at a time t π represent the coefficient andY_{t-1}, Y_{t-2} andY_{t-3} are the lag of its and other dependant variables. Studies like Patrick Enu, et. Al, (2013); sighted by

Tewodros Gebru Biswas and Saha, (2014) applied similar economic function macroeconomic determinants of economic growth in Ghana and India respectively. More over the variables are proffered based on their relevance and data availabilities. Therefore the mathematical relationship between real GDP and major government expenditure components are expressed as follow:

RGDP=f (GSEX, SSEX) or GSEX =f (RGDP, SSEX) or SSEX= f (RGDP, GSEX)

$$RGDP = f(GSEX, SSEX, EEX, MEX) -3.1$$

Where: RGDP = real gross domestic product,

GSEX= General Service Expenditure,

SSEX= Social Services Expenditure,

EEX= Economic Expenditure and

MEX= Miscellaneous Expenditure.

The explanatory variable in equation 3.1 function is in fact components of GDP. This can be addressed by measuring the explanatory variables as shares of GDP. Expressing the dependant variable in difference form, an attempt has been made to examine the impact of each explanatory variable on growth of real GDP. Thus, the model to be estimated is specified as:

DRGDP1t=β1+β11 (1) GSEX1,t-1+β12(1)SSEX2,t-1+β3EEX+β4MEX+εt……3.2

LRGDP= the difference of Real Gross Domestic Product

GSEX=the share of General services expenditure to RGDP

SSEX= the share of Social Services Expenditure to RGDP

EEX= the share of Economical activities Expenditure to RGDP

MEX=the share of Mislanious expenditure to RGDP

β1, β2, β3 and β4 are coefficients of semi- elasticity and ε is stochastic disturbance term standard properties. The sign of each coefficient is dependant up on the relative contributions of the corresponding explanatory variables which in turn depend on the functioning of the economic system under consideration.

3.2.1 Vector Autoregressive (VAR) Model

The VAR model is one of the most successful, flexible, and easy to use models and easy to implement by using OLS for the analysis of multivariate time series. It is a natural extension of the univariate autoregressive model to dynamic multivariate time series. The VAR model has confirmed particularly useful for describing the dynamic behavior of economic and financial time series and for forecasting.

Forecasting from VAR models are quite flexible because they can be made conditional on the potential future paths of specified variables in the model. In addition to data description and forecasting, the VAR model is also used for structural conclusion and policy analysis. In structural analysis, certain assumptions about the causal structure of the data under investigation are imposed; the resulting causal impacts of unexpected shocks or innovations to specified variables on the variables in the model are summarized.

3.2.2 Stationary Vector Auto regression Model

Let $Y_t = (y_{1t,}\ y_{2t\ldots}y_{n\ t})^{T}$ denotes an (n×1) vector of time series variables. The basic p-lag vector autoregressive ($VAR_{(p)}$) model has the form (Hamilton, 1994).

$$\mathbf{Y_t = C+\pi_1 Y_{t-1}+\pi_2 Y_{t-2}+\pi_3 Y_{t-3}---\pi_p Y_{t-p}+\varepsilon_1,\ t=1\text{-}T----------3.3}$$

Where C denotes vector of constants and π_p is autoregressive coefficients

Thus, a vector auto- regression is a system in which variable is regressed on a constant and p of its own lags as well as on p-lags of each of the other variables in the VAR. Note that each regression has the same explanatory variables.

The basic VAR (p) model may be too restrictive to represent sufficiently the main characteristics of the data. In particular, leaner time trend may be required to represent the data properly. Additionally, exogenous variables may be required as well (Seifu Neda, 2011).

3.2.3 Testing Stationarity: Unit root test

Before fitting a particular model to time series data, the series must be made stationary. Stationarity occurs in a time series when the mean and autocovriances of the series remains constant over the time series. However, the normal stochastic process is fully specified by its two

moments, the mean and the variance (Gujarati, 2003).Therefore, the stochastic process Y_t is said to be stationary.

If: 1. E (Y_t) =μ, constant for all variable of t ---------- (3.4)

2. The Cov (Yt, Y_{t-j}) =π_j=E[(Y_t-μ) (Y_{t-j}-μ)]=π_{-j} for all t and j=0,1,2,……(3.5)

Condition (3.3) means that all Y_t have the same finite mean vector μ and (3.4) requires that the autocovarians of the process do not depend on t but just on the time period j the two vectors Yt and Yt-j are apart. Therefore, a process is stationary if its first and second moments are time invariant. Normally, differencing may be needed to achieve stationary .To test for stationarity of a series several procedures has been developed. The most popular ones are Augmented Dickey-Fuller (ADF) test and the phillip-perron (PP) test. The following discussion outlines the basics features of a simple AR (1) process:

$Y_t = \rho Y_{t-1} + X_t$ ‘δ+ ε_t……. (3.6)

Where X_t are optional exogenous repressors (act an enzyme synthesis) which may consist of constant or a constant and trend ρ and δ are parameters to be estimated, and εt, assumed to be white noise. If absolute value of ρ greater than or equal 1,y is a non stationary series and the variance of y increases with time and approaches infinity. If absolute value of ρ<1, y is a stationary series. Thus, the hypothesis of (trend) stationaity can be evaluated by testing whether the absolute value ρ is strictly less than one.

Hypothesis:

H0: The series are not stationary (ρ=1)

H1: The series are stationary (ρ<1)

3.2.3.1 Augmented Dickey-Fuller (ADF) Test

The standard Dickey Fuller test is conducted by estimating equation (3.6) after subtracting y_{t-1} from both side of the equation

$\Delta Y_t = \alpha Y_{t-1} + X_t' \delta + \varepsilon_t$……. (3.7)

α = ρ-1 and $\Delta Y_t = Y_t - Y_{t-1}$ the null and alternative hypotheses may be written as

H0: α=0

H1: $\alpha < 0$……. (3.8)

ADF is one of the broadly used approaches of unit root testing. For this study the researcher use one of the most widely used approaches of unit root testing which is Augmented Dicky-Fuller (ADF) test.

The lag length on these extra terms is either determined by Akaike Information Criterion (AIC) or Schwarz Bayesian/Information Criterion (SBC, SIC), or more usefully by the lag length necessary to whiten the residuals.

The three possible forms of the ADF test are given by the following equations:

$\Delta Y_t = \beta_1 + \Phi Y_{t-1} + \beta Y_{t-i} + \mu_t$ …… (With intercept only)

$\Delta Y_t = \beta_1 + \beta_2 t + \Phi Y_{t-1} + \beta Y_{t-i} + \mu_t$ …… (With intercept and trend)

$\Delta Y_t = \Phi Y_{t-1} + \beta Y_{t-i} + \mu_t$ ……(no intercept and no trend)

Mackinnon (1991, 1996) implements a much larger set of simulation (reproduction) than those tabulated by Dickey and Fuller. In addition, Mackinnon estimates response surface for stimulation results, permitting the calculation of Dickey Fuller critical values and p- values for arbitrary (random) sample sizes.

The simple Dickey Fuller unit root test described above is valid only if the series is an AR (1) process. If the series is correlated at a higher order lags, the assumption of white noise disturbances $\varepsilon_t$is violated. The Augmented Dickey- Fuller (ADF) test constructs a parametric correction for higher – order correlation by assuming that the series follows an AR (p) process and adding lagged difference terms of the dependant variable y to the right – hand side of the test regression:

$\Delta Y_t = \alpha Y_{t-1} + X_t' \delta + \beta 1 \Delta Y_{t-1} + \beta_2 \Delta Y_{t-2} + \ldots + \beta_P \Delta Y_{t-P} + U_t$…….(3.9)

This augmented specification is then used to test (3.8). An important result obtained by Fuller is that the asymptotic distribution of the t- ratio for α is independent of the number of lagged first difference includes in the ADF regression. Moreover, while the assumption that y follows an autoregressive (AR) process may seem restrstritive, Singh. B and Sahni B. S, (1984) demonstrate

that the ADF test is asymptotically valid in a presence of moving average (MA) component, provided that sufficient lagged difference terms are included in the test regression.

3.2.3.2 The Phillips-perron (PP) Test

Phillips and perron, (1988) propose an alternative (nonparametric) method of controlling for serial correlation when testing from a unit root. The PP method estimates the non- augmented DF test and the test highly respect to unspecified autocorrelation and heteroscedasticity in the disturbance process, so that serial correlation does not affect the asymptotic distribution of the test.

3.2.4 Estimating Order of the VAR

The lag length of the VAR model may be determined using model selection criteria. The general approach is to fit VAR models with orders of m =0… p max and choose the value of m which minimizes some model selection criteria (Lutkepohl, 2005). There are a number of criteria but the three most commonly used information criteria for selecting the lag order are the Akaike information criteria (AIC),Schwarz information criterion (SIC), and Hannan –Quin information criterion (HQ). Thus among the three criteria AIC is always suggests the largest order, SIC chooses the smallest order and HQ is between. But of course, this does not exclude the possibility that all three criteria agree in the choice of VAR order. The HQ and SIC criteria are both reliable, that is, the order estimated with these criteria converges in probability or almost surely to the true VAR order p under quit general conditions, if p_{max} exceeds the true order. FPE and LR are other form of criteria to choose lag order selection.

3.2.5 Co- integration Analysis

The variables in the VAR system may have a long- run equilibrium relationship to which any deviating variable is gradually pulled over time. The long run equilibrium relationship is called the co-integrating vector .When there is a significant co-integrating vector, the VAR model should be augmented with an Error Correction term. In other words, pure VAR can be applied only when there is no co- integrating relationship among the variables in the VAR system. Hence, a prerequisite before running any VAR model is to run a co- integration test.

The role of co integration is to link between the relation among asset of integrated (non-stationary) series and the long –term equilibrium. The presence of a co- integrating equation is

interpreted as a long run equilibrium relationship among the variables. If there is asset of K integrated variables of order one (I (1)), there may exist up to K-1 indepenant leaner relationships that are I (0). In general, there can be r is less than or equal to K-1linearly independent co-integrating vectors. Thus, each element in the r-dimensional vector is I (0), while each element in the k-1dimensional vector is I (1) (Engle and Granger, 1987).

Testing for co-integration using Johansen's methodology .The starting point in Johansen's procedure (1988, 1991), in determining the number of co- integration vectors, is the VAR representation of Yt. It is assumed a vector autoregressive model of order p and is expressed as follows: $Y_t = A_1 y_{t-1} + A_2 Y_{t-2} + \ldots\ldots + ApY_{t-p} + \beta X_t + \varepsilon_t$

Where y_t is a k-vector of non-stationary I (1) variables (if a non stationary series, y_t must be differenced d times before it becomes stationary, then it is said to be integrated of order d. This would be written $y_t \sim I(d)$, Xt is a d-vector of deterministic variables, and εt is avector of innovation.

Johansen, (1988) proposed two tests for estimating the number of co-integrating vectors: the Trace statistic and Maximum Eigenvalue. Trace statistics investigate the null hypothesis of r co integrating relations against the alternative of n co integrating relations, where n is the number of variables in the system for r = 0,1, 2……n-1.

The Maximum Eigenvalue statistic tests the null hypothesis of r co- integrating relations against the alternative of r+1 co- integrating relations for r= 0,1,2,……n-1.or

H0: There are no co- integration / relationships

H1: There is at most one co-integration /relationships

3.2.6 Vector Error Correction (VAR) Models

After running Johansen co- integration test and finding vector, VEC estimation can be done. The long run relationship between variables can be analyzed through looking at co-integration equations. It also enables one to analyzed long run relationship with co-integrating error which implies break points or disturbances in the long run equilibrium, Moreover, short-run relationship can be observed based on changes of the lagged values in VEC estimation which gives details of the relationship regarding past and current values of variables and explain causality among them. Thus, the VAR it can be reparametrized as a vector error correction

(VECM) (Hamilton, 1994). VECM contains information on both the short run and long run adjustment.

3.2.7 Model checking

A wide range of procedure is available for checking the adequacy of VAR and VECM. They should be applied before a model is used for a specific propose to ensure that it represents the data sufficiency.

3.2.7.1 Test of residual autocorrelation

The Portmanteau autocorrelation and Correlogram test for residual autocorrelation checks the null hypothesizes that all residuals autocorrelations are zero, which is:

$H_0: E(\varepsilon_t \varepsilon_{t-i}) = 0\ (i = 1, 2, 3, \ldots,$ …….. (3.9)

It is tested against the alternative hypotheses that at least one auto-covariance and hence, one auto co-relation is none zero ($H_1 \neq 0$).

3.2.7.2 Normality of the residuals

Lutkepohl, (1993) suggests using the multivariate generalization of the Jarque- Bera test (Jarque and Bera, 1987) to test the multivariate normality of the u_t .This tests the skewness and kurtosis properties of the u_t(3^{rd} and 4^{th}) against those of a multivariate normal distribution of the appropriate dimensions.

It is possible that the first four movement of the u_t much the multivariate normal movements, and they are still not normally distributed. It is hoped that most of the "normal" properties desired by the model fitter in the u_t are met by these four movements. This situation has an analog in linear regression. We assume that the errors are independent, but we can only test whether they co-related. In linear regression, it is adequate to test the co-relation of the residuals. If they are uncorrelated, that is enough "independency" for getting variance calculation correct. We don't worry about the other form of dependency.

3.2.8 Granger causality test

Based on the VAR estimation, Granger causality test is run in order to observe the causality and its direction among variables or Granger causality test is implemented to identify how much the one factor significant in forecasting the other one (granger, 1987). This test simply checks

whether or not the past values of one variable would explain or imply a change in present values of the other variables. In that respect, a change in the past values of one variable would enable one to predict present values of the other variables. In principle, if this is the case that changes in X variable is observed and then changes in Y variable is happened, then it can be said that X Granger cause Y. In other words, if past values of X variable increases the prediction or forecasting of Y variable, then it is said that X Granger cause Y. The hypotheses of Granger causality test are the following:

$$H_O: Y_t \; does \; not \; cause \; X_t$$

$$H_1: \; Y_t \;\; cause \;\; X_t$$

Where : Y_t and X_t are random time series variables.

CHAPTER FOUR

4. RESULT AND DISCUSTION

The study is based on annual time series data observed from1974/75 to 2014/15.The total number of observation is 41 year. In this chapter the results of time series and data analysis in Ethiopia will be presented. The discussion begins by describing the data set and the result from the model selection procedure. Then result will be interoperated and discussed. Finally the relationship between government expenditure and economic growth in Ethiopia case will be analyzed. Data analysis was performed by EVIEWS software.

4.1 Descriptive analysis

In the empirical analysis five aggregate variables namely Real Domestic Product, Economic expenditure, Expenditure on Social Services, Expenditure on General Services and expenditure on misilaious expenses were used. Some descriptive statistics including the mean, the standard deviation, the coefficient of variation, minimum and maximum value of the variables under study are presented in **Table 4.1**.

Table 4.1 Descriptive statistics of series: 1974/75 to 2014/15

	RGDP	EEX	SSEX	GSEX	MEX
Mean	235958.7	12385.55	9506.701	7198.684	248.5685
Median	156247.2	2526.430	1910.210	2212.700	42.28000
Maximum	748021.1	91239.30	80328.11	51023.10	2593.000
Minimum	102407.0	230.2800	240.8800	363.2000	0.720000
Std. Dev.	172304.2	23136.87	17796.66	10826.85	568.6648
Sum	9674308.	507807.7	389774.8	295146.0	10191.31
Sum Sq. Dev.	1.19E+12	2.14E+10	1.27E+10	4.69E+09	12935186
Observations	41	41	41	41	41

4.2 Unit Root properties of individual series

The time series under consideration should checked for stationary before one can attempt to fit a suitable model. That is, variables have to be tested for the presence of unit root there by the order of integration of each series is determined. **Figure 4.1** suggests that most of the series of both endogenous and exogenous variables display a non-stationary behaviour.

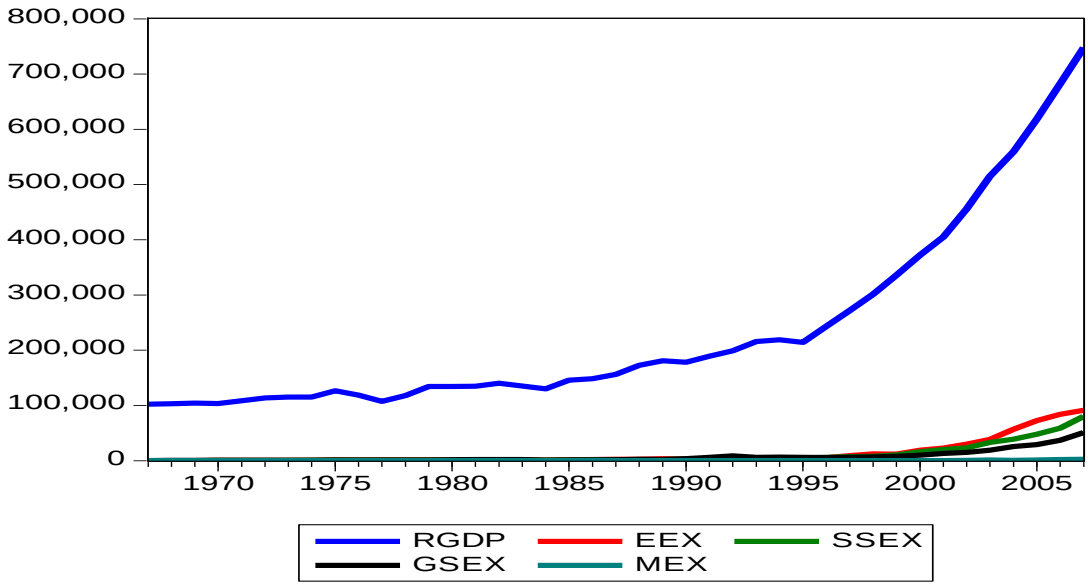


Figure 4.1: Time series plot of RGDP, EEX, SSEX, GSEX and MEX

- **Source author plot of graph by using eviews sot wear**

The stationarity of the series can be tested by using ADF test and PP test. The results of ADF and PP test, with intercept and intercept and trend both at level and first difference for each variable are presented in **Table 4.2** and Table **A1 (Appendix)**respectively. The critical values used for the test are the Mackinnon (1991) critical value. Test results, presented in both **Tables (4.2 and A1)** indicate that the null hypothesis of the variables in levels and first difference contain unit root test could not be rejected for all variables under consideration at 5% significant level.

Table 4.2: Unit root test results (At level)

Variables (series)	Level with intercept Test statistic		Prob*		Level with intercept and trend Test statistic		Prob*	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
RGDP	13.858311	14.84315	1.000	1.000	6.703544	6.456013	1.000	1.000
EEX	0.650355	6.886308	0.9894	1.000	0.126070	3.884332	.9965	1.000
SSEX	6.218379	37.73514	1.000	.9999	6.169287	67.63236	1.000	.9999
GSEX	11.02094	11.24209	1.000	1.000	8.48188	8.441936	1.000	1.000
MEX	6.98850	3.799084	1.000	1.000	5.781916	1.761346	1.000	1.000

*MacKinnon (1996) one-sided p-values (eviews soft ware)

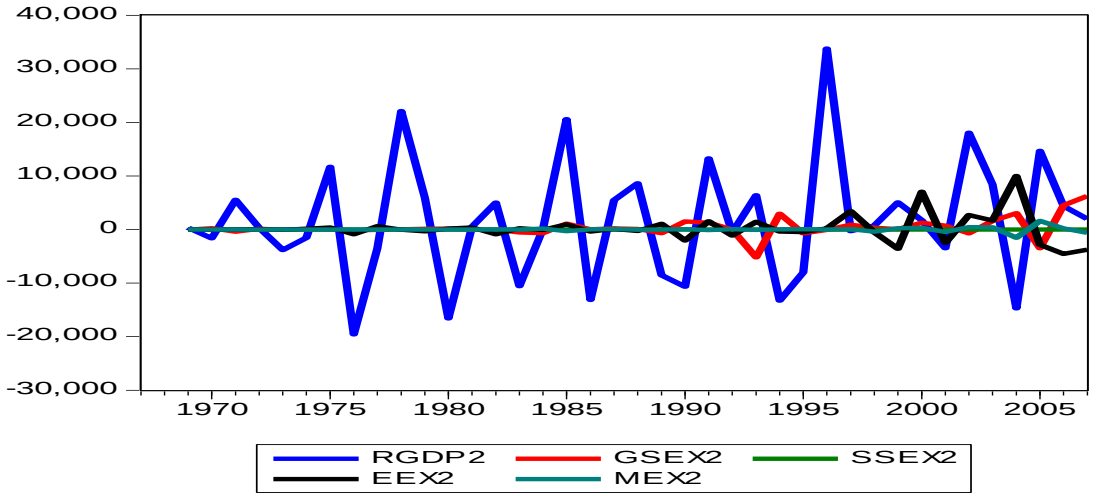
The null hypothesis were not rejected at level and first difference and in order to determine the order of integration of the non-stationary time series, the same tests were applied to their second difference. The result in **Table 4.3** indicates that the null hypothesis is rejected at the 2nd difference of all variables ,because the p-values is less than 5% of significance level with intercept and trend and intercept in both PP and ADF test. This implies that all the variables were integrated of degree two (I(2))

Table 4.3: Unit root test result (after 2nd difference).

Variables (series)	2nd difference with intercept				2nd with intercept and trend			
	Test statistic		Prob*		Test statistic		Prob*	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
2D(RGDP)	-8.62368	-9.48525	0.0000	0.000	-9.27267	-19.8900	0.000	0.000
2D(EEX)	-6.91006	-7.84109	0.0000	0.000	-5.09301	-9.63956	0.0011	0.000
2(DSSEX)	-5.41212	-5.48789	0.0001	0.0001	-6.35441	-6.35441	0.0000	0.000
2(DGSEX)	-4.70133	-5.82526	0.0005	0.0000	-5.68847	-6.42176	0.0002	0.000
2(DMEX)	-12.2440	16.84296	0.0000	0.000	-12.7974	-17.8050	0.0000	0.000
Critical value (5%)		2.94					3.54	

*MacKinnon (1996) one-sided p-values (eviews soft ware)

Figure 4.2: Time series plot of RGDP, EEX, SSEX, GSEX and MEX after 2nd difference.



*MacKinnon (1996) one-sided p-values (eviews soft ware)

4.3 VAR Model specification

4.3.1 Estimating for order of the VAR

Since we determined the stationarity nature of the variables, the next step in the bounds test approach of cointegration is estimating the VAR model using the appropriate lag length selection criterion. According to Pesaron and Shine, (1999), as sited in Narayan, (2002) for the annual data are recommended to choose a maximum of two lag lengths. AIC is preferred to determine the optimal lag length, because it is a better choice for smaller sample size data as this study. Apart from this AIC found to be produce the least probability of under estimation among all criteria available (Liew, et. Al. 2004) as cited in Tsadikan, (2013). But in this study other criteria like FPE, LR, SIC&HQ was considered. In **Table 4.4,** the lag length selection criterion is tabulated. The FPE, LR AIC and HQ test suggest appropriate lag length for the VAR model is two.

Table 4.4: VAR lag order selection result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-672.2968	NA	1.15e+13	38.58839	38.72171*	38.63441
1	-661.0076	19.99816	1.01e+13	38.45758	38.99084	38.64166
2	-649.1561	18.96239*	8.73e+12*	38.29463*	39.22784	38.61678*
3	-645.4692	5.266898	1.22e+13	38.59824	39.93140	39.05845
4	-639.9862	6.892944	1.59e+13	38.79921	40.53231	39.39748

* indicates lag order selected by the criterion

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4.3.2 Co-integration analysis

Once we know VAR lag order, the next is determine whether or not a long run equilibrium relationship exists among the unit root variables in a given model, we need to test empirically that the series in the model are cointegrated. So far there are two major procedures to test for the existence of cointegration, namely, the Engle-Granger two step procedures and the Johanson Maximum Likelihood Estimation procedure.

In the Engle Granger two step procedure, variables entering the cointegrating vector are tested for integration of the same order; in fact order of two[I(2)]. The first step is to estimate the long

run static model of the I(2) variables and obtain residual. If this residual, which is linear combination of the variables or the disequilibrium, is stationary, then the variables are said to be cointegrated. The second step in this procedure is to estimate the error correction model (ECM) in which the second difference of the dependent variable is regressed on other variables with their appropriate lags, and the first lag of the residual obtained in the first step. But a Johansson Juselious approach is preferred over Engel-granger method due to these statistical reasons. Since the entire dependant variables are integrated of order two we apply Johanson Juselious maximum likelihood method to obtain the number of cointegration vectors.

In Ethiopia case under the study period the result of co integration tests or condition (that is the existence of a long term linear relationship) for RGDP, GSEX, SSEX, EEX and MEX are presented in **Table 4.5**. The Trace statistics indicates that at least two cointegrating vector exists in the system at the95% confidence level, (estimated LR statistic 45.47>29.8and 19.99 > 15.5 critical value). But at most two; there is no co integration among the variables because 2<3.8 or 0.16>0.05significant level. In order to cross check for identifying the specific number of co integrated vectors; the max- Eigenvalue statistics is further employed. This statistics confirms that the existence of two cointegrating relationship at the 95% confidence level in this system (estimated LR statistic 25.48>21.13 and 17.98 >14.26 critical value) but the result of max-Eignvalue at most two estimated LR statistics value is the same to that of trace test statistic value. Generally in Ethiopian case the result of the cointegration (the existence of a long term linear relation) is presented in **Table 4.5** Trace Statistics and Maximum Eigenvalue using methodology prepared by Johnson and Juselius (1991) shows the rank of cointegration among the variables.

Table 4.5: Johansen co integration test results (by assumption: linear deterministic trend)

Hypothesized # of co.in Vector	Eigenvalue	Trace test			Maximum Eigen value test		
		Statistic	critical value	Prob**	Statistic	critical value	Prob**
None*	0.507210	45.46990	29.79707	0.0004	25.47616	21.13162	0.0115
Atmost1*	0.393173	19.99374	15.49471	0.0098	17.98240	14.26460	0.0123
Atmost2	0.054338	2.011332	3.841466	0.1561	2.011332	3.841466	0.1561

Trace test and Max-Eignvalue test includes 2 cointegration equation's at the 0.05 level.

*denotes rejection the null hypothesis at 0.05 level.

*Mackinnon-Haug-Michelis (1999) P-value

Source: - authors plotting Eview 9

Normalized; cointegrating coefficients (standard error in parentheses).

RGDP	GSEX	SSEX
1.000000	-4.046251	-87816.37
	(2.30186)	(21296.1)

In the above cointegration **Tables 4.5**, both trace statistics and maximum Eigen value statistic presented, there are at most one; cointegration among the endogenous variable at 5% level of significance. In other words there is long run relationship among the variables. I.e. the null hypothesis is rejected at most two.

The values corresponding to the cointegrating coefficient of RGDP (normalized to one), GSEX and SSEX respectively are: β = (1, -4.05, -87816.37), and thus, vector can be expressed as follows:

$RGDP_t$= 457.9524+ 4.046251 ($GSEX_t$) +87816.37 ($SSEX_t$)

From this analysis and results the finding of this research considering the long run positive impact of general services expenditure and social services expenditure on Ethiopian economy growth, are consistent with endogenous growth and Keynesian economist theories mainly advocated and/or developed by Lucas, (1988),Romer, (1990), Ram,(1986) , Omoke,(2009) Biswal,(1990) which argue that improvement of government expenditure leads to productivity improvement that enhance output and increase government expenditure on socio economic and physical structure improve countries economic growth. And also the findings of this research are consistent with Ram, (1996) in 115countries, Lin, (1994) in LDCs, Bose, et.al. (2003) in 30 developing countries in capital expenditure, Kalio, (2000) in Kenya in capital expenditure and in Ethiopia Teshome, (2006), Wondewasen, (2012) and Zerihun Assefa, (2014).

4.4 Model Estimation (Vector Error Correction (VAR) Models)

Obtaining long run estimates of cointegration relationships is only a first step to estimating the complete model. The short run structure of the model is also important in terms of the

information it express on the short run adjustment behavior of economic variables. The analysis of short run dynamics is often done by first eliminating trends in the variables, by differencing. The more appropriate approach is converting the dynamic model in to an error correction model (ECM). ECM contains information on both the short run and long run properties of the model, with disequilibrium as a process of adjustment to the long run model.

Having to conclude the relationship between government expenditure and economic growth in a country that variables in the VAR model appears to be cointegrated, so that to now this we proceed to estimate the short run behavior and the adjustment to the long run models, which is represented by VECM. The coefficient estimates of the VECM are presented in **Table A2 (appendix)**. This table consists of two parts; the first part contains the detail of the cointegration vector which is derived by normalizing the real gross domestic product. The result indicate that, the long run coefficients of real gross domestic product has positive long run relationship with, expenditure on social services expenditure and expenditure on general services . The long run equation is given as follow:

$RGDP_t = 457.9524 + 4.046251\ (GSEX_t) + 87816.37\ (SSEX_t)$

The value 4.05 suggests that other things remain constant a one unit change in governmental expenditure on general services in a time t induces, on average, about 4.05times change in real gross domestic product. Similarly, one unit change in government expenditure on social services induces, on average, change of about 87816.37 times the country real gross domestic product. The second part of the **table A2** contains the coefficients of the error correlation terms **(cointEq1)** for the cointegration vector. These coefficients are called the adjustment coefficients. This measures the short run adjustments of the deviations of the endogenous variables from their long run value.

The result in **table A2 (appendix)** shows that the adjustment coefficients have negative and positive value of RGDP, GSEX and SSEX (-0.74, 0.02 and 0.01) respectively and significant with large t-values. The figures in this row identify the fraction of the long -term gap that is deviation of RGDP from GSEX and SSEX each year. Because the coefficient indicated in the table the long run gap between real GDP and these two variables are not close to each other (the positive and negative sign of the coefficient). Therefore in the long run RGDP with GSEX and SSEX will not expect to have an equilibrium point in the study period. The first equation, i.e. the

RGDP equation (equation (1) below), shows that the remaining long-term RGDP gap disparities by about 74% in each period with GSEX and SSEX when GSEX and SSEX close by2% and 1.06% respectively. In short these results indicated that RGDP and both GSEX and SSEX cannot achieve equilibrium in the long run. But both dependant and independent variables have increasing patterns (consistent with the Keynesians finding).

Finally, using the error correction term as another independent variable we can estimate the following Vector Error Correction Model.

D(RGDP2) = C(1)*(RGDP2(-1) - 4.0462511876*GSEX2(-1) - 87816.3742902*SSEX2(-1) - 457.952378332) + C(2)*D(RGDP2(-1)) + C(3)*D(RGDP2(-2)) + C(4)*D(GSEX2(-1)) + C(5)*D(GSEX2(-2)) + C(6)*D(SSEX2(-1)) + C(7)*D(SSEX2(-2)) + C(8) + C(9)*EEX2 + C(10)*MEX2

$DRGDP_t$=0.741(-$RGDP_{t-1}$+4.046251*$GSEX_{t-1}$+87816.37*$SSEx_{t-1}$+457.9524)-
0.201132*$DRGDP_{t-1}$-0.381334*$DRGDP_{t-2}$-0.657185*$DGSEX_{t-1}$+1.143250*$DGSEX_{t-2}$-
55216.48*$DSSEX_{t-1}$-34070.51*$DSSEX_{t-1}$+291.7656+0.207663*EEX-1.474983*MEX------eq (1)

The equation explain that estimated coefficient of RGDP (one period lag value)has statically significant negative long run relationship to economic growth, but GSEX(one period lag value) and SSEX (one period lag value) has statically significant positive long run relationship with RGDP. Because, the sign of the confident is positive and P- value 3.07% is less than 5% significant level. While the estimated coefficient of RGDP (two period lag values), SSEX (one and two period lag value) has significant negative short run relationship with RGDP. On the other hand RGDP (one period lag value),GSEX (one period lag value) and MEX has negative and insignificant but GSEX (two period lag values) and EEX have positive insignificant short run relationship with RGDP at 5% level.

D(GSEX2) = C(11)*(RGDP2(-1) - 4.0462511876*GSEX2(-1) - 87816.3742902*SSEX2(-1) - 457.952378332) + C(12)*D(RGDP2(-1)) + C(13)*D(RGDP2(-2)) + C(14)*D(GSEX2(-1)) + C(15)*D(GSEX2(-2)) + C(16)*D(SSEX2(-1)) + C(17)*D(SSEX2(-2)) + C(18) + C(19)*EEX2 + C(20)*MEX2

DGSEXt=0.0197($RGDP_{(t-1)}$-4.046251*$GSEX_{(t-1)}$-87816.37*$SSEX_{t-1}$-457.9524)-
0.003790*D($RGDP_{(t-1)}$)-0.029515*D($RGDP_{(t-2)}$)-0.756202*D($GSEX_{(t-1)}$-0.524437*D(GSEX(t-

$_{2}$)+3205.078*D($SSEX_{(t-1)}$)+1051.441*D($SSEX_{(t-2)}$))+295.6710-0.173754*(EEX)-2.274024*(MEX) ----------eq(2)

From equation (2) we can understand the estimated coefficient of RGDP (one period lag value) statically has positive insignificant long run relationship with GSEX, but GSEX (one period lag value) and SSEX (one period lag value) has statically insignificant negative long run relationship with GSEX .On the other hand GSEX (one and two period lag value) and MEX have a negative significant short run relationship with GSEX. RGDP, (one and two period lag values) and EEX have a negative insignificant shot run relationship with GSEX, but SSEX (one and two period lag value) has positive insignificant short run relationship with GSEX at a time.

D(SSEX2) = C(21)*(RGDP2(-1) - 4.0462511876*GSEX2(-1) - 87816.3742902*SSEX2(-1) - 457.952378332) + C(22)*D(RGDP2(-1)) + C(23)*D(RGDP2(-2)) + C(24)*D(GSEX2(-1)) + C(25)*D(GSEX2(-2)) + C(26)*D(SSEX2(-1)) + C(27)*D(SSEX2(-2)) + C(28) + C(29)*EEX2 + C(30)*MEX2

$DSSEX_t$=0.010578(RGDP$_{(t-1)}$-4.o46251*GSEX$_{(t-1)}$-87816.37*SSEX$_{(t-1)}$-457.9524)-0.02233557*D(RGDP$_{(t-1)}$)-0.0117492853*DRGDP$_{(t-2)}$)+0.022167846*D(GSEX$_{(t-1)}$)-0.007411742*D(GSEX$_{(t-2)}$)+0.054484*D(SSEX$_{(t-1)}$)-0.007204*D(SSEx$_{(t-2)}$)-0.004023+0.0171926251*(EEX)+0.0658297422(MEX)------eq(3)

From equation (3) like the above two equation only the estimated coefficient of RGDP(one period lag value)has a positive statistically significant long run relationship with SSEX but GSEX and SSEX(one period lag value) have statistically significant negative long run relationship with SSEX. In parallel RGDP (one and two period lag value) has a negative significant short run relationship with SSEX, but GSEX and SSEX (two period lag values), have negative insgnifant short run relationship with SSEX. And also GSEX and SSEX (one period lag value), EEX and MEX have positive insignificant short run relationship with SSEX.

Generally the main objective of VAR estimation is that to identify whether the variables have short run or long run relationship one variable with another. Based on the objective of this section or estimation the result of adjustment equation indicates (estimated) that:

RGDP has negative significant long run relationship with RGDP (one period lag value), but positive significant long run relationship with GSEX and SSEX (one period lag value. While

RGDP has a negative significant short run relationship with RGDP (two period lag value) and SSEX (one and two period lag values).

GSEX has only negative significant short run relationship with GSEX (one and two period lag value), and MEX.

SSEX also has a positive significant long run relationship only with RGDP (one period lag value) and negative significant long run relationship with GSEX and SSEX (one period lag value). On the other hand there are a negative significant short run relationship between SSEX and RGDP (one and two period lag value).see more on (**appendix A2toA3**).

Where: D is for difference, the value in the bracket is the error correction term and the coefficients of error correction term are called adjustment coefficients.

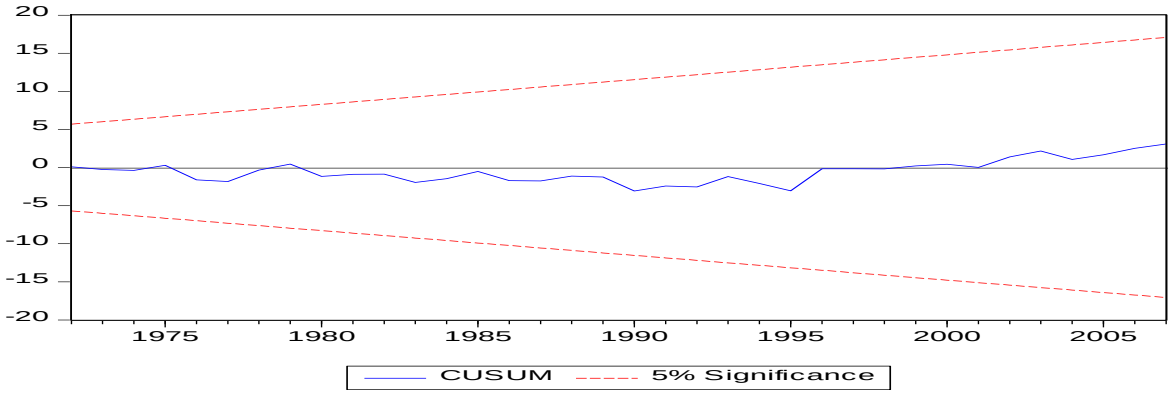
4.5 Model checking

In order to ascertain whether the model provides an appropriate representation, a test for misspecification should be performed.

4.5.1 Stability Test

Stability test is one of the important tests to check whether endogenous variables (model) are stable or not. The stability of long run estimates has been tested by using the cumulative sum of recursive residuals (CUSUM) test .Since the test statistics of this stability test can be graphed, we can distinguish not only their significance but also at what point of time a possible instability (structural break) occurred. If the plot of CUSUM statistic moves between the critical bounds (at 5% significant level), then the estimated coefficients are said to be stable.

Figure 4.3 .Testing parameter stability using CUSUM test



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Note: The straight lines represent critical bounds at 5% significant level.

As can be seen from figure 4.3 the plot of CUSUM test did not cross the critical limits. This shows that the graph do not cross the lower and the upper critical limits. As a result, we can conclude the long run and short run estimates are stable. Hence the results of the estimated model are reliable and proficient.

In addition to this, we conducted stability check test for the model (**Appendix A4**) and found to impose two unit roots indicating that the model is stable and there are two potentially co-integrating equation in the system. Similarly, the roots of characteristic polynomial as clearly showed figure in (**appendixA4)**, component the existence of double cointegration equation. In verse root of AR characteristics polynomial shows no point residuals outside the circle. This again confirms the model is stable and there are potentially two cointegrated equation in the system.

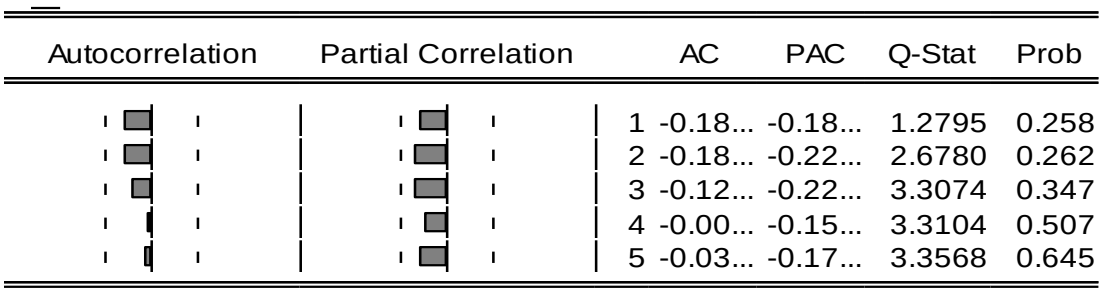
4.5.2 Test of serial correlation (autocorrelation)

To detecting serial correlation or residual autocorrelation test is help us to justify the residual have auto correlated or not with each other (εt have auto correlated or not with εt-1).If dependant variables RGDP, GSEX, and SSEX are express in the form RGDP (-1), GSEX (-1) and SSEX (-1) are called regressive model. Meaning that, these dependant variables are themselves regressing by one period lag. Normally in time series data, serial correlation (autocorrelation) problem regularly is able to become visible. So to make sure whether these models has affected by serial correlation or not we can use Durbin-Watson statistics test, but when the models are regressive model D.W statistics test were not suitable (advisable). So we should better to use correlogram approach for individual model or residual, portmanteau and (LM) autocorrelation test approach for model in general model. To test residual autocorrelation (serial correlation):

H0: There is no autocorrelation (serial correlation) in the residual.

H1: There is autocorrelation (serial correlation) in the residual based on the 'P'value other criteria. The following figure and table indicate sample result of serial or autocorrelation.

Figure4.4.Correlogramof Residualssquaredtest (Q-statistics)



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The result from the figure indicates that residuals are no serial correlated based on the following criterion: AC value or function is almost zero or very close to zero, The value of Q-statistic should be greater than 5% level, The probability value also should be greater than 5% level, The spank must between the two lines. Therefore as we have seen from the figure all criterions are successfully fitted. The null hypothesis is not rejected rather we accept. Table 4.6 also confirms the above result, meaning that there is no serial or autocorrelation in the model or in the residual model in general.

Table 4.6.Test of residual autocorrelation (portmanteau and LM test)

Lag	Q.Stat		Adj.Q-Stat		LM-Stat	
	Value	Prob&	Value	Prob*	Value	Prob*
1	2.707813	NA*	2.875179	NA*	5.759177	0.7638
2	7.281046	NA*	7.627426	NA*	6.913570	0.6461
3	13.94446	0.1243	14.89660	0.0938	15.02673	0.0902
4	20.44001	0.3086	22.20410	0.2230	10.64951	0.3005
5	25.66424	0.5373	28.27094	0.3971	6.757046	0.6624

*****The test is valid only for lags larger than the VAR lag order. **Source: -** authors plotting Eview 9

As we have seen the **Table 4.6** presents the results of the portmanteau autocorrelation, Adj.Q-statistic and autocorrelation Lagrange Multiplier (LM) test for VECM residual serial correlation. These tests are used to test for the overall significance of the residual autocorrelation problem up to lag two. Both results suggest that there is no obvious residual autocorrelation problem up to lag two because all p- value larger than the 5% level of significance. In this context the null hypotheses is accepted rather than rejected. But alternative hypothesis is rejected. In short both results indicate there is no serial or autocorrelation problem.

4.5.3 Testing Normality

Multivariate version of the Jarque Bera tests is used to test the normality of the residuals by using cholesky of covariance (Lutkepoh).The test has null hypothesis indicating that the error term in the model has skewness and kurtosis corresponding to the normal distribution. In other words null hypothesis; the residual is normally distributed .The result in **Table 4.7** shows that the null hypothesis has to be accepted in all aspects of the jarque Bera testes. This implies that residual is normally distributed by rejection of alternative hypothesis

Table 4.7 .Normality test

Component	Jarqu.Bera	Prob*	Skewness	Prob*	Kurtosis	Prob*
1	3.257940	0.1961	0.132610	0.7453	1.550304	0.0758
2	1.012891	0.6026	-0.230639	0.5721	3.680061	0.4049
3	2.355249	0.3080	0.011953	0.9766	1.747165	0.1249
Joint	6.626081	0.3568	0.425537	0.9349	6.200544	0.1023

Source author calculation Eivew9

4.5.4 Lag exclusion test

To check whether the chosen lag is optimal or not, Wald lag exclusion test is used. Given that VAR modeling requires uniform lag length for each variable, the result in **Table 4.8** shows that lag 2 is significant for all variables at 5% level of significance jointly. The null hypothesis is the chosen lag is not optimal. Therefore according to the Wald lag exclusion test null hypothesis is rejected and alternative hypothesis is accepted, because P-value is less than the 5% significant level. That is, the value in the square brackets indicates probability value for the corresponding chi-square statistics. Therefore; VAR at the second lag is found the most favorable for the data set and hence could be adopted.

Table4.8. VAR Lag Exclusion Wald Test

Numbers in [ ] are p-values

	D(RGDP2)	D(GSEX2)	D(SSEX2)	Joint
DLag 1	19.98342	27.80531	23.99994	61.49363

	[0.000171]	[3.99e-06]	[2.50e-05]	[6.90e-10]
DLag 2	15.43036	10.18219	7.518837	31.75121
	[0.001483]	[0.017079]	[0.057076]	[0.000220]
Df	3	3	3	9

Source author calculation from Eview 9

4.6 Structural Analysis

4.6.1 Granger –Causality Test

Granger causality test is considered a useful technique for determining whether one time series is good forecasting for the other or one variable has a long run relationship with another. The concept of Granger causality test is search when the coefficients of the lagged of the other variables are not zero. Table 4.9 presents results from the VAR Granger Causality /Block Exogeneity Wald test.

VEC Granger Causality/Block Exogeneity Wald Tests

Sample: 1967 2007

Dependent variable: D(RGDP2)			
Excluded	Chi-sq	Df	Prob.
D(GSEX2)	2.826478	2	0.2434
D(SSEX2)	6.290889	2	0.0430
All	14.12478	4	0.0069

Dependent variable: D(GSEX2)			
Excluded	Chi-sq	Df	Prob.
D(RGDP2)	2.257738	2	0.3234
D(SSEX2)	0.812095	2	0.6663
All	2.948406	4	0.5665

Dependent variable: D(SSEX2)			
Excluded	Chi-sq	Df	Prob.
D(RGDP2)	7.728443	2	0.0210

D(GSEX2)	5.200408	2	0.0743
All	9.654938	4	0.0467

Source: - authors plotting Eview 9

The result shows that SSEX Granger causes RGDP, and also; the converse is true, or RGDP has granger cause SSEX (has bidirectional relationship). This indicates that the change in SSEX precedes the change in RGDP, and that the last information on the SSEX provides important information to forecast future value of the RGDP and the last information on RGDP is provides important information to forecast future value of SSEX and at 5% significant level. But others result indicated from the table all variables have not granger cause of other variables. Meaning that null hypothesis is accepted except the two variables individually.

On the other hand Granger causality test is important to recognize whether the two independent variables jointly can influence the dependant variable or not in multivatiar time sires VAR model, and this test is supported by VAR Granger causality (Block exogeneityWald test). The result from **Table 4.9** indicates GSEX and SSEX are jointly can affect RGDP significantly at 5% level or GSEX and SSEX jointly have a Granger causes of RGDP, and also RGDP and GSEX jointly have a Granger cause of SSEX.(i.e. they have bidirectional relationship) at 5% significant level but RGDP and SSEX jointly have not Granger causes of GSEX.

CHPTER FIVE

5 SUMMARY, CONCLUSION AND POLICY IMPLICATION

5.1 Summary

The thesis is containing five chapters. Chapter one is the introductory parts of the paper; it includes the background, problem of the statement, research question, hypothesis formulated, objectives of the study ,significance of the study, scope, limitation and organization of the research paper.

Government expenditure is simply refers the value of all goods and services provide by the public sector (government).This kind of expenditure is directed towards accelerating economic growth and economic development with ultimate aim of transferring the nation in to an industrialized economy as well as raising standard of living of the people. In general government expenditure classified as capital and recurrent expenditure. The capital expenditures are expenditure spending by government on capital project like: road, dams, electricity, education, health, and soon. While recurrent expenditure includes; the expenditures of government on administration such as wage, salaries, interest, maintenance, loan and soon.

This thesis will fill the gap of the long run relationship between government expenditure and economic growth within four categories. Economic Expenditure(EEX),Social Services Expenditure(SSEX),General Service Expenditure(GSEX) and Miscellaneous Expenditure(MEX) from 1974/75 and 2014/15 at the same time by using multivariate time sires analysis, econometric methodology of co-integration and Granger causality in order to identify empirically whether government expenditure has positive or negative relationship with economic growth and to assess and identify the long run relationship between these sectorial spending by the government and economic growth (real GDP), to provide common clarification to further researchers and to make concluding, remarks with policy implementation.

The research answers the following three questions:

1. Do aggregate economic expenditure, aggregate social service expenditure, aggregate general service expenditure and aggregate miscellaneous expenditure have a significant long run relationship on economic growth in Ethiopia?

2. Is there a causal relationship between government expenditure and economic growth in Ethiopia and what will be the direction of the relationship between them in the long run?
3. Which government expenditure or variable have strong relationship with economic growth in the long run in Ethiopia.

And the general objective is to provide a comprehensive study and critical overview of the long run relationship between government expenditure and economic growth in Ethiopia over a specific period of time; (1974/75 to 2014/15).

In chapter two is review of related literature and it has two parts: theoretical literature and empirical literature. Theoretical literature includes review of economic growth, review of government expenditure, and theoretical explanation of Wagner's law, Keynesian approach and practical observation of government expenditure and economic growth, Neo-classical growth model.

In chapter three already discussed the methodology part including data sources methods of analysis, Model specification, Vector Autoregressive (VAR) model and test like stationarity or unit root, by using Augmented Dickey Fuller and Phillips-perron test, estimating order of the VAR, co-integration analysis, Vector error correction model (VCM) and model checking by using different test such us: test of residual autocorrelation, normality, Granger causality test and etc.

Chapter four is the empirical analysis; it is divided in to two parts the first part is the descriptive analysis and the second part is econometric analysis with model and causality relationship analysis. The stationarity of the series can be tested by using ADF test and PP test. Test results, indicate that the null hypothesis of the variables in levels and first difference contain unit root test could not be rejected for all variables under consideration. That is, their respective p- values are greater than conventional significant level of 5%. But the null hypothesis is rejected at the 2^{nd} difference of all variables ,because the p-values is less than 5% of significance level with intercept and trend and intercept in both PP and ADF test. This implies that all the variables were integrated of degree two (I(2)). To tabulate the optimal lag of the model based on FPE, LR AIC and HQ test suggest appropriate lag length for the VAR model is two.

In Ethiopia case under the study period the result of co integration tests of the Trace statistics and max-Eignvalue indicates that there are the existence of a long term linear relationship among RGDP, GSEX, SSEX, EEX and MEX. This statistics confirms that the existence of two cointegrating relationship at the 95% confidence level. VECM contains information on both the short run and long run properties of the model, with disequilibrium as a process of adjustment to the long run model. The result indicate that, the long run coefficients of real gross domestic product has positive long run relationship with, expenditure on social services and expenditure on general services .

The model also checked by different test like: Stability tests, normality test, autocorrelation (serial correlation) test, lag exclusive test and also granger causality test. The last chapter includes conclusion and policy implication based on the result and practical observation.

5.2 Conclusion

The main objective of the study is to analyze the long run relationship between government sectorial expenditure and economic growth in Ethiopia (using real GDP); and fit a multivariate time series model for real GDP and its component which can be used to determine the long run relationship between government expenditure and economic growth in Ethiopia. The analysis was based on annual data from 1974/75 to 2014/15. The series used in this study are RGDP, GSEX and SSEX and also EEX and MEX were included as independent variables. To determine the long run relationship between government expenditure and economic growth, (real GDP) the study has used the Vector Autoregressive model (VAR) approach to co-integration and the error correction model (ECM).

The main finding of this thesis is that in the long run relationship between economic growth and aggregate sectorial government: expenditure on social service, expenditure on general service, economic expenditure and mislanious expenditure are the main contributors to the growth of real GDP. In other words, the result tells as the economic performance can be improved significantly when the ratio of public expenditure on these sectors to real GDP increases. Meaning that over the time period considered, all the series showed an increasing pattern, that is the sign of non stationary in each of the series. In order to determine the VAR model, the unit root tests (ADF and Phillips-Perron tests), identification the number of lags and co integration analyses were contacted. Unit root tests indicate that all variables are non stationary at level and first difference but stationary in the second difference at 5% significant level.

Johansen co-integration test suggests that there is at least one cointegration vector, which describes the long run relationships, so there are at most two cointegration vectors in this thesis to describe the long run relationship between RGDP, GSEX and SSEX. The appropriate number of lag was two. Farther more, Granger causality test are applied to explore the long run relationship. From these result we can understand all other things remain constant, one unit change in government expenditure on general service brought 4.05 unit changes in real GDP and a one unit increase in government expenditure on social services has resulted in 87816.37 unit change in real GDP. Next to these independent variables like government expenditure on economic activity and on mislanious expenditure change; RGDP per capita changes 0.21 and -1.5 times per unit respectively.

On the other hand, one unit increase in real GDP; government expenditure on general services increase by 0.25units and a one unit increase in government expenditure on social services 21703unit times increase government expenditure on general services. While, one unit increase in RGDP, expenditure on social service increase 0.0077unit times and one unit increase in government expenditure on general service 0.0311unit time increase in government expenditure on social services.

However, government expenditure on recurrent drought has negative impact on the economy. The finding of this research concerning, the long run positive relationship between aggregate sectoral expenditure and economic growth employed Keynesian theory of government expenditure and economic growth relationship (mainly advocated and developed by) Mankiw, Romer and Weil (1992), (JU-Haung, 2006) and (Omoke, 2009)and practical observation which argue that important government expenditure leads to productivity improvement and output growth.

In the short run, the coefficient of error correction term is -0.74, 0.02 and 0.01 suggesting that about74.1, 2 and 1.06 percent for RGDP, GSEX and SSEX respectively annual adjustment towards long run equilibrium. This is another proof for the existence of a stable long run relationship among the variables. And also both cointegration result and the estimated short- run model reveals that expenditure on social service is the main contributor to the growth of real GDP change. On the other hand RGDP one period lag has statically significant negative and SSEX one period lag and GSEX one period lag has statically significant positive long run relationship with real GDP growth. But the estimated coefficient of RGDP two period lag, SSEX one and two period lag values have statically significant negative short run relationship with real GDP.

When we see another dependant variables government expenditure on general services (GSEX) have statically insignificant long run relationship with all variables but GSEX (one and two period lag value) and MEX have statically negative significant short run relationship with GSEX. And expenditure on social service (SSEX): RGDP (one period lag value) have statically significant positive long run relationship with SSEX but GSEX and SSEX one period lag value has statically negative relationship with SSEX. While RGDP one and two period lag values have

negative, statically significant short run relationship with SSEX; other variables are insignificant relationship with these endogenous variables.

Granger causality is one a use full technique for determining whether one time series has a long run relationship with another .The result of Granger Causality (Block exogeneity Wald test) in a Vector Correction Model indicated bidirectional (two-way) causality, running from government expenditure on social services to economic growth,(real GDP) while there is no causality runs from other sectoral government expenditure to economic growth (real GDP) and vice versa individually.

On the other hand causality also can check jointly by using Granger Causality (Block exogeneity Wald test) the outcome indicates that government Expenditure on general services (GSEX) and government Expenditure on Social Services(SSEX) jointly has bidirectional(two-way) causality to economic growth,(real GDP). Therefore, the study recommended the need to stimulate economic growth by allocating appropriate proportion sectoral government expenditure in the national budget.

5.3 Policies Implication

The result of this study has important policy implications. In order to improve economic growth, public expenditure needs to be better prioritized towards basic social services provision. In addition, to achieve a better economic growth, more resources should be devoted to social services for the citizen of the country. Such measures have a large impact on human productivity which leads to improve national output per capita. In other words as more people become educated, skilled, healthy, urban development, social welfare, culture and sport and bought all infrastructures like road, water, electrification and communication etc, they will increase productivity in the long run. Next to this government expenditure on general services also important to improve economic growth in a nation especially in developing country like Ethiopia. Because without government intervention economic growth in developing country by itself in risk. In order to avoid this and such kinds of problem the government and the policy maker should focused more on social services expenditure because the result completely confirm the Keynesians view in Ethiopian case.

Generally policy makers and the government should fight to create institutional capacity to increases; first for social services, second for general services, and other economic activities for economic growth. That means, the policy makers and the government should center on securing more resources and structures that are essential and appropriate for better social services and improve basic general services provision. Such measures should focus not only on creating new social services institutional capacity, but also the on strengthening and changing institutional setup on the over all of sectoral expenditure of Ethiopia can produce qualitative and quantitative output so as to improve annual real GDP. In addition, to this the government should also improve by transform the policy and its leadership role in creating enabling environment that encourage better investment opportunity in social services, general services, any economic and mislanious activities in economic growth by the private sector. Because, good participation of the private sector; in all sectorial activities, can speed up economic growth in Ethiopia.

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APPENDIX

Table A1. Unit root test results (after first difference)

Variables (series)	1st difference with intercept				1st difference with intercept and trend			
	Test statistic		Prob*		Test statistic		Prob*	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
D(RGDP1)	1.321883	-0.07617	0.9983	0.9450	-0.58090	2.529727	0.9743	0.3130
D(EEX1)	-1.65067	-1.56999	0.4478	0.4881	-2.57186	2.560725	0.2945	0.2993
D(SSEX1)	4.830686	11.68075	1.000	1.000	3.560175	5.328055	1.000	1.000
D(GSEX1)	3.477925	1.836701	1.000	0.9997	2.105838	0.417031	1.000	0.9986
D(MEX1)	1.251713	-6.26290	0.9979	0.000	0.245147	-7.07750	0.9975	0.000
Critical value (5%)		2.94			3.52			

*Mackinnon (1996) one-sided p-value

Table A2.VECM

Vector Error Correction Estimates
Date: 10/07/16 Time: 05:11
Sample (adjusted): 1972 2007
Included observations: 36 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
RGDP2(-1)	1.000000
GSEX2(-1)	-4.046251 (2.30186) [-1.75782]
SSEX2(-1)	-87816.37 (21296.1) [-4.12360]
C	-457.9524

Error Correction:	D(RGDP2)	D(GSEX2)	D(SSEX2)
CointEq1	-0.741001 (0.33662) [-2.20132]	0.019692 (0.05198) [0.37883]	1.57E-05 (4.4E-06) [3.56810]
D(RGDP2(-1))	-0.201132 (0.24764) [-0.81218]	-0.003790 (0.03824) [-0.09909]	-9.01E-06 (3.2E-06) [-2.77642]

D(RGDP2(-2))	-0.381334	-0.029515	-4.74E-06
	(0.18065)	(0.02790)	(2.4E-06)
	[-2.11096]	[-1.05805]	[-2.00341]
D(GSEX2(-1))	-0.657185	-0.756202	3.29E-05
	(1.86560)	(0.28809)	(2.4E-05)
	[-0.35226]	[-2.62488]	[1.34407]
D(GSEX2(-2))	1.143250	-0.524437	-1.10E-06
	(1.58862)	(0.24532)	(2.1E-05)
	[0.71965]	[-2.13778]	[-0.05273]
D(SSEX2(-1))	-55216.48	3205.078	0.054484
	(23795.0)	(3674.47)	(0.31193)
	[-2.32051]	[0.87226]	[0.17467]
D(SSEX2(-2))	-34070.51	1051.441	-0.007204
	(14664.2)	(2264.47)	(0.19223)
	[-2.32338]	[0.46432]	[-0.03747]
C	291.7656	295.6710	-0.004023
	(1857.39)	(286.821)	(0.02435)
	[0.15708]	[1.03085]	[-0.16523]
EED2	0.207663	-0.173754	6.93E-06
	(0.79151)	(0.12223)	(1.0E-05)
	[0.26236]	[-1.42158]	[0.66790]
EME2	-1.474983	-2.274024	9.77E-05
	(5.61804)	(0.86755)	(7.4E-05)
	[-0.26254]	[-2.62120]	[1.32660]
R-squared	0.735794	0.685428	0.712919
Adj. R-squared	0.644339	0.576538	0.613545
Sum sq. resids	3.18E+09	75884644	0.546855
S.E. equation	11063.20	1708.403	0.145027
F-statistic	8.045355	6.294677	7.174087
Log likelihood	-380.4338	-313.1835	24.28584
Akaike AIC	21.69077	17.95464	-0.793658
Schwarz SC	22.13064	18.39450	-0.353791
Mean dependent	-99.97396	185.3689	-0.000962
S.D. dependent	18550.79	2625.326	0.233292
Determinant resid covariance (dof adj.)		6.57E+12	
Determinant resid covariance		2.47E+12	
Log likelihood		-666.9145	
Akaike information criterion		38.88414	
Schwarz criterion		40.33570	

Table A3

System: UNTITLED
Estimation Method: Least Squares
Date: 10/09/16 Time: 05:17
Sample: 1972 2007
Included observations: 36
Total system (balanced) observations 108

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.741001	0.336616	-2.201323	**0.0307**
C(2)	-0.201132	0.247643	-0.812182	0.4192
C(3)	-0.381334	0.180645	-2.110958	**0.0380**
C(4)	-0.657185	1.865602	-0.352265	0.7256
C(5)	1.143250	1.588623	0.719648	0.4739
C(6)	-55216.48	23794.98	-2.320510	**0.0229**
C(7)	-34070.51	14664.17	-2.323385	**0.0228**
C(8)	291.7656	1857.385	0.157084	0.8756
C(9)	0.207663	0.791506	0.262364	0.7937
C(10)	-1.474983	5.618042	-0.262544	0.7936
C(11)	0.019692	0.051981	0.378833	0.7058
C(12)	-0.003790	0.038242	-0.099095	0.9213
C(13)	-0.029515	0.027896	-1.058053	0.2933
C(14)	-0.756202	0.288090	-2.624880	**0.0104**
C(15)	-0.524437	0.245319	-2.137778	**0.0357**
C(16)	3205.078	3674.471	0.872256	0.3857
C(17)	1051.441	2264.472	0.464320	0.6437
C(18)	295.6710	286.8214	1.030854	0.3058
C(19)	-0.173754	0.122226	-1.421576	0.1591
C(20)	-2.274024	0.867550	-2.621202	**0.0105**
C(21)	1.57E-05	4.41E-06	3.568102	**0.0006**
C(22)	-9.01E-06	3.25E-06	-2.776419	**0.0069**
C(23)	-4.74E-06	2.37E-06	-2.003407	**0.0486**
C(24)	3.29E-05	2.45E-05	1.344071	0.1828
C(25)	-1.10E-06	2.08E-05	-0.052734	0.9581
C(26)	0.054484	0.311928	0.174669	0.8618
C(27)	-0.007204	0.192232	-0.037473	0.9702
C(28)	-0.004023	0.024348	-0.165231	0.8692
C(29)	6.93E-06	1.04E-05	0.667902	0.5062
C(30)	9.77E-05	7.36E-05	1.326600	0.1885

Determinant residual covariance	2.47E+12

Equation: D(RGDP2) = C(1)*(RGDP2(-1) - 4.0462511876*GSEX2(-1) - 87816.3742902*SSEX2(-1) - 457.952378332) + C(2)*D(RGDP2(-1)) + C(3)*D(RGDP2(-2)) + C(4)*D(GSEX2(-1)) + C(5)*D(GSEx2(-2)) + C(6) *D(SSEX2(-1)) + C(7)*D(SSEX2(-2)) + C(8) + C(9)*EEX2 + C(10) *EME2
Observations: 36

R-squared	0.735794	Mean dependent var	-99.97396
Adjusted R-squared	0.644339	S.D. dependent var	18550.79
S.E. of regression	11063.20	Sum squared resid	3.18E+09
Durbin-Watson stat	2.298615		

Equation: D(EGSD2) = C(11)*(RGDP2(-1) - 4.0462511876*GSEX2(-1) - 87816.3742902*SSEX2(-1) - 457.952378332) + C(12)*D(RGDP2(-1)) + C(13)*D(RGDP2(-2)) + C(14)*D(GSEX2(-1)) + C(15)*D(GSEX2(-2)) + C(16)*D(SSEX2(-1)) + C(17)*D(SSEX2(-2)) + C(18) + C(19)*EEX2 + C(20)*MEX2

Observations: 36

R-squared	0.685428	Mean dependent var	185.3689
Adjusted R-squared	0.576538	S.D. dependent var	2625.326
S.E. of regression	1708.403	Sum squared resid	75884644
Durbin-Watson stat	2.091734		

Equation: DSSEX2) = C(21)*(RGDP2(-1) - 4.0462511876*GSEX2(-1) - 87816.3742902*SSEX2(-1) - 457.952378332) + C(22)*D(RGDP2(-1)) + C(23)*D(RGDP2(-2)) + C(24)*D(GSEX2(-1)) + C(25)*D(GSEX2(-2)) + C(26)*D(SSEX2(-1)) + C(27)*D(SSEX2(-2)) + C(28) + C(29)*EEX2 + C(30)*MEX2

Observations: 36

R-squared	0.712919	Mean dependent var	-0.000962
Adjusted R-squared	0.613545	S.D. dependent var	0.233292
S.E. of regression	0.145027	Sum squared resid	0.546855
Durbin-Watson stat	1.974233		

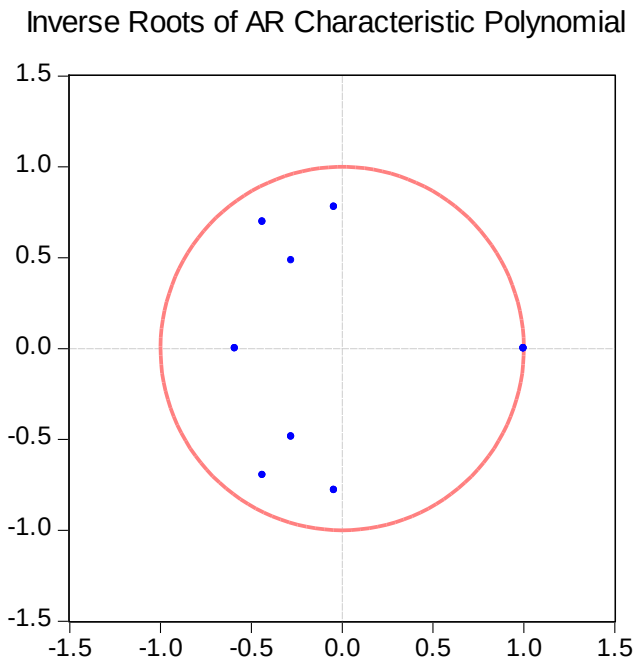
Stability test Table A4

Roots of Characteristic Polynomial
Endogenous variables: RGDP2 GSEX2 SSEX2
Exogenous variables: EEX2 MEX2
Lag specification: 1 2
Date: 10/19/16 Time: 20:51

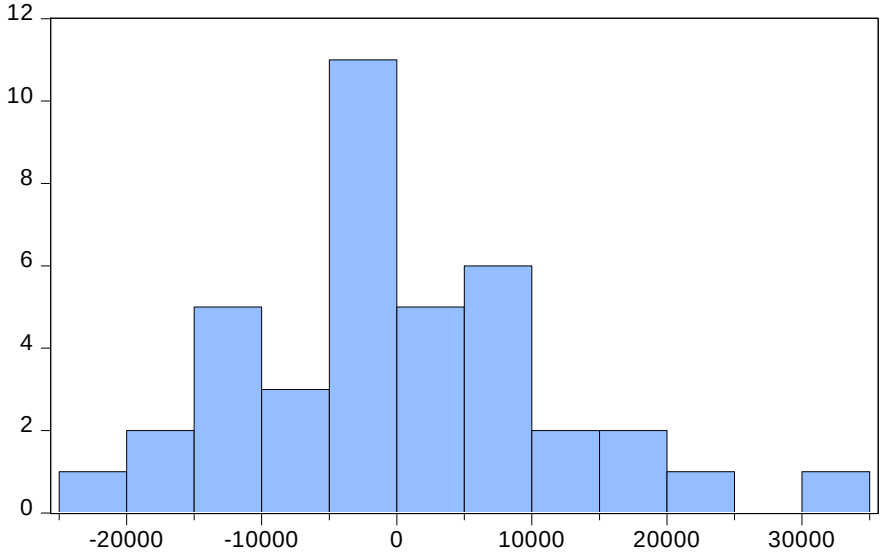
Root	Modulus
1.000000	1.000000
1.000000	1.000000
-0.436989 - 0.696775i	0.822469
-0.436989 + 0.696775i	0.822469
-0.042652 - 0.778563i	0.779731
-0.042652 + 0.778563i	0.779731
-0.588620	0.588620
-0.279146 - 0.485128i	0.559707
-0.279146 + 0.485128i	0.559707

VEC specification imposes 2 unit root(s).

Fig A1 stability test result



Normality test fig. A2



Series: Residuals	
Sample 1969 2007	
Observations 39	
Mean	-4.20e-13
Median	-1470.459
Maximum	31805.00
Minimum	-21599.47
Std. Dev.	11088.89
Skewness	0.514312
Kurtosis	3.524513
Jarque-Bera	2.166417
Probability	0.338508