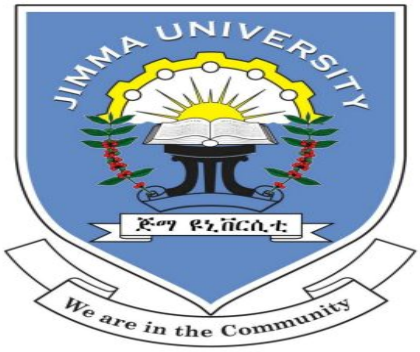

JIMMA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

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BY:

ZELALEM MEHARI

MAY, 2013

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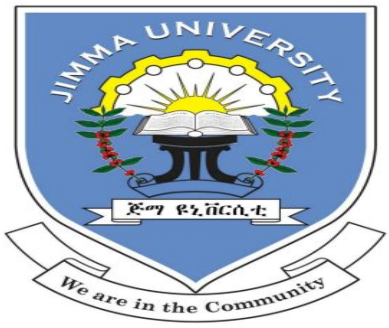

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Abbreviation and Acronyms

ADB	African Development Bank
ADI	African Development Indicators
AICD	Africa Infrastructure Country Diagnostic
CSA	Central Statistical Authority
ERA	Ethiopian Road Authority
EU	European Union
EEA	Ethiopian Economic Association
FDRE	Federal Democratic Republic of Ethiopia
FY	Fiscal Year
GDP	Gross Domestic Product
GNI	Gross Net Income
GoE	Government of Ethiopia
GTP	Growth and Transformation Plan
IMF	International Monetary Fund
LDC	Least Developing Countries
MDG	Millennium Development Goal
MoFED	Ministry of Finance and Economic Development
NBE	National Bank Ethiopian
OECD	Organization of Economic Cooperation and Development
OLS	Ordinary Least Square
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
RSDP	Road Sector Development Programs
SDPRP	Sustainable Development and Poverty Reduction Programm
SSA	Sub-Saharan Africa
WB	World Bank

Abstract

This study analyzes the impact of government road spending on economic growth in Ethiopia using annual time series data for the period 1974-2010. T\o do so, both descriptive and econometric analyses are employed in the study. From the descriptive analysis the findings indicate that the trend of government road sector spending has increasing for the past few years. Regarding the performance of road sector, the road network is by now growing at an encouraging rate. The issue of rural accessibility still remains far from the desired level that the country needs to have. Thus, the country needs to do a lot to graduate to middle income country status in terms of road network expansion and improved accessibility. The Econometric analysis, With the help of cointegration and vector error correction analysis, the impact of government road spending on economic growth was assessed in the long-run as well as in the short-run. The findings reveal that government spending on road has a significant and positive effect on the economic growth (GDP) in the short-run as well as in the long-run. By way of recommendation, the government need to strengthen its support on road infrastructure through allocate more road financing to expand the road network with the aim of increasing the current rural accessibility, thus, improving agricultural productivity and market access of the poor rural population with the aim of boost the current economic growth.

CHAPTER ONE
INTRODUCTION

1.1. Background of the study

Public expenditure is the main instrument used by Governments especially in developing countries to promote economic growth which is an essential ingredient for sustainable development. Economic growth brings about a better standard of living of the people through provision of better infrastructure, health, housing, education services and improvement in agricultural productivity and food security (Loto 2012). Nearly all the sectors in the national economies of developing countries demand more budgetary allocations every year.

Infrastructure in Africa is very so central to the various efforts to support growth, reduce poverty and improve the overall quality of life of Africans. A common argument for the push for a large increase in public spending on infrastructure in Africa is that infrastructure services may have a strong growth-promoting effect, through their impact on the productivity of private inputs and the rate of return on capital – particularly when, to begin with, stocks of infrastructure assets are relatively low. The role of infrastructure development in economic growth in Africa has been well documented in the literature. The unequivocal finding from this research is that there will be no growth and no significant poverty alleviation in Africa without a major improvement in the level and state of its infrastructure supporting the widely held consensus that the MDGs will not be achieved without at least a 7 percent annual growth rate for the region, and that this 7 percent target will not be achieved without a significant increase in infrastructure investment. (Afeikhena, 2011)

Since 1993/94, the Ethiopian government has been adopting various reforms leading to rapid economic growth and poverty reduction; that have involved the processes of structural adjustment programs along with commercialization of agriculture, private sector development, and a number of related poverty alleviation programs. Successful implementation of the programs requires an efficient infrastructural system. In particular, road transport is supposed to create a network over a wide array of infrastructural facilities. In addition, the road transport sector is essential for developing countries for the reason that provision of other advanced means

of transportation is expensive. For instance, Fan and Rao (2003), citing numerous studies (Aschauer 1989; barro 1990; Tanzi & Zee 1997) on the role of government spending on the growth of national economies. The results indicated that public spending in infrastructure is one of the most powerful instruments that governments can use to promote economic growth and poverty reduction and among these services road sector is considered as the crucial one.

Road infrastructure in Ethiopia has had a great strategic, political, economic and social significance. First, from an economic perspective, road infrastructure is a classic example of a public good that is characterized by non-excludability. As a consequence, the private sector has no interest in providing roads (Becker/Demissie,2006). Hence, road construction has been a domain of the Ethiopian state throughout its history. Second, from a political perspective, road infrastructure and the accessibility of peripheral rural areas are of crucial importance for the state's. Third, from a development perspective, road infrastructure constitutes a precondition and decisive factor for development and has therefore to be provided by the state. (Clapham, 2002)

During the PASDEP period, Ethiopia has been very successful in achieving rapid economic growth and poverty reduction. Driving this success was a series of policy and institutional reforms and massive public investments in roads and other key infrastructures. Ethiopia has experienced the largest boost in road infrastructure in its history since the second half of the 1990s. Government expenditure patters in Ethiopia have changed dramatically over the last few years. In recent years, it has dedicated 3% of GDP to road investments. This is one of the highest shares in Africa, although the absolute value of this spending (approximately US$5 per capita annually) is actually comparable to what other East African countries are investing. African Infrastructure Country Diagnostic (AICD, 2011).

To Achieve the Government vision which is to transform Ethiopia country to a middle-income country by 2023, it requires sustainable growth of the economy, which in turn depends on the development of infrastructure in general and expansion and improvement of the road network of the country in particular. In PASDEP, two alternative economic growth scenarios were considered. In the base case scenario, an average economic growth rate of 7 percent per annum was considered necessary to achieve the MDGs. For the high case scenario, which aimed beyond achieving MDG's targets, a 10 percent annual average economic growth target was set. During

the time of PASDEP's implementation, substantial economic growth and significant progress on social and human development were achieved. Annual average GDP growth is estimated at 11 percent (MOFED 2010), which exceeded both the base case and high growth scenarios set in PASDEP. The government has formulated the five year Growth and Transformation Plan (GTP) (2010/11–2014/15) to carry forward the important strategic directions pursued in the PASDEP. The GTP has a major objective of maintaining at least an average real GDP growth rate of 11 percent under the medium growth case scenario and under high growth scenario, annual average GDP growth rate of 14.9 percent is targeted. and, recently, in order to achieve the objectives of Growth and Transformation Plan (2010/11-2014/15),a larger amount of resource requirement (a base case scenario of ETB 690.90 billion) has been projected compared to the previous year's plan period ETB 332.57 billion (GTP, 2010).

Government expenditure patters in Ethiopia have changed dramatically over the last few years. Public expenditure in top four pro-poor sectors (on Agriculture, Education, health, and road) increased consistently since 2000, rising from 42.8 percent in 2001/02 to 66 percent in 2010/11, among those sectors road sector spending rising from 10.7 percent in 2001/02 to 21 percent in 2010/11. (MOFED, 2010)

It is more important to analyze the effect of the increasing government expenditure in overall growth aspiration of the nation. Aware of the importance examining the short and long run impacts of government spending on economic, this paper empirically investigates whether government road spending has positive or negative relationship with economic growth and their short and long-run effects. This thesis uses multivariate analysis to analyze the relationship between government road spending and economic growth in Ethiopia. It is therefore supposed to provide a standard explanation in line with the views raised above, and to make concluding remarks with policy implication.

1.2. Statement of the Problem

Policymakers are divided as to whether increased government expenditure expansion helps or hinders economic growth. Advocates of the concept of bigger government expenditure argue that government programs contribute valuable "public goods" such as education and infrastructure. They also claim that increases in government spending can bolster economic growth by putting

money into people's pockets. Supporting of this view, Suleiman (2009) observes that the size of Government and its impact on economic growth has emerged as a major fiscal management issue facing economies in transition. Dalamagas (2000) highlight several main ways on how governments could facilitate economic growth. The government could be a provider for defense, social security, judiciary, property rights, regulations, infrastructure development, workforce productivity, community services, economic infrastructure, regulation of externalities, and pleasure marketplace. In addition, Lindauer & Valenchik (1992) state that when both public and private capital formations are complementing to each other, government activities may encourage the private sector to increase their investment which consequently boost economic growth.

On the other hand, Proponents of the concept of smaller government expenditure have the opposite view. They explain that government is too big and that higher spending undermines economic growth by transferring additional resources from the productive sector of the economy to government, which uses them less efficiently. There are several potential factors that could cause government inefficiencies such as bureaucracy in public sector, political patronage and rent-seeking activities. They also warn that an expanding public sector complicates efforts to implement pro-growth policies; such as fundamental tax reform and personal retirement accounts, because critics can use the existence of budget deficits as a reason to oppose policies that would strengthen the economy (Mitchell, 2005).

The relationship between economic growth and government spending, or more generally the size of the public sector, is an important subject of analysis and debate among scholars. The general view is that public expenditure, particularly on physical infrastructure or human capital, can be growth enhancing although the financing of such expenditures can be growth-retarding (for example, because of disincentive effects associated with taxation). Government activity may directly or indirectly increase total output through its interaction with the private sector. Lin (1994) outlines some important ways in which government can increase growth. These include provision of pubic goods and infrastructure, social services and targeted intervention (such as export subsidies). Yosif and Abdullah (2000) indicated that Government performs two functions; protection (rule of law and enforcement of property rights and security) and provisions of certain public goods (defense, roads, education, health, and power). Some scholars such as Ranjan and Sharma (2008), and Cooray (2009) argue that increased government expenditure on socio-

economic and physical infrastructure (on health and education) would raise the productivity of labour which affects expansion of national output. By the same reasoning, expenditure on goods like roads will enhance reduction in the production costs, stimulate private sector investment and profit margin of firms, create employment and wealth; thereby improving the economic growth of the country.

However, some scholars such as Barro (1991), Skinner (1992) and Folster S, (2001) did not support the claim that increasing government expenditure promotes economic growth, instead they assert that higher government expenditure may slowdown overall performance of the economy. For instance, in an attempt to finance rising expenditure, government may increase taxes and/or borrowing. Higher income tax discourages individual from working for long hours or even searching for jobs. This in turn reduces income and aggregate demand. In the same vein, higher tax tends to increase production costs and reduce investment expenditure as well as profitability of firms. Moreover, if government increases borrowing (especially from the banks) in order to finance its expenditure, it will compete (crowds-out) away the private sector, thus reducing private investment.

There is a need for increasing public expenditure along with the need for public goods (utilities) so as to achieve certain goals and objectives like economic growth and development. It should be born in mind that recently the scale and composition of government spending have changed dramatically. Over the last decade, Ethiopia has made economic progress and since 2003 recording more than 11% average growth. By spending more than 60 percent of its total expenditure on poverty oriented sectors, such as road infrastructure development during the last few years, the government has maximized its efforts and shown the highest level of dedication to bring about pro-poor economic growth (Ethiopia:2010 MDGs Report).

In line to the above views, there are a few studies that have examined to relate road development and economic growth and poverty reduction in the Ethiopian case, such as Ibrahim (2011), Lofgren and Robinson (2004), Tewodaj.*et al* (2006) and Lofgren.*et al* (2005). Though, the empirical evidence of those studies on the contributions of public road investment on economic growth was mixed in terms of magnitudes and direction of impacts; because the impact of public

spending is limited by various factors and constraints such as methodologies employed, composition of expenditure, and the time duration of the study.

In general, various study attempted to analyze the impact of different components of government spending on economic growth; all these studies come up with widely different conclusions. Thus, this necessitates the current research interest for empirical analyzed the impact of government road sector spending on economic growth in Ethiopia. This study is tried to make some improvement on other studies on economic growth and government expenditure relationship in Ethiopia for two reasons. Firstly, it considers government expenditure on road as an important variable that affects economic growth. Recent most studies like; Ibrahim (2011), Dercon *et al*. (2008) did not include the variable (expenditure on road) in the growth model. Secondly, this paper extends the study period to 2010.

Therefore, the study contributes to yield interesting insights about the debate and to fill the knowledge gap by proving further empirical evidence on the impacts of government road sector expenditure on economic growth. On the basis of this, this paper attempts to address the following basic research questions.

1. Is there a positive and strong correlation between level of spending on road sector and economic growth?
2. What will be the short and long term relationship between the growing spending on road sector and economic growth?
3. What kind of trends of road expenditure and performance does the road sector reveal in Ethiopia for the period 1974/75 to 2010/11?
4. What are the economic implications of public expenditure on road infrastructure?

1.3. Objective of the Study

The general objective of this paper is to examine the impact of government road spending on economic growth in Ethiopia for the last thirty seven years (1974/75 – 2010/11). The specific objectives are to:

- Analyze the relationship between government expenditure on road infrastructure and economic growth both in the short-run and in the long-run.
- Analyze the trends in public road expenditure and the performance of the road infrastructure development in Ethiopia.

1.4. Significance of the Study

This study uses up to date data and employs empirical analysis in order to generate evidence on the effect of road spending on economic growth in Ethiopia. This study, therefore contributes significantly. Firstly, it provides useful information input into policymaking decision by bridging the aforementioned gaps. In addition, it gives literature by providing new and robust facts on government road and economic growth; this contributes to other interested people to undertake further study on the issue is indispensable. Lastly, it provides recommendations on the basis of the findings of the study, which helps policy makers on allocating government spending and enhancing the efficiency of the resource use.

1.5. Scope and limitation of the Study

This study is delimited to the investigation of the impact of government road spending on economic growth in Ethiopia, the period ranges from 1974/75 – 2010/11. In this study, the government road spending denotes only the Federal budgetary expenditure (which includes recurrent and capital expenditures) at national level, The study doesn't takes into account road spending of regions, since there was no regional level budgeting before the decentralization in 1991. It is no possible to make comparisons of the state of the sector before and after decentralization.

Although this study attempts to investigate the impact of government road spending on economic growth, it suffers from some limitations. One of the main problems in this study has been the inconsistent of data by different institutions. Even data arises from the database set and annual reports of the MOFED, EEA and NBE shows different figures for the same year. Additionally, because of lack of adequate data, it has been unable to use long period sample size for the study.

1.6. Organization of the paper

This thesis is organized in Five Chapters as follows. Chapter One discusses the introduction of the paper. Theoretical and empirical literatures are discussed in chapter Two. The introductory part discusses the concepts of main theories and determinants of economic growth, theories of government expenditure, and the nature & constituents of government expenditure. Under theoretical and empirical literature; the impact of government spending on economic government are discussed. Following this, Chapter Three presents methodological part of the study; it discusses data type and sources as well as the methods of analysis are shown**.** Model specification used in this study; the pre-estimation tests and post-estimation diagnosis are also employed. The cointegration and vector error correction mechanisms (VECM) are used to show the long-run and short-run relationship between real government road spending and economic growth in Ethiopia. The results of the econometric analysis and interpretation of the findings are presented in the Fourth chapter. The trend of government road expenditure and the performance of the road infrastructure development in Ethiopia are discussed with the help of graphs. Conclusions of the findings and policy recommendations based on the study findings are provided in chapter Five. Finally reference and indices are presented.

CHAPTER TWO
LITERATURE REVIEW

Before looking at the studies that have been examined the theoretical and empirical literatures on the effects of government road sector spending on economic growth, it would be useful to give a brief description of economic growth theories, public expenditure growth theories, and theoretical and empirical literatures that links government spending and economic growth; in studying the relationship between government spending and economic growth, this will provide better insights into the basis of the public expenditure in general and road sector spending in particular on economic growth of the countries.

2.1. Main theories and determinants of economic growth

2.1.1. Theoretical perspectives

The starting point of conventional economic growth theorization is the neoclassical model of Solow (1956). The basic assumptions of the model are: constant returns to scale, diminishing marginal productivity of capital, exogenously determined technical progress and substitutability between capital and labour. As a result the model highlights the savings or investment ratio as important determinant of short-run economic growth. Technological progress, though important in the long-run, is regarded as exogenous to the economic system and therefore, it is not adequately examined by this model. Turning to the issue of convergence/divergence, the model predicts convergence in growth rates on the basis that poor economies will grow faster compared to rich ones.

The role of technological progress as a key driver of long–run economic growth has been put in analysis from more recent studies, which accept constant and increasing returns to capital. These theories, known as endogenous growth theories, propose that the introduction of new accumulation factors, such as knowledge, innovation, etc.., will induce self-maintained economic growth. Triggered by Romer's (1986) and Lucas' (1988) seminal studies, work within this framework highlighted three significant sources of growth: new knowledge (Romer, 1990, Grossman and Helpman, 1991), innovation (Aghion and Howitt, 1992) and public infrastructure

(Barro, 1990). As a result, in the endogenous growth model, technological advances result from research & development activity, and technological progress and knowledge accumulation are treated as endogenous variables, thus it is also termed the endogenous growth theory. According to the model, the long-run growth rate depends on a stable business environment: government policies and actions on taxation, law and order, provision of infrastructure services, protection of intellectual property rights, and regulation of international trade, financial markets, and other aspects of the economy.

Investment has a limited role in promoting economic growth and a continuous increase in the factors of production (investment) is unlikely to yield growth. Under endogenous growth theory and despite the law of diminishing returns, marginal factor productivity can be increased. For example, technical progress that is funded by capital investment increases productivity. Similarly, new skills through improved education and training, and better health, tends to increase the productivity of labour. Also, the endogenous growth approach argues that there is a role for government institutions that can overcome any market failures associated with the various types of investment. Hence, investment is crucial to economic development and growth. Further, endogenous growth theory states that the improved technology accessed by investment drives growth; thus, investment may contribute to a long-run rate of economic.

The neoclassical growth model of Solow (1956), or its version in optimal growth formalized by Cass (1965) and Koopmans (1965) following previous evidence in Ramsey (1928), leaves little place for public policy to economic growth interaction. Long-term economic growth is zero (or exogenous), thus government decisions are ineffective in the long-run. Moreover, they at best leave unchanged the short-run growth rate or equilibrium levels of different macroeconomic variables, without any possibility for positive effects.

The Barro (1990) model constitutes without any doubt a breaking point in this evolution. By allowing for productive public spending, *i.e.* public spending that increases private capital marginal productivity, as for example infrastructure or property rights, the author identifies the existence of a positive correlation between government spending and long-run economic growth.

This result represents in fact a necessary condition in order to conduct a consistent analysis of government policies. Indeed, most of public policies that are realistic (flat-rate taxes, the use of public deficits, seigniorage financing) imply a certain form of distortion.

2.1.2. Determinants of economic performance

A wide range of studies has investigated the factors underlying economic growth. Using differing conceptual and methodological viewpoints, these studies have placed emphasis on a different set of explanatory parameters and offered various insights to the sources of economic growth.

Investment is the most fundamental determinant of economic growth identified by both neoclassical and endogenous growth models. However, in the neoclassical model investment has impact on the transitional period, while the endogenous growth models argue for more permanent effects. The importance attached to investment by these theories has led to an enormous amount of empirical studies examining the relationship between investment and economic growth (see for instance, Levine and Renelt, 1992; Mankiw, 1992; Barro and Sala-I-Martin, 1995; Sala-i-Martin, 1997; Easterly, 1997; Bond *et al*, 2001; Podrecca and Carmeci, 2001). Nevertheless, findings are not conclusive.

Economic policies and macroeconomic conditions have also attracted much attention as determinants of economic performance (see Barro, 1991, 1997; Fischer, 1993; Easterly and Rebelo, 1993) since they can set the framework within which economic growth take place. Economic policies can influence several aspects of an economy through investment in human capital and infrastructure, improvement of political and legal institutions and so on (although there is disagreement in terms of which policies are more conductive to growth). Macroeconomic conditions are regarded as necessary but not sufficient conditions for economic growth (Fischer, 1993).

In general, a stable macroeconomic environment may favour growth, especially, through reduction of uncertainty, whereas macroeconomic instability may have a negative impact on growth through its effects on productivity and investment (e.g higher risk). Several

macroeconomic factors with impact on growth have been identified in the literature, but considerable attention has been placed on inflation, fiscal policy, budget deficits and tax burdens. Public spending represents one of the most important policy instruments for governments. Consequently, they are expected to stimulate large effects on economic growth.

2.2. Theories of Government Expenditure

2.2.1. Peacock and Wiseman's Theory of Expenditure

Peacock and Wiseman's (1883) study is probably one of the best known analyses of the time pattern of public expenditures. They founded their analyses upon a political theory of public determination namely that governments like to spend more money and citizens do not like to pay taxes, and that government need to pay some attention to the wishes of their citizens. The duo saw taxation as setting a constraint on government expenditure. As the economy and thus incomes grew, tax revenue at constant tax rate would rise, thereby enabling public expenditure would show a gradual upward trend even although within the economy there might be a divergence between what people regarded as being desirable level of public expenditure and the desirable level of taxation. During the periods of social turmoil however, this gradual upward trend in public expenditure would be disturbed.

These periods would coincide with war, famine or some large-scale social disaster, which would require a rapid increase in public expenditures; the government would be forced to raise taxation levies. The rising of taxation levels would, however, is regarded as acceptable to the people during the period of crisis. Peacock and Wiseman referred to this as the "displacement effect". Public expenditure is displaced upwards and for the period of the crisis displaced private for public expenditure does not however fall to its original level.

A war is not paid for from taxation; no nation has such large taxable capacity. Countries therefore borrow and debt charges have to be not after the event. Another effect that they thought might operate was the "imperfection effect" thus they suggested arise from the people Keener awareness of social problems during the period of upheaval. The government therefore expands its scope of services to improve these social conditions and because people perception to tolerable levels of taxation does not return to its former level, the government is able to finance

these higher levels of expenditures originating in the expanded scope of government and debt charges.

2.2.2. Ernest Engel's Theory of Public Expenditure

Ernest Engel was also a German economist writing almost the same time as Adolph Wagner in the 19th century. Engel pointed out over a century ago that the composition of the consumer budget changes as family income increases. A smaller share comes to be spent on certain goods such as work clothing and a larger share on others, such as for coats, expensive jewelries etc.
As average income increase, smaller charges in the consumption pattern for the economy may be to occur. At the earlier stages of national development, there is need for overhead capital such as roads, harbors, power installations, pipe-borne water etc. But as the economy developed, one would expect the public share in capital formation to decline over time. Individual expenditure pattern is thus compared to nation expenditure and Engel finding is referred to as the declining portion of outlays on foods.

2.2.3. Wagner Law of Increasing State Activities

Wagner was emphasizing long-term trend rather than short-term changes in public expenditure. Moreover, he was not concerned with the mechanism of increase in public expenditure. Since it is based on historical experience, the precise quantitative relationship between the extent of increase in public expenditure and time taken by it was not fixed in any could not be used to predict its rate of increase in future. Actually, it is consistent with the Wagner's law of the state that in future, the state expenditure will increase at a rate slower than the national income though speaking; it had increase at a faster rate in the past.

Thus, in the initial stage of economy growth, the state finds out that it has to expand its activities quite fast in several fields like education, health, civil amenities, transport, communications, and so on. But when the initial deficiency is removed, then the increase in state activities many be slowed down. The factors, which contribute to the tendency of increasing public expenditure, relate to a growing role of the state in ever-increasing socio-economic complexities of modern society.

2.3. The nature and constituents of government expenditures

Government expenditures refer to the expenses that the government incurs for its own maintenance, for the society and the economy as a whole. Government spending reflects the policy choices of government. Once governments have decided upon the type and quantity of goods and services to provide, government spending represents the cost of carrying out these policies.

The basic rationale behind the need for government expenditure is associated with the existence of an externality or market failure. Without externalities or market failures there is no reason to assume that additional public sector investments would be more productive than the private sector investments.

Government spending on public services has a profound effect on people's standard of living and life chances or opportunities. Spending on public services has the objectives of giving citizens the chance to realize their full potential (through education, training and work), building an inclusive and fair society and strengthening a competitive economy. Thus, the government's objectives for public expenditure encompasses both equity and efficiency elements. It is sometimes argued that efficiency improvements must not be achieved at the expense of equity. However, inefficiency in the provision of public services has the result that opportunities for improved equity are lost because of wasteful use of resources. This result may be exacerbated to the extent that both the provision and financing of public services crowds out the private sector and leads to reduced economic growth. Lower economic growth results in fewer resources being available to pursue social programs (Bailey, 2002).

Government expenditures can be represented by two broad categories of government activity: exhaustive expenditures and transfer expenditure. Exhaustive public expenditures correspond to the government's purchases of current goods and services (i.e. labour, consumables etc.) and capital goods and services (i.e. public sector investment in roads, schools, hospitals etc.). These expenditures are, therefore, purchases of inputs by the public sector and are calculated by multiplying the volume of inputs by the input prices. This distinction of government spending is considered useful by many economists and policy makers who believe that a large share of developmental expenditure in total public expenditure is a sign of an economic policy that

contributes to growth. However, there is no standardize way of classifying expenditure as current or capital so that what is classified as current in one country may be classified as developmental in another.

Furthermore, since it is easier to obtain foreign grants and concessional credit for developmental expenditure than for current expenditure, there is an incentive for countries to make developmental expenditure look larger than it might be in reality by reclassifying some current expenditure as developmental.

2.4. Impacts of government spending on economic growth

The effect of government spending on economic growth is still an unresolved issue theoretically as well as empirically. Although the theoretical positions on the subject are quite diverse, the conventional understanding is that a large government spending is a source of economic instability or stagnation. Empirical research, however, does not conclusively support the conventional perception and clearly indicates that the effect of government spending on economic growth is at best mixed. A few studies report positive and significant relation between government spending and economic growth while several others find significantly negative or no relation between an increase in government spending and growth in real output (GDP). An extensive review of literature presented in the next section.

2.4.1. Theoretical literature

Economic theory is important in providing a framework for understanding how the world works, and it helps to determine which economic theory is most accurate. This section reviews global theories that link government spending and economic growth, to determine whether government spending helps or hinders economic performance.

Classical economists of the 18th century such as Adam Smith subscribed the doctrine of laissez-faire in the workings of the economy. They argued that governments are always and without exception the greatest spend thrifts of society as they spend other people's money. He believed that individuals acting in self-interest will promote public good under the guidance of the invisible hand. Supporters of laissez-faire maintained that people should be left unhindered to pursue their best interests and in the process they would benefit the society. The implication of

this is that there is a need for minimal level of government expenditure for accelerated economic growth.

In the 1930's, John Maynard Keynes argued that government spending particularly increases in government spending boosted growth by injecting purchasing power into the economy. According to Keynes, increased government spending is thought to raise aggregate demand and increase consumption, which in turn leads to increased production, government could reverse economic downturns by borrowing money from the private sector and then returning the money to the private sector through various spending programs. This "pump priming" concept did not necessarily mean that government should be big. Instead, Keynesian theory asserted that government spending especially deficit spending could provide short-term stimulus to help end a recession or depression. The Keynesians even argued that policymakers should be prepared to reduce government spending once the economy recovered in order to prevent inflation, which they believed would result from too much economic growth.

In line with this school of thought, some 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 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 fostering economic growth.

During 1950's and 1960's many economist believed that government intervention was one of the best way to achieve different development goals such as economic growth and poverty reduction in a given country though yet the direct and indirect impacts of public spending on economic growth and poverty reduction remained inconclusive. But, in 1980's there was a growing debate on the importance of government intervention. Indeed, government expenditure policies are one of the major components of fiscal policies. The major government instruments constitute government consumption and investment. The consumption aspects constitute mainly wage and non-wage consumption of the government expenditures whereas investment aspect represents allocation of government funds mainly to the provision of public goods such as infrastructure, health and education (Cavallo, 2005).

The broad principles for guiding public expenditure allocations are based on the need to address market failure (public goods, externalities) to promote growth, and improve distribution and reduce poverty through public interventions. The sources of market failure commonly identified in the literature are: the absence of competitive markets, the existence of positive or negative externalities in consumption and production, the undersupply of public goods by the market, imperfect information on production and consumption opportunities and coordination failures (Fiestas, 2005).

Public investment can be defined as public expenditure that adds to the public physical capital stock which includes building of roads, schools, hospitals, electric power, etc. This corresponds to the definition of public investment, in national income account data, capital expenditure (Lofgren and Robinson, 2004). The IMF and WB often divide total spending in to three broad categories: economic spending (agriculture and infrastructure), social spending (education, health, nutrition and safety nets) and public administration and defense spending. Government spending can also divided into those expenditures whose welfare goals are meant to be realized in the long-term or short-term (Fan, 2007).

The long-term expenditures include investment on human and physical capital (infrastructure, education, health, and technology) while the short-term expenditures are social safety nets/welfare spending. Public expenditure diverts economic resources in to channels determined by the government in accordance with national objectives and public policy. As a consequence, the scale and direction of public expenditure may affect the pattern and levels of consumption, volume of production, allocation of resource, distribution of income, levels of prices and employment.

The new theory, called the *endogenous growth theory*, integrates two fundamental hypotheses, namely that private capital productivity should not be decreasing and the externality concept. In a few years, several seminal models made their way. The first one, Romer (1986), assimilates to capital the stock of knowledge created by a *learning-by-doing* process, in the spirit of Haavelmo (1956) and Arrow (1962). This article was promoted by the architect of the neoclassical economy, Lucas, in 1988, who proposed his own endogenous growth model with human capital as the engine of perpetual growth.

To resume, Aschauer (1989) considered that *productive public spending* is a fundamental variable in order to explain economic growth rates heterogeneity among countries. Furthermore, these studies reinforce the importance of the existent contributions and generate an outbreak of empirical papers analyzing the correlation between productive public spending and economic growth. In 1990, Robert Barro published "Government Spending in a Simple Model of Endogenous Growth", article that was to reassess economists' view over the relationship between fiscal policy and economic growth. This model was also based on a consumer-producer representative agent set-up, with production function.

Following the influential work of Barro (1990) a number of researchers for instance, (Barro and Sala-i-Martin, 1992, and Fisher, 1995) have developed models in which governmental activities, in the form of provision of infrastructural services, affect the long-run growth rate of the economy through the production function, as a factor along with private capital. The main theoretical prediction of this literature is that increases in government spending on infrastructure are associated with higher long-run growth rates; however, this rise in the growth rate is reversed after a point.

In a strictly economic growth vision, the Barro (1990) model allows to obtain long-term growth. Indeed, as compared to the Solow model or its version in optimal growth by Cass-Koopmans-Ramsey, in the Barro (1990) model the per capita production function yields constant returns to scale. Consequently, there exists a positive long-run growth rate that is model-generated or endogenous, whereas in exogenous growth models this rate comes at best from outside the model. Due to the presence of long-run growth, the model implicitly opens the way to the analysis of government policies impact on long-run economic growth. However, in any model with long-term economic growth (selection of endogenous growth models), one can study the effect of different public policies on economic growth.

Finally, the relationship between public spending and economic growth, for a long period of time, was found to be absent as in the neoclassical models of Solow (1956) and Ramsey (1928). Consequently, most studies focused on the effects of public spending on the steady-state values of different macroeconomic variables, as well as on the transition period from equilibrium to

another. Results were however highly disappointing, since all government actions could at best be neutral, if not harmful.

The theoretical model of Romer (1986) seemed to bring some enlightenment, because it emphasized the existence of an endogenous economic growth rate in the long-term. Therefore, numerous contributions tried to outline the effect public policy may have on long-run growth. However, once again results were deceiving, which was even more frustrating as the empirical literature was providing strong evidence on the existence of a positive correlation between public spending and economic growth, as in Aschauer (1989).

Things radically changed since the Barro (1990) model with productive public spending. In his model, raising public spending is long-run increasing, and it is even optimal to set a strictly positive value for the distortionary (on the revenue) tax rate, in terms of long-run economic growth (and welfare). Based on some examples, we aim to suggest that this set-up allows for a coherent and consistent analysis of some key problems, as for example the long-run growth effects of deficits.

Additionally, Dercon (2005) make two important points. First, some factors cause levels of household consumption to *diverge across time or space*. For example, exploiting insights from endogenous growth theory, it is possible to allow for growth rates to be increasing functions in some endowments of factors of production, while decreasing in other factors. For example, if *infrastructure variables* have positive growth effects, this would be a sign of external effects in infrastructure. Second, several critical reviews of this framework, such as those by Temple (1999) and Easterly and Levine (2002), highlight the importance of *applying this framework with care* in either a macro or micro context, given the theoretical and empirical assumptions implied by this model and a range of potential econometric concerns.

2.4.2. Empirical Literature

Numerous empirical studies (see Nworji, 2012; Wendwesen, 2012; Ibrahim, 2011; Loto 2011; Narudeen & Usman 2010; Dorosh *et al*, 2009; Olugbenga and Owoeya, 2007; Teshome, 2006; Akpan 2005; Fan and Chan-kang, 2005; Canning and Pedroni, 2004; Fan and Rao, 2003; Al.Faris, 2002; Yousify and Abdullah, 2000; Nketia-Amphosah 2000, and Kweka and Morrisey

2000 Aschauer (1989); Barro (1990); Tanzi and Zee (1997)), use different econometric method of analyses and investigated the relationship between different government sectoral spending and economic growth. The empirical literatures on the relationship between government spending and economic growth remained controversial. There is no consistent evidence or a significant relationship that exists between public spending and economic growth, in positive or negative direction. The results and evidence about the effect of government spending on economic growth differ by country, the range of analytical methodologies employed in the types of economic studies, the relative sectoral emphases of different studies and categorization of public expenditures. Thus researches and estimations are difficult to generalize because of the above main reasons. In this regard, this study is tried to look at the relevant empirical literature on the impact of public expenditure in general and road sector spending in particular on economic growth of Ethiopia.

Loto (2011) applied co-integration and error correction model and he concluded that in the short-run, expenditure on agriculture and educations were negatively related to economic growth. However, expenditure on health, national security, transportation, and communication were positively related to economic growth.

Amasoma *et al* (2011) also investigated the relationship between the components of government expenditure (that is education, agriculture, health and transport and communication) on economic growth in Nigeria for the period spinning 1970 to 2010 using an Error Correction Model. The authors find out that expenditure on agriculture was the most significant component of government expenditure which impacted on economic growth. While the other components education, health, transport and communication was observed to be insignificant in both the short run and long run. Based on the study the author suggested that government educational spending has been relatively low which is expected to affect the nation's level of human capital in the long run.

Abu and Nuredin (2010) studied the effects of government spending on economic growth by employing a disaggregated analysis. The paper uses the co integration and error correction methods to analyze the relationship. The result was that total government expenditure and expenditure on education have negative effect on economic growth and on the contrary, rising

expenditure on transport and communication and health results to an increase in economic growth.

Nketia-Amphonsah (2009) in Ghana showed that aggregated government expenditure retarded economic growth, but expenditures on health and infrastructure promoted economic growth while expenditure on education had no significant impact in the short run. This result obtained because of its return is long term and the analysis is should also require many years data, on other hand, the way it was measured and the level of education as well as the type… etc must have varied results. Thus, it is not easy to conclude the effect of education on economic growth in the short run.

Kweka and Morrissey (2000) in Tanzania found that increased productive expenditure (physical investment) has a negative impact on growth but consumption expenditure has a positive impact. The reason for this finding was, they adopted a simple growth accounting model, in which total government expenditure is disaggregated into expenditure on (physical) investment, consumption spending and human capital investment. Increased productive expenditure (physical investment) appears to have a negative impact on growth. Consumption expenditure relates positively to growth, and in particular appears to be associated with increased private consumption. Expenditure on human capital investment was insignificant in the regressions, probably because any effects would have very long lags. The results confirm the view that public investment in Tanzania has not been productive, but oppose the widely held view that government consumption spending is growth reducing. Olugbenga and Owoye (2007) investigated the relationships between government expenditure and economic growth for a group of 30 OECD countries, using annual data during the period 1970-2005. The variables of interest were total government expenditure (TGE) and gross domestic product (GDP) with the use of co-integration and Granger causality tests. The results showed that the existence of a long-run relationship between government expenditure and economic growth.

Fan and Rao (2003) analyzed the impact of different types of government spending on overall GDP growth across 43 developing countries between 1980 and 1998 using OLS method and found mixed result. In Africa, government spending on agriculture and health was particularly strong on promoting economic growth. Among all types of government expenditures,

agriculture, education, and defense contributed positively to economic growth in Asia. In Latin America, health spending had a positive growth-promoting effect. Structural adjustment programs had a positive growth-promoting effect in Asia and Latin America, but not in Africa. In fact, structural adjustment programs hurt economic development in Africa.

Aschauer (1989); Barro (1990); Tanzi & Zee (1997) studies on the role of government spending on the long term growth of national economies found mixed results about the effects of government spending on economic growth. Those who have found a negative relationship between government expenditure and economic growth include Al-Faris (2002) in his work on Public Expenditure and Economic Growth concluded that an insignificant relationship exists between government consumption expenditure and the rate of economic growth.

There are a few studies more specifically to the growth effects of road spending based on the experiences of some developing countries. For example, Nworji and Oluwalaiye O. B (2012) analyzed the impact of government spending on road infrastructure development on economic growth in Nigeria for the period 1980-2009. They employed simple regression analysis model specified on the basis of hypothesized functional relationship between government spending on road infrastructure development and economic growth. Their findings showed that transport and communication as proxy of road, have statistically significant impact on the growth of the economy. One of the limitation of this study is their study does not show the short and long run relationship between road spending and economic growth.

Dorosh *et al.* (2009) analyzed the importance of road connectivity to agricultural productivity in Africa. Their findings indicate that lower return from having high density is exhibited to be low for West Africa. Whereas, longer travel time decreases total crop production, and reducing travel time significantly increases adoption of high-input/high-yield technology in East Africa. Their findings showed the importance of increased road connectivity in East Africa.

Fan and Chan-kang (2004) estimated the effect of quality of roads on growth and poverty reduction in China by using provincial level data for 1982-1999. Contrary to usual findings, the study finds that the impact of investment in lower quality roads is 4 times higher than of higher quality roads both in rural and urban areas. In terms of poverty reduction the impact from low

quality roads is larger than the corresponding impact from high quality roads in both rural and urban areas. Similarly, Jalan and Ravallion (2000) find that increase road density has a significant positive effect on the consumption expenditure of rural farm households in poor regions of China.

In Ethiopia, very few empirical studies were conducted at the country level to examine the relationship between government expenditure and economic. For example, Wendwesen (2012) studied the effects of government sectoral spending- human capital and agriculture on economic growth; using annual data set on GDP and government expenditure for the period 1960/61-2010/11, employed a co-integration and error correction methods to analyze the relationship. The results indicated that education sector expenditure has both short-run and long-run statistically positive-significant effect on growth while health sector spending has negative insignificant relation. In the case of agriculture, the result shows that the sectoral spending has negative relationship on growth both in the short run and in the long run. Based on his finding, the negative relationship of agriculture sector in the short-run probably could be the increased migration of the healthy young people move out of agriculture, leaving behind the old, the sick and the dependant and it is often the men who move to urban areas in change of the farm. This could resulted in the increased sophistication of agriculture markets (and value chains) which excludes traditional small holders, who are poorly equipped to meet the demanding product specifications and timeliness of delivery required by, for instance, expanding manufacturing sectors (skin and hides, cotton etc..), hotels and supermarkets (vegetables, cereals and other food products). The deteriorating and poor resource base (desertification, global warming etc...) which agriculture depends are also the probable cause for negative association given the effort and investment done.

Teshome (2006) examined the impact of various components of government spending (investment, consumption and human capital expenditures) on overall GDP growth in Ethiopia for the period 1960/61-2003/04 using Johanson Maximum Likelihood Estimation procedure. His results indicated that only expenditure on human capital positive a significant effect on economic growth in the long-run. Investment (productive) government spending displays insignificant impact on growth of real GDP.

A few empirical studies have attempted to examine relate government road spending and economic growth in the Ethiopian context. For example, Ibrahim (2011) investigate the impact of road network on economic growth in Ethiopia for the period 1971-2009, using augmented Cobb-Douglas production function. His findings revealed that the total road network has significant economic growth-spurring impact. Dercon *et al*. (2008) used the standard Cobb-Douglas type production function to analyze the impact of road and agricultural extension on growth and poverty reduction in a panel data set of selected fifteen Ethiopian villages. Their findings indicated that there is strong link between road development, economic growth, and poverty reduction. Lofgren *et al* (2005) use dynamic CGE model found that focus on human development (sufficiently to achieve human development MDGs) puts the economy on a slower growth track that does not permit the economy to reach MDG1 (poverty reduction) by 2015 while focus on infrastructure puts the economy on a faster growth that raises household consumption sufficiently to reach poverty reduction, and achieve the other MDGs within a few years after 2015.

In general, both theoretical and empirical literatures indicate that public spending has both significant positive and significant negative effect on growth. Some of the empirical studies give mixed results. In sum, the expected effect of public spending on growth differs in the context of countries, methodology used and it is also considered different types of expenditures have divergent effects.

This study is an improvement on other studies on economic growth and government expenditure relationship in Ethiopia for two reasons. Firstly, it considers government expenditure on road as an important variable that affects economic growth. Recent most studies like; Ibrahim (2011), Dercon *et al*. (2008) did not include the variable (expenditure on road) in the growth model. Secondly, as departure from previous studies, this paper extends the study period to 2010.

CHPETER THREE

RESEARCH METHODOLOGY

3.1. Methodology of the Study

3.1.1. Data type and sources

The objective of the study is to investigate the impact of government road sector spending on the economic growth in Ethiopia using annual time series data covers the period 1974 – 2010. This study uses secondary data. Data were collected from annual reports and publication. Specifically, the sources are obtained from MoFED, EEA, ERA, NBE, IMF and WB and African Development Indicators CD-ROMs. A data on public spending by sectors and GDP obtained from MoFED, EEA and ENB data set. The major data source regarding most of road related variables is obtained from the ERA. Other relevant variables are also collected from IMF, WB and African Development Indicators CD-ROMs. All the variables that used in the study are aggregated to national level datasets and summaries.

3.1.2. Method of Data Analysis

Descriptive as well as Econometric methods are employed to discuss and analyze different issues in this study. In the descriptive technique, is used to analyze the trending of government road expenditure and the performance of the road infrastructure development in Ethiopia. In the Econometric method part, emphasis is placed on investigating the impact of government road spending on economic growth and the relationship between government on road infrastructure and economic growth both in the short-run and in the long-run. The data are analyzed using EVIEWS software. The nature of the model is given in logarithmic form to make the analysis and interpretation of the explanatory variables easier in terms of percentage and growth rate.

3.2. Model Specification

There are no merely generally accepted models of the growth process and no standard analytical frameworks that are appropriate for such studies. Many studies adopted augmented Solow growth model and augmented endogenous model so as to analyze the economic impact of road sector spending on the economic growth of a country.

Studies, for instance, Fan *et al*. (2002), Fan and Chan-Kang (2005), Canning and Bennathan (2000), Canning and Pedroni (2004) used the standard Cobb-Douglas type production function to analyze the impact of infrastructure on the overall GDP growth, which per se is assumed to be a measure of overall economic growth. Ibrahim (2011) used the augmented Cobb-Douglas production function to investigate the impact of roads on economic growth. Dercon *et al.* (2008) also used a similar type of specification to see the impact of road and agricultural extension on growth and poverty reduction in a panel data set of selected fifteen Ethiopian villages. Fan and Chan-Kang (2005) indicated that there is strong link between road development, economic growth, and poverty reduction.

The study also considered the impact of road network on sectoral GDP. For instance, Dorosh *et al.* (2009) analyzed the importance of road connectivity to agricultural productivity in Africa. The findings indicate that lower return from having high density is exhibited to be low for West Africa. Whereas, longer travel time decreases total crop production, and reducing travel time significantly increases adoption of high-input/high-yield technology in East Africa. The findings showed the importance of increased road connectivity in East Africa.

Following the aforementioned studies, this current study utilizes similar specifications of [(Ibrahim (2011), Fan *et al.* (2002), Fan and Chan-Kang (2005), Canning and Bennathan (2000), Canning and Pedroni (2004), Dercon *et al.* (2008)] to investigate the impact of government road spending on economic growth in Ethiopia. The general specification of the model is based on the augmented Solow growth model and augmented endogenous growth model in which the model are basically derived from a log transformation of the Cobb-Douglas production function. The logarithmic form of this production function allows incorporating physical capital (road) and other relevant variables which affects the growth of GDP.

Existing empirical studies on the impact of public road investment on economic growth are essentially based on the production function framework. Assuming a generalized Cobb-Douglas production and extending the augmented Solow growth model to include physical capital (road infrastructure) as additional input to enter the production function. According to Solow's formulation, economic growth is a function of capital accumulation, an expansion of labor force

and exogenous factor, technological progress which makes physical capital and labor more productive, the production function is written as follows.

$$Y_t = (K_t, L_t, A_t,) \text{ ---------- (1)}$$

Where **Y_t = aggregate real output**

K_t = capital stock

L_t = labor

A_t = Technological progress

t = time dimension

The above general Cobb-Douglas type functional specification is augmented with road infrastructures so as to identify its impact on economic growth. Accordingly, the above functional specification is reformulated as:

$$Y_t = f(K_t, L_t, R_t A_t,) \text{ ---------- (2)}$$

Where, **R** is road

This generalized form of equation (2) is open to the possibility of constant return to scale as suggested by Solow type model (Solow, 1956). On the other hand, the model also admits the possibility of increasing returns of physical capital suggested by endogenous growth theories (Romer, 1987).

According to Endogenous growth theory argues that the growth model should be include all variables, which are crucial for growth of GDP, in particular saving, investment, and technical knowledge are the outcome of rational decision.

In this context, Investment is an important determinant in the endogenous growth theory model, allowing improvement in productive capacity, and increasing profits that lead to growth. As noted, neoclassical growth theory assumes that, following the law of diminishing returns, Investment has a limited role in promoting economic growth and a continuous increase in the factors of production (investment) is unlikely to yield growth.

Under endogenous growth theory and despite the law of diminishing returns, marginal factor productivity can be increased. For example, technical progress that is funded by capital investment increases productivity. Hence, investment is crucial to economic development and growth. Further, endogenous growth theory states that the improved technology accessed by investment drives growth; thus, investment may contribute to a long-run rate of economic growth.

This growth model simply extends the basic production function framework to allow an additional input to enter the production function; i.e. physical capital (road infrastructure). The endogenous growth model or approach argues that there should be an additional effect of physical capital (road) on the level of output (GDP). This indicates that the endogenous models explain growth promote with road infrastructure investment, which is the growth rate also depends on the rate of return to physical capital. Road infrastructure influences economic growth and hence the model can be modified by including physical capital (road) in one aggregate function.

Accordingly, the aggregate Cobb-Douglas production function along with the road component as (physical capital), which could be estimable, can be reached through the following procedure,

$$\mathbf{Y} = K_t^{\alpha} HK_t^{\beta} (A_t L_t)^{1-\alpha-\beta} \text{ ---------- (3)}$$

Where **Y** represents output, **A** is the level of technology progress that is exogenous determined the level of aggregate productivity. **K, H** and **L** are physical capital, human capital and labor respectively.

The model is then transformed to the logarithmic form whereby the resulting equation is set as follows,

$$Log\ Y_t = \alpha + \beta_1 log\ K_t + \beta_2 log L_t + \beta_3 log HK_t + \varepsilon_t \text{ ---------- (4)}$$

Where **Log Y_t** = log of real output proxied as log of real GDP

Log K_t = log of physical capital at time t (as government road spending)

Log HK_t = log of Human capital at time t

Log L_t = log of labor force at time t

Based on the above formulations, the road sector is entered in the functional specification on the aggregate production function. Thus, the specification will be stated as follows:

GDP = f(L , K, HK, R)

The model is then transformed to the logarithmic form as follows.

$$Log\text{GDP}_t = \alpha + \beta_1 log\ K_t + \beta_2 logL_t + \beta_3 logHK_t + \beta_4 logR_t + \varepsilon_t \text{ ---------- (5)}$$

The prior economic expectations are; $\alpha_{0,}\ \beta_{1,}\ \beta_{2,}\ \beta_3$ and $\beta_4 > 0$.

The framework for the study has its basis on the Keynesian and endogenous growth models. The Keynesian model argues that expansion of government expenditure accelerates economic growth. The endogenous growth model supports the role of government in the growth process, however, Barro (1990) emphasized the importance of government policy in economic growth and that we have some expenditure that are productive (in principle including State-owned production) should contribute positively to growth, whereas others that are not productive (government consumption spending) is anticipated to be growth retarding (Barro & Sala-i-Matin, 1992). Others argue that composition of government expenditure might exert more influence compared to the level of government expenditure on economic growth. This discussion suggests that the level of government expenditure and composition of government expenditure are important determinants of economic growth.

The growth model is thus a function of public expenditure, but the main objective of the study is empirically investigated the effect of Public road Spending on economic growth. The study is considered public expenditure on road. Thus, in order to estimate the impact of road infrastructure on growth, the study is taking into account other relevant sectors expenditure to capable of shedding light to link between government road expenditure and economic growth, the model in this study is built upon the following augmented function;

$$\mathbf{Y_t = f\ (R_d, H_e, E_d, A_g, N_p)} \text{ ---------- (6)}$$

Where $\mathbf{Y_t}$ is real GDP, $\mathbf{R_d}$ is real public spending on road, $\mathbf{H_e}$ is real public spending on health sector, $\mathbf{E_d}$ is real public spending on Education sector, $\mathbf{A_g}$ is real public spending on agriculture and $\mathbf{N_p}$ is real public spending on non pro-poor sector.

Based on the above formulations, the public expenditure is entered in the functional specification on the aggregate production function. Thus, taking into account for the analysis purpose equation (6) the model can be represented as the following natural logarithmic reduced form equation;

$$lnRGDP_t = \alpha + \beta_1 lnRRd_t + \beta_2 lnRHe_t + \beta_3 lnREd_t + \beta_4 lnRAgi_t + \beta_5 lnRNp_t + \varepsilon_t \text{ --------}$$

----------**(7)**

Where $\mathbf{lnRGDP_t}$ = the natural logarithm of real GDP proxied as Economic growth at time t

$\mathbf{lnRRd_t}$ = the natural logarithm of real road sector spending at time t

$\mathbf{lnRHe_t}$ = the natural logarithm of real health sector spending at time t

$\mathbf{lnREd_t}$ = the natural logarithm of real Education sector spending at time t

$\mathbf{lnRAgi_t}$ = the natural logarithm of real Agriculture sector spending at time t

$\mathbf{lnRNp_t}$ = the natural logarithm of real non pro-poor sector spending at time t

ε_t = the error term that is white noise.

The variables are measured as follows; Economic growth refers to the growth rate in real GDP, Real GDP in turn is obtained by dividing GDP at current market price by the GDP deflator (1999/2000 base year). RRd is measured as total Road expenditure divided by the GDP deflator. RHe is captured by the total Health expenditure divided by the GDP deflator. REd is measured as total government expenditure on Education divided by GDP deflator. RAGI is captured by government expenditure on agriculture divided by GDP deflator. RNP is measured as government expenditure on others non-pro-poor sectors divided by GDP deflator. $\varepsilon-$ refers to the error term. The various expenditure items used are defined as payments for transactions within one year. Thus, we assumed the expenditure items to be actual expenditures.

Based on the Model, Real GDP in log form (LRGDP) is used as dependent variable in the regression model and real expenditure in log form of road sector is incorporated as explanatory

variables. Besides, other relevant conditioning variables like others pro-poor sectors spending on Agriculture, health, and Education, and expenditure on non-poverty such as (general service sectors, defense, industry, tourism, hotels, transport and communication and mining and energy etc….) are also included as control variables which are designed to capture the influences of the size of the components of government spending on economic growth. This study uses co-integration and error correction methods to analyze the relationship between government road sector expenditure and economic growth

Where α = Intercept of the regression line. It represents any level of economic growth that at zero government expenditure level. β_i (i = 1, 2, ...5) are coefficients of the components of government expenditure. It is a measure of the effects of the respective components of government expenditure on economic growth. ε is stochastic variable to hold the influence of other determinants of economic growth not included in the model. On estimation, the intercept (α) and slope coefficients (β_{is}) are expected, *a priori*, to have positive sign, β_i (i = 1, 2, ---, 5) > 0, implying that each component expenditure of the government will be expected to correlate positively with economic growth.

The main propose of the study is to investigate the impact of government road spending on economic growth in Ethiopia; it has also examines the long run and short run relationship between government road expenditure and economic growth. To achieve the above objectives, this study has employed co-integration and error correction modeling.

In order to estimate the short run relationship among the variables, the corresponding Vector Autoregressive (VAR) error correction model for $\Delta lnRGDP_t$ is estimated as;

$$\Delta lnRGDP_t = \alpha + \beta_1 \Delta lnRRE_t + \beta_2 \Delta lnRHE_t + \beta_3 \Delta lnRRE_t + \beta_4 \Delta lnRA_{gt} + \beta_5 \Delta lnRNp_t + \beta_6 \varepsilon_{t-1} \text{ ---------- (8)}$$

Where Δ stands for the first difference operator & ε_{t-1} is the error correction term and the coefficient of (β_6) measures the speed of adjustment towards the long run equilibrium and the ECM test is essential to see whether an economy is converging towards equilibrium in the long run or not; and also shows short run deviations.

3.2.1. Test for Unit Roots

Empirical work based on time series data assumes that the underlying time series is stationary; this implies that the distribution of a process remains unchanged when shifted in time by an arbitrary value. More formally, a stochastic process is said to be weakly stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap between the two time periods and not the actual time at which the covariance is computed. A time series is strictly stationary if all the moments of its probability distribution are invariant over time. However, the normal stochastic process is fully specified by its two moments, the mean and the variance (Gujarati, 2003).

However, in practice most econometric time series are non-stationary in the sense that the mean and variance depend on time and thus there are no tendencies for them to hold back to a given value. Non-stationarity is a very series matter in that regression of one non-stationary variable on another is very likely to yield impressive-seeming regression results which are wholly spurious. In a spurious regression, the results suggest that there are statistically significant long-run relationships between the variables in the regression model (very high R^2 value and significant t-ratios) when in fact all that is being obtained is evidence of contemporaneous correlations rather than meaningful causal relations.

The first task in analyzing econometric time series data should be testing for the presence of unit roots. In this case, it is important to test the order of integration of each variable to know how many times the variable needs to be differenced to result in a stationary series. The absence of co-integration leads back to the problem of spurious regression. Hence, the concept of integration mimics the existence of a long-run equilibrium to which an economic system converges over time.

There are different ways of testing stationarity. In this paper, the most widely applicable test of unit root, namely Augmented Dickey –Fuller (ADF) are used. It is a modification of the DF test and involves augmenting the Dickey-Fuller equation by lagged values of the dependent variable. This is done to ensure that the error process in the estimating equation is residually uncorrelated but also captures the possibility that $\mathbf{y}_t$ is characterized by a higher order autoregressive process. A failure to introduce variables designed to capture omitted dynamics leads to a biased standard

errors, hence the importance of introducing the lagged terms. The ADF test solves this problem by considering a higher order and augmenting the random walk equation with some more lags. It is suggested to allow both an intercept and time trend in the regression model used to test the presence of unit root. In both tests the null hypothesis is that the variable is non-stationary against the alternative stationary. The null hypothesis is rejected only when there is strong evidence against it at the conventional levels of significant. The following specifies the type of equation used to compute an ADF

$$\Delta y_t = \mu + \gamma y_{t-1} + \gamma t + \sum_{j=1}^{k} \delta_j \Delta y_{t-j} + e_t$$

Taking the variables in first difference form presents only the dynamic interaction among the variables with no information about the long run relationship. However, if the variables that are non-stationary separately have the same stochastic trend then it points that the variables have a stationary linear combination. This in turn implies that the variables are cointegrated; therefore, there exists long run equilibrium among the variables (Enders, 1996).

3.2.2. Cointegration and Testing for Cointegration

Cointegration among the variables reflects the presence of long run relationship in the system. We need to test for cointegration because differencing the variables to attain stationarity generates a model that does not show the long run behaviour of the variables. Hence, testing for cointegration is the same as testing for long-run relationship. In general, if variables that are integrated of order 'd' produce a linear combination which is integrated of order less than 'd' (say 'b') then the variables are cointegrated and hence have long run relationship (Gujarati,1995).

The two widely employed approaches for testing cointegration relationships are the Engle-Granger (1987) two-step procedure and Johansen (1988) maximum likelihood approach. In the Engle-Granger approach the first step is to estimate the cointegrating regressions and then to test whether the residual obtained from the cointegrating regressions is stationary or not; if the residual is stationary, then the independent and dependent variables have long run relationships (Rao, 1994). The drawback of this procedure is that it is difficult to determine the number of equilibrium relationships if the variables are more than two. In addition to this, it needs priori

information that the dependent variables are endogenous and the independent variables are weakly exogenous. In cointegration relationship estimating a single equation is potentially inefficient since information is lost unless each endogenous and weakly exogenous variable is clearly identified (Harris, 1995). In this paper, the Johansen Maximum likelihood procedure is used in testing for cointegration since it offers solutions for the above problems.

The Johansen (1988) procedure allows testing the presence of more than one cointegration vector. Moreover, it permits to estimate the model without priory restricting the variables as endogenous and exogenous. The starting point in this procedure is formulation of VAR model in the following form. Considering K-lags of Z_t,

$$\mathbf{Z_t = A_1, Z_{t-1} + \ldots\ldots\ldots\ldots\ldots\ldots A_k Z_{t-k} + \mu}$$

Where Z_t is a (n×1) vector of stochastic I(1) variables, A_i (i= 1……k) is n×n matrix of parmeters, μ is a vector of deterministic component (i.e., a constant and trend), and t=1,……..T (T is the number of observation).

The long run relationship among the variables is captured by the term z_{t-k}. In the Johansen (1988) procedure, determining the rank of π (i.e., the maximum number of linearly independent stationery columns in π) provides the number of cointegrating vector between the elements in z. In this connection, there are three cases worth mentioning. (i) If the rank of π is zero it points that the matrix is null which means that the variables are not cointegrated. In such case the above model is used in first difference, void of long run information. ii) If the rank of π equals the number of variables in the system (say n) then π has full rank which implies that the vector process is stationary. Therefore, the VAR can be tested in levels. (iii) If π has a reduced rank [i.e., $1< r(\pi)< n$] it suggests that there exists r<(n-1) cointegrating vector where r is the number of cointegration in the system.. Therefore, the matrix π equals to $-\alpha\beta'$ where α and β are n x r matrices, β represents the cointegration parameters with α showing their corresponding feedback or adjustment mechanism to equilibrium (i.e., it shows the speed with which disequilibrium from the long run path is adjusted). In identifying the number of cointegrating vectors, the Johansen procedure provides n eigenvalues denoted by λ (also called characteristics

roots) whose magnitude measures the extent of correlation of the cointegration relations with the stationery elements in the model.

In general, to identify the number of cointegrating vectors in the system, the Lambda max (λ max) and Lambda trace (λ trace) statistics are used. They are obtained from the following formulas.

$$\lambda_{max} = -T\,log\,(1-\lambda_{r+1}), \quad r = 0, 1, 2, \ldots, n-1$$

$$\lambda_{trace} = \quad T\,\sum_{i=r+1}^{n} log\,(1 \quad \lambda_i), \quad r = 0, 1, 2, \ldots, n \quad 1$$

λ max statistic tests the null hypothesis that there are 'r' cointegrating vectors against the alternative of 'r+1'. The trace statistics, on the other hand, tests the hypothesis of less than or equal to 'r' cointegrating vectors against the alternative of 'r+ 1. The distribution of both test statistics follows Chi-square distributions (Enders, 1995). Reimers (1992) points out that the Johansen approach tends to over reject the null hypothesis when the sample size is small. While testing for cointegration, therefore, he suggests adjustment to be made for the degrees of freedom. This is done by substituting 'T-nk' in place of T, where n is the number of variables and k is the lag length set in the test for cointegration.

The other important thing in the cointegration analysis is the issue of identifying endogenous and exogenous variables in the system. This is required because the Johansen procedure do not restrict the variables behaviour a priori. If a variable is weakly exogenous, it implies that its error correction term (i.e., the corresponding α coefficient) does not enter in the error correction model. This implies that the dynamic equation for that variable contains no information concerning the long run relationship in the system. Hence, variables that are weekly exogenous should appear in the right hand side of the VECM. This restricts the exogenous variables to be contemporaneous with the dependent variable (Harris, 1995). The first step in the test is formulation of the null hypothesis which states that the variable is weakly exogenous against the general alternate. That is,

$$H_0 = \alpha_{ij} = 0 \quad for \quad j = 1, \ldots, r \ (r\ being\ the\ number\ of\ cointegrating\ vectors)$$

$$H_1 = \alpha_{ij} = 0$$

The test (for weak exogeneity) is conducted using the following formula.

$$-2\log(Q) = T\sum_{i=1}^{r}\log\left(\frac{1-\lambda_i^*}{1-\lambda_i}\right)$$

$$Where, Q = \frac{(restricted\ maximized\ likelihood)}{(unrestricted\ maximized\ likelihood)}$$

T = the number of observations, r = the number of rank, and λ i and λ i* represents eigen values for unrestricted and restricted models respectively. If the result obtained from the above formula is less than the Chi-squared distribution, then we cannot reject the null hypothesis. This implies that the variable is weakly exogenous.

3.2.3. Vector Error Correction Model (VECM)

Economic variables have short run behaviour that can be captured through dynamic modeling.
If there is long run relationship among the variables, an error correction model can be formulated that portray both the dynamic and long run interaction between the variables. In the previous discussion, we show that if two variables that are non-stationary in levels have a stationary linear combination then the two variables are cointegrated. It means the presence of error correcting representation. That is, any deviation from the equilibrium point will revert back to its long run path. Therefore, an ECM depicts both the short run and long run behaviour of a system. Engle and Granger (1987) defined ECM as "a particular representation of a vector autoregression appropriate for cointegrated results." This means it exist a long run relationship (i.e., cointegration among the variables) we can rewrite equation with the following VECM specification.

$$\Delta Z_t = \sum_{i=1}^{k-1}\Gamma_i \Delta Z_{t-1} + \alpha\left(\hat{\beta}_1^{'} Z_{t-1} + \hat{\beta}_2^{'} Z_{t-1} + \ldots + \hat{\beta}^{'} Z_{t-1}\right) + \mu + \varphi D + \varepsilon_t$$

The figure in the parenthesis represents the error correcting terms (ECT). If there is only one cointegrating vector and if the endogenous and exogenous variables are identified in the long run analysis, we can develop the VECM by conditioning on the exogenous variables. In this case, only the error correcting terms of the endogenous variables appear in the error correction model. Thus, assuming that Y_t is endogenously determined in the model and Xj_t represents weakly exogenous variables, we can model for Y_t. This is performed using the lagged first difference of

Y_t, the current and lagged first differences of the explanatory variables as well as the error correcting term (designed to capture adjustment speed to the long run equilibrium).

That is:-

$$\Delta Y_t = \alpha + \sum_{i=1}^{k} \beta_i \Delta Y_{t-1} + \sum_{i=0}^{k} \theta \Delta X_{jt-i} + \gamma ECT$$

Where $\Delta \mathbf{Xj}_{t-i}$ is a vector of the first differences of the explanatory variables, ECT represents the error correcting term lagged on period. It is derived from the lagged residuals ε t of the levels in the regression in levels using the Johansson method.

The Error correction representation shows the short run and long run dynamics. The long run dynamic is contained in the error correction term. The coefficient of the error correction term is a priori expected to be negative. And the magnitude of this coefficient shows the speed of adjustment towards the long run equilibrium. The estimation is performed using E-view and software.

CHAPTER FOUR

EMPIRICAL ANALYSIS AND INTERPRETATION

4.1. Descriptive Data Analysis

4.1.1. Introduction

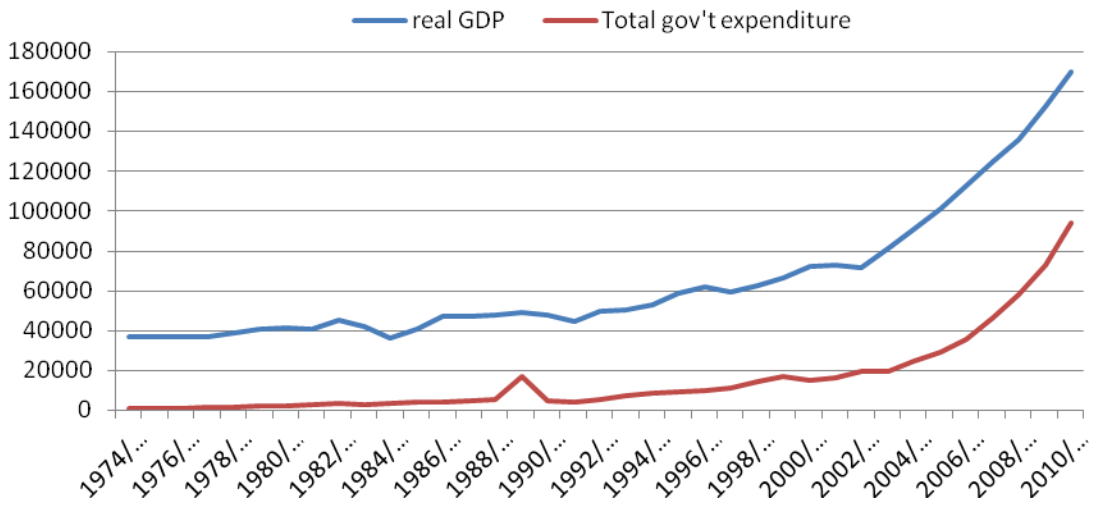
Under different regimes the broader framework of policies and strategy, in which promoting agricultural and other social sector development remains at the centre of the Governments agenda. Sector development in the area of education, health, roads, agriculture and natural resources have got significant attention as key poverty related sectors (WB, 2001)

During the Derg regime (1974/75-1991/92), along the lines of socialist ideology, opt for establishing strong and self-sufficient state economy as the target of its policies and programs. The regime deliberately discouraged private sector so as to assure huge government involvement in the economy. As a result, the size of the government was one of the largest in the world during that time. In the post-Derg periods (post-1991/92), the EPRDF government adapted market economy principle as a guiding principle with the aim of encouraging private sector participation in the economy. The expenditure management is fiscal federalism (decentralization), which claims respect of the rights of nations, nationalities and peoples to administer their own affairs within their defined territory.

4.1.2. Trends in total government spending and GDP

During the last three decades, the trends of total government spending and real GDP, there is considerably rising in public expenditures proportional to the growth rate of real GDP, Government spending growth relates with rising public sector share. In this case, the path of overall government expenditure is demonstrated by considering the ratio of total government expenditure to GDP, which measures the amount of government spending relative to the size of its economy (GDP).

Figure 1. Trends in Real GDP and Total Government Spending



Source: MoFED (2010) Data base and own computation

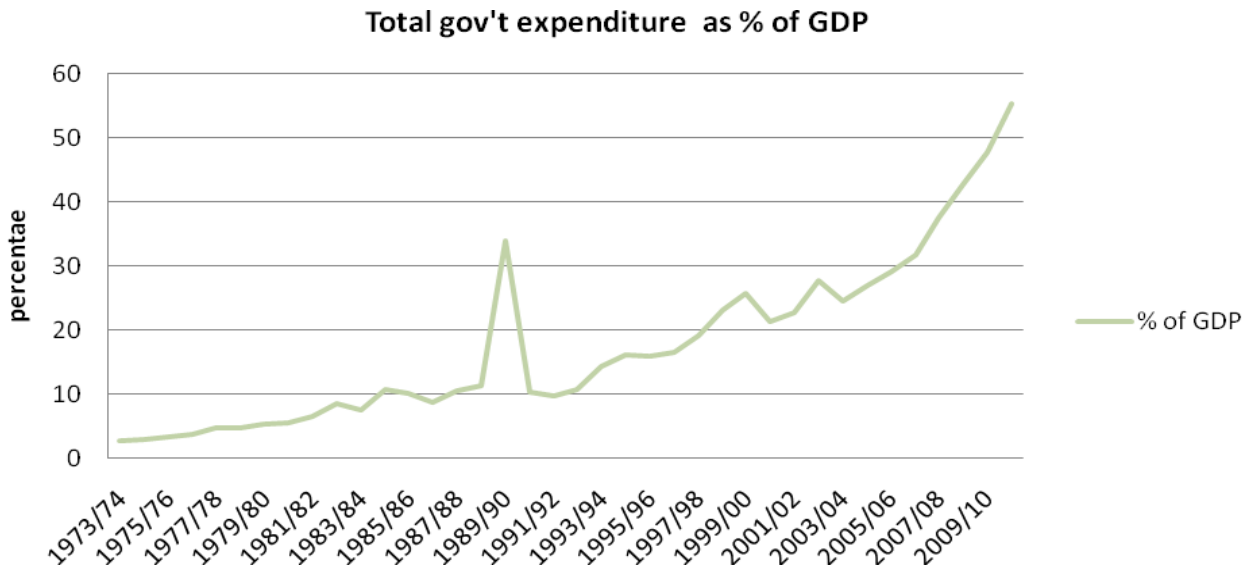
As shown in Table 1, the ratio of government expenditure to GDP rose from average of 11.8 in years 1974 to 38% of GDP in 1988 during the Derg era. The fact that the Derg regime had adopted socialism ideology which was high state involvement in the economy attributed to high share of government expenditure has shown overpowering expansion and reached the maximum in the economy. Government's commitments to provide every infrastructural facilities and social services to the 'mass' while at the same time engaging in the production and distribution of basic goods led to the establishment of many new ministries, institutes, corporations and departments which in turn led to phenomenal expansion of the public sector in the economy (Teshome, 1993).

After the fall down of the Derg regime, the EPRDF has taken the power to implement policy measures on the expenditure side which mainly focuses on controlling the growth and rationalizing its use. In controlling the growth of expenditure, the government takes measure to leave from direct involvement in production and service delivery while opening the gate for private sector participation. Because of this, there was a sharp decline in the relative size of government during the early post-1991 periods. Up to 1998/99, the share of government expenditure in economy (as measured by % of GDP) was generally found to be lesser compared

to last decade of the Derg regime. However, since 1997, the share has been rising steadily in which 35% was registered in 2001/02. On the other hand, in rationalizing expenditure, the government needs to reorient its capital and recurrent expenditure (reduce recurrent expenditure) in order to reallocate resources to basic social services (education and health) and economic infrastructure (Agriculture, Road) at the larger scale.

Real GDP grew on average by 5.8 percent from 1992/93 to 2001/02 while population growth was about 2.7 percent over the same period. The Ethiopian-Eritrean Border conflict affected GDP growth rates in 1998-2000 and the economy faced a sharp decline and a negative growth rate as a result of the drought in 2002/03 fiscal year.

Figure 1. Trends in Total Government spending as the share of GDP



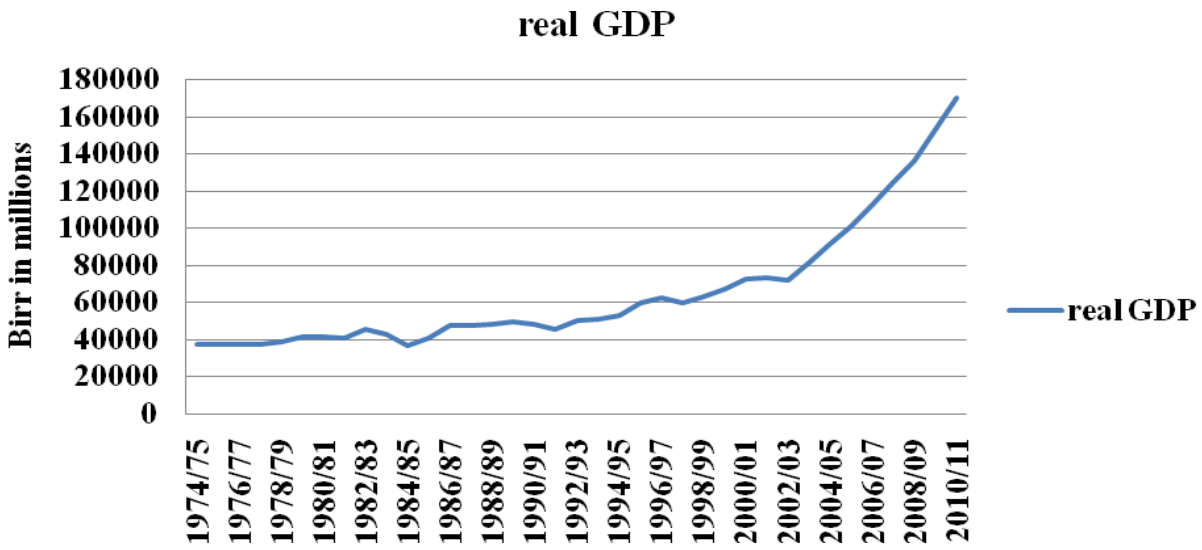
Source: MoFED (2010) Data base and Own computation

Total government expenditure as a percentage of GDP measures the amount a country spends relative to the size of its economy. In the Derg regime government spending show a tremendous fluctuation ranging from a high of 33.51% in 1988/89 and a low of 18.01% of GDP in 1974/75. On average, government spending was 25.22% of GDP over the seventeen years of the regime. The share of government spending on average reached 28.21% of GDP between the year's 2000/01-2004/05 and the share decreased by about 22% for the last six years average (19.21%).

Regarding trends in the real GDP generally it has upward but fluctuation trend as shown in figure 2. The annual average growth rate of Real GDP for the whole period under consideration (1974-2004) is 2.6%. During the Derg era, the economy experienced tremendous growth fluctuations.

Agricultural sector is the predominant sector in the economy and hence its performance significantly affects the growth in GDP. The performance of agricultural sector in turn is highly dependent up on the weather condition (rain fall). Thus, GDP registers the highest figure when there is timely and sufficient rainfall as well as during recovery from a very low base and the lowest when this is not the case. That is why we see erratic nature of growth. There was a mere 2.02 percent annual average growth in real GDP for the entire Derg period. Under the current regime (1991/92 – 2003/04), on the average the economy has been growing at about 4.5 percent per annum in real terms.

Figure 2. Trends in Real GDP



Source: MoFED(2010) Data base and Own computation

Trends in real GDP as shown on the figure (3), Government spending trend in Ethiopia has changed dramatically within the last ten years. Thus, it is important to monitor trends in the levels and composition of government expenditures, and to assess the causes of the change over time. It is even more important to analyze the relative contribution of sectors expenditures to

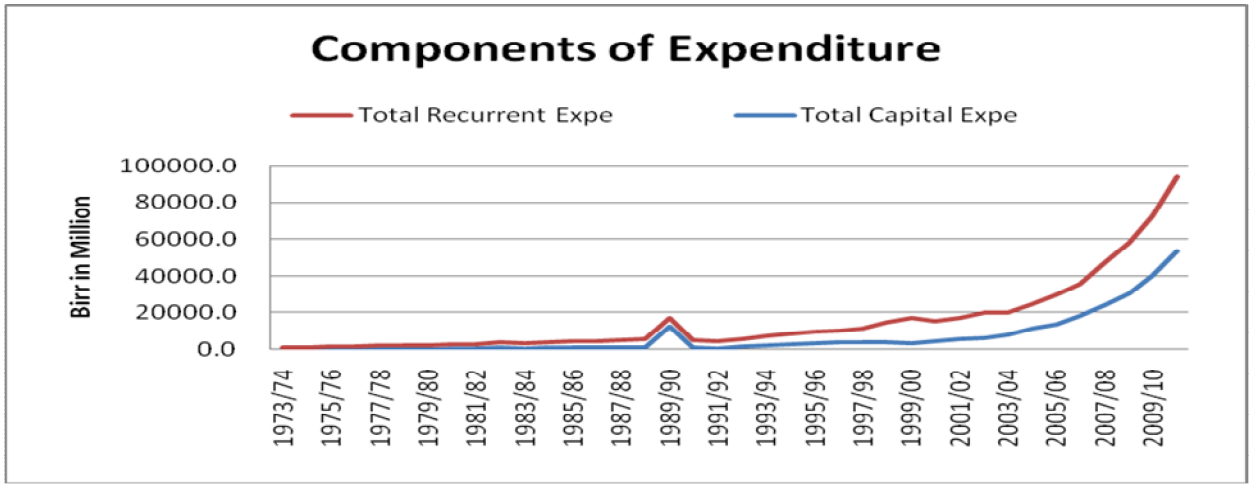
GDP and poverty reduction, as this will provide important information for more efficient targeting of these Limited financial resources.

4.1.3. Composition of government expenditure

Public expenditure is categorized into two broad areas. These are capital and recurrent expenditure. Recurrent expenditure refers to expenditure outlays necessary for the day-to-day running of government business. Wage, subsidies, operation and maintenance, pension and debt servicing are among the major components of recurrent expenditure. It is regarded as final government consumption expenditure. Capital expenditure of government implies investment outlays that increase the capital stock of the nation, such outlays includes spending on land development, construction of power plants, buildings, dams, roads and purchase of machinery and equipment.

During the two regimes, spending pattern as shown on the figure (4) below, the percentage share of recurrent expenditure to GDP was higher than that of capital expenditure. The share of recurrent expenditure to Total Government Expenditure (TGE) is decreasing sharply from the Military regime (73.5%) to the EPRDF regime (60.7%) but the percentage share of capital expenditure to TGE is increasing at an increasing rate. On average, the share of capital expenditure increased from 26.4% in Derg regime of TGE to 39.3% in EPRDF regimes.

Figure 3. Trends of Components of expenditure



Source: MoFED(2010) Data base own computation

During the period 1974/75-1990/91, remarkable change occurred in government expenditure since the down fall of the imperial regime in the year 1974/75. At the end of the military regime's period (1990/91) government expenditure constitutes 75.4% was recurrent which shows government increased expenditure on General services such as defense. The share of government expenditure observed a growth rate as high as 43.7% in the year 1982/83 from the preceding year 1981/82. In general, during the period 1974/75-1990/91, the increment in recurrent expenditure was very fast as compared to capital expenditure and this can be attributed to the case of Somalia and civil war.

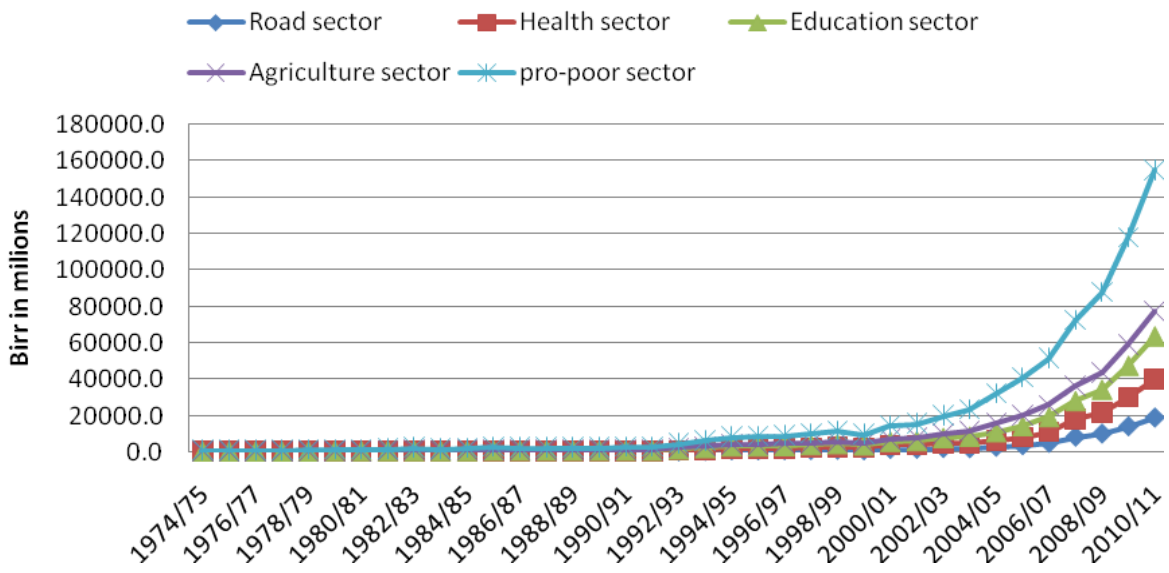
During EPRDF regime, expenditure follows four patterns; for the period 1992/93- 1997/98 which the share of recurrent and capital expenditure is nearly the same, in 1991/92, 75% of the TGE was recurrent expenditure. The trend increases at a decreasing rate and in 1997/98 reached 67% of the total expenditure of the year. The second pattern, during the Ethiopian-Eritrea war (1998/99 and 1999/00) the share of recurrent expenditure took the highest share (80% of the TGE) showing that most of the government budget was allocated for defense. Again during 2000/01-2003/04 the share of recurrent expenditure was more than 50% of the TGE. Thirdly, during 2004/05-2006/07 the share of recurrent and capital expenditure from the total spending was nearly equal. On the last pattern, at the end of the year 2007/08 there was dynamic change in budget allocation that is capital budget allocation (52% of TGE) was greater than recurrent expenditure and reached about 57% at the end of the year 2010/11. This was a new history for budget allocation during the two regimes and indicates government policy shift of budget allocation for investment to reduce poverty and promotes growth.

4.1.4. Public expenditure on pro-poor sectors

In fact, the top four pro-poor expenditures for Ethiopia between 1973/74 and 2010/11were education, agriculture health and road; those have an important impact on the livelihood improvement of people. It is believed that Pro-poor growth must be focused on rural areas, improve incomes in agriculture and make intensive use of labor, in order to have an immediate impact on poverty. Analytically there are two ways in which economic growth can be pro-poor. First, the pattern of growth is one which *directly* raises the incomes of the poor, and second, poor

sections of the population can benefit from growth *indirectly* through public redistributive policies, such as taxes, transfers and other government spending. It is generally agreed that the vast majority of the poor are in rural areas, a majority depend directly or indirectly on agriculture for their livelihood, and the factor of production the poor possess and use most is labor. This second way of understanding pro poor growth in principle means that any kind of high growth could be made pro-poor if it involved progressive taxation and targeted government spending on the poor.

Figure 4. Composition and trends of Pro-poor sectors



Source: MoFED (2010) Data base and own computation

With regard to the composition of pro-poor sectors, during the military regime, the share of expenditure on pro-poor sectors to total government spending had been decreasing from what it was highest in 1975/76 (40.74%), except a minor growth record in 1985/86 (35.20%) from the preceding year expenditure share decreased to 27.93% of total spending. The military regime as it was a period of war and instability, the pattern (trend) of expenditure observed may not be surprising.

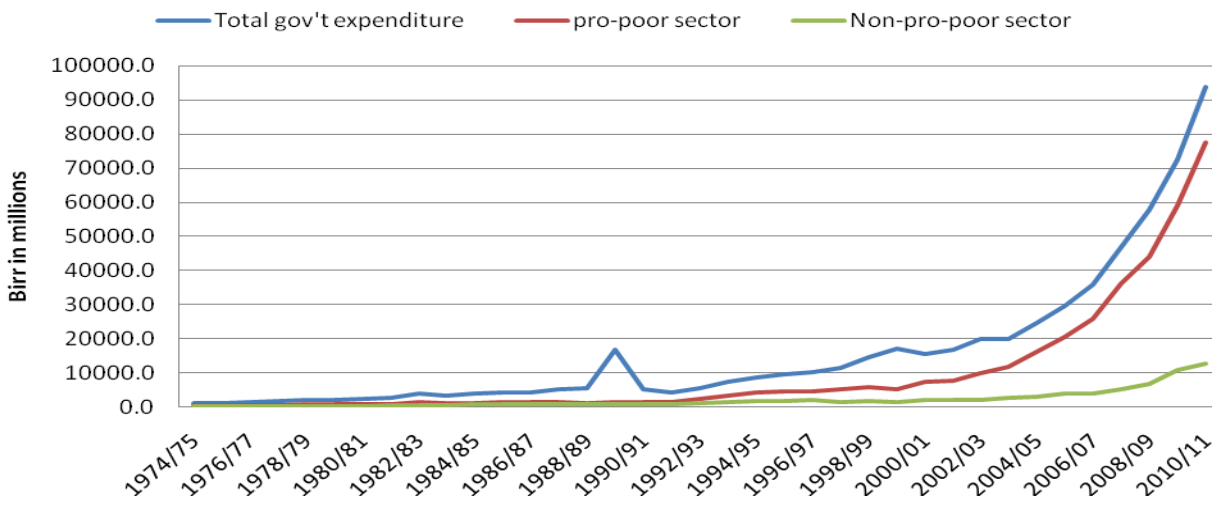
The public expenditure has substantially increased during post reform period (1992-2002). An uprising an interesting change in the pattern of public expenditure began in 1992. As part of the

market reform process, the government took important macroeconomic reform including taxation. The participation of the private sector has increased. The end result was an increase in Government revenue, which partially contributed to increase Government spending. The overall growth in sectoral spending has shown volatility partly because of the war situation with Eritrea. Nevertheless, towards the beginning of 2000 and onwards, the patterns of overall expenditure, has shown an upshot increasing trend, to meet the growing demand for investment in infrastructure, health, education and transport and communication.

During the EPRDF period, the percentage share of pro-poor sectors to TGE of the period, a major increase and remarkable growth has achieved. For instance, the share of poverty sectors from the TGE was 39.66% in 1992/93, reached 45.14% in 1995/96. Contrary to this encouraging trend of increase in the share of TGE it had been declining and reached 21.97% in 1998/99 which is the lowest in the two regimes. The decrease in the share of expenditure was due to the Ethiopia-Eritrea conflict and since 2004/05 the share increase more than 55% and reached 66.46 in 2010/11 Based on the expenditure by pro-poor sectors each of the two regimes had had similarities except some less significant variations.

The percentage share of poverty sectors, especially education has a bigger share while health has the smallest as compared to others. It is important to look at the TGE trend in the two regimes with regard to expenditure level. The following figure depicts the government spending for pro-poor sectors and non pro-poor by the two regimes: This indicates, although it was inconsistent, the pro-poor sectors spending as percent of GDP has achieved significant change.

Figure 5. Trends of the share of Pro-poor and non pro-poor spending

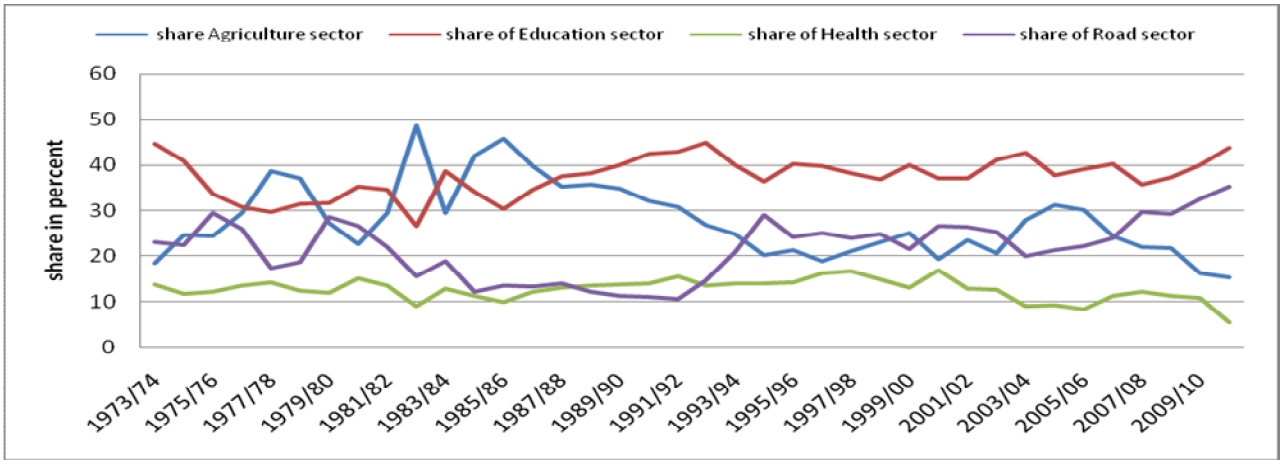


Source: MoFED (2010) Data base and own Computation

4.1.4.1. Trends of Spending in Pro-poor Sectors

Government spending on pro-poor sectors has generally increasing during the period under study. Expenditure on these sectors as a share of GDP increased from 4.11% in 1974/75 to 12.21% in 2010/11. Spending on education is the highest average spending, 14.1% of the total government spending between 1974/75 and 2010/11(figure 3.8.) which accounts 36.74% of total government pro-poor spending. The share of spending on Agriculture and natural resource has increased from 4.41% in 1974/75 to 15.12% in 2010/11 averaged 28.27% of total pro-poor spending Government.

Figure 6. Composition and trends of Pro-poor sectors



Source: MoFED (2010) Data base and own Computation

Similarly, the health sector have got the lowest share as compared to the other sectors, which accounts for average share of 3.19% and 13.07% of the total spending during the period under study.

4.1.4.2. Spending on Road and Urban Development

Road and Urban Development sector had been the third second most important poverty reduction sector during the Derg and the EPRDF. Expenditure for this sector as percentage of GDP had been significant in the Derg period, though the trend was inconsistent to raise and fall. During the period, 1974/75-1976/77, expenditure on road and Urbanization was registering a share of 9.01%, 11.76% and 10.45% of GDP respectively. But this amount declined and became 5.82% of GDP in 1979/80; and there after it continuously declined till it reached 2.22 in 1989/90. Generally in the period government expenditure for the sector was inconsistent, and there was of conformity with the plans.

The EPRDF period to assess is the present government period which has two main phases in relation to both road and urban development. The first phase is the period between 1990/91 and 2000/01 while the second is the period since 2001/02. The first phase has demonstrated a focus mainly in rural road construction and connect Cities-zonal and Woreda level. While urban development initiatives were mostly left to city administrations and private sector. During EPRDF government, expenditure on road and urban development started at 3.16% in 1991/92

grew to 11.45% in 1994/95, and went down to 6.23% of TGE in 1999/00 and 8.12% in 2000/01 at the time of war with Eritrea. These nine years are grouped into a single phase by the researcher. In this period, expenditure was better than the last thirteen years of Derg, but similar in lack of consistency. Until the end of this phase, road and urban development expenditure was 7.9% on average, the third largest among poverty sectors for the period (1991/92-2000/01). However, since 2001/02 road and urban development becomes the second largest expenditure sectors next to education for the last ten years. In this phase, expenditure grows steadily to 10.6%, 11.44%, 14.38%, 17.85% and 22.51% of TGE for the years 2001/02, 2003/04, 2005/06, 2007/08 and 2010/11 respectively. The second phase is mainly the period of the planning and deliberation of construction for major Asphalt Roads, Urban housing projects and etc. The construction works has surely contributed to the rise in expenditure on the sector and GDP.

4.1.4. Performance of road sector in Ethiopia

In this section, attention is given to the road network, road density and accessibility, which are the main indicators for the sector's performance are described.

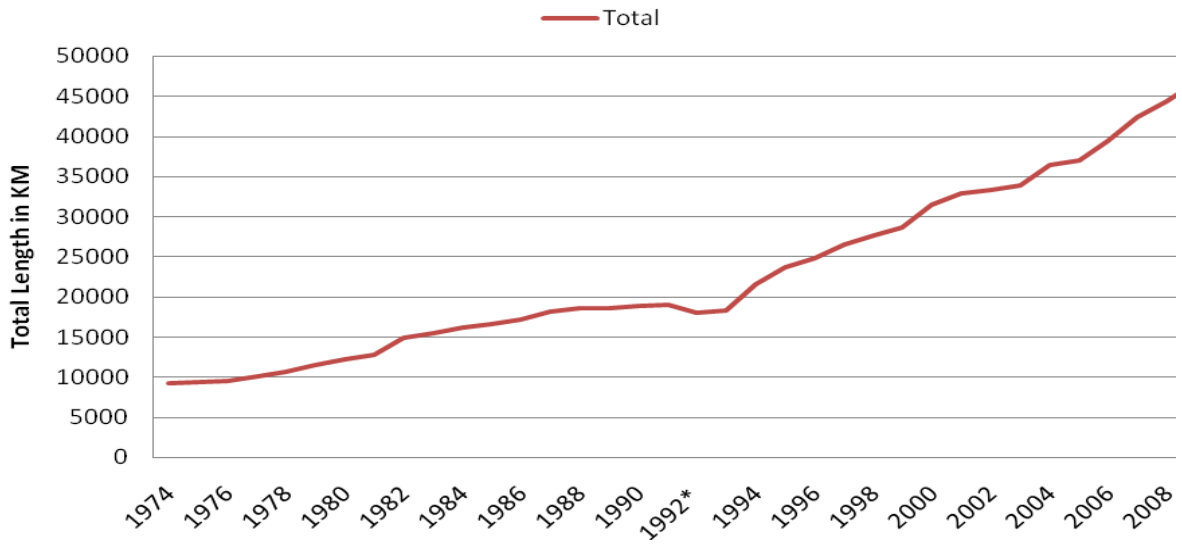
4.1.4.1. Road network

During the Derg regime, 1974-1991, the stock road increased to 19017 km with a growth rate of 6.2 percent per annum. With the current EPRDF regime, the road network has reached 46812 km in 2009 with an average annual growth rate of 9.35 percent. Over the period 1991 to 2009, 28731 km of new road network was constructed. The development of road network is yet to go far. A large space in the country is networked with only a few roads. Though the development is good, more construction is important for connecting the remote areas. Especially, the rural part of Ethiopia is less networked with roads. (ERA 2009)

Similarly, Figure 8 below shows the road network length in Ethiopia. Though there was an increase in the length of roads between 1974 and 1989, it was somewhat constant in the years 1989 to 1991. After, the takeover of EPDRF the government has invested much in construction of asphalt roads. Especially after 2001 there is a significant growth in asphalt road length. However, there is a negative growth in gravel road length. This happened in the recent years like 2003, 2005 and the last two years. One possible cause for the negative growth in gravel roads would be the fact that community roads, which could be considered as part of gravel road, are

being constructed with Productive Safety Net Projects (PSNP). This type of road is not counted or included as gravel road for the very reason that it fails to meet the standard set by the Ethiopian Roads Authority (ERA). In addition, either the federal or regional road authorities do not administer this type of road. Another cause may be the fall in expenditure for maintenance and reconstruction, mainly over the period 2003 and 2005.

Figure 7. Total length of road



Sources ERA (2009) and Own computation

4.1.4.2. Road density

The proper level of road network is assessed by road density, which is measured by road length per 1000 persons or by road length per 1000 km^2. In the three RSDP periods, there was a plan to increase the road density form 0.43 to 1.5 km per 1000 persons and from 21 to 116 km per 1000 km^2, starting 1997 through 2009. At the end of the first phase the road density has increased achieving the target of the government. In 2002 the road density was exactly at the aimed level, which is 0.49 km per 1000 persons whereas the road length per 1000 km2 is more than the target level by 30.27 km per 1000 km^2.

When the second phase of RSDP continued, the government has also targeted for higher levels, i.e. targeted road density of 0.5 km per 1000 persons and 30 km per 1000 square km. At the end

of RSDP II, road density has reached 0.55 km per 1000 persons and 38.6 km per 1000 km^2 in the year 2007. The accomplishment of the second phase was thus a success.

4.1.4.3. Road accessibility

Access refers to the opportunity to use or the right to or the ability to reach some destiny. Accessibility is measured as the percentage of population having access to all weather roads. The benefits of having access to a road network is measured in terms of reductions in monetary costs or time needed by beneficiaries to access output markets or key public social services like health and education.

The accepted theory, according to ERA (2008) study, is that accessibility has three elements: 1) the location of the individual; 2) the location of the supply, service, or facility to which the individual needs access; 3) the link to bring the two together. The study used three approaches, namely, the random model approach, the graph theory approach, and the squire grid approach to cover the country's network demand. This demand was estimated as such that all rural population could have access to all weather roads within a 5 km distance.

According to the ERA study the country is required to construct 200,000 km of optimum national road network, which is considered as a target road network on the assumption that it will give reasonably good accessibility. Whereas, for the country to be competitive enough and enter into middle income category, the targeted road density which secures the rural population to have access to all weather road is estimated to be 0.3 km/km2, the average road density of the lower middle countries. In this case the road transport network has to reach 330,000 km.

The same study defined the concept measured in terms of average distance from the road network and proportion of area farther than 5 km from all weather roads as lack of access, which deprives people from the opportunities to improve their lives. Access is composed of two elements: mobility, reflecting the ease or difficulty in traveling to a service or facility; and proximity of those services and facilities. The study considered access to be one key element in providing the opportunity for both social and economic development, and a key determinant of both poverty itself and opportunities to escape from the poverty trap.

When we look at the recent trend regarding society's access to the all weather road network, we find a slight improvement over the past seven years. However, In 2008 only about 33% of the rural population had access to an all weather road within a distance of 5 km. Given the fact that around 80 million people are living in rural area, such a low rate exacerbates the problem of poverty. Improving the current access rate should be a major concern of the country's road sector expansion program.

Similarly, African Development Indicators (ADI) (2008/09) data indicates that the country has made an effort to provide access to all weather roads, though it is not satisfactory. Within a period of seven years (2002 to 2008), an additional seven percent of the rural population is provided with access to all weather roads (from 26% to 33% of the rural population). ERA (2008) study also indicates that with the recent construction of new roads, the average distance from a road has been reduced from 21km in 1997 to 11.7 km in 2009. On the other hand, the proportion of area farther than 5 km from all weather roads, which was 79% in 1997, has been reduced to 65.3% in 2009. Therefore, the issue of accessibility calls for a kind of „big-push approach in expanding all weather roads for the destitute rural poor. The problem of accessibility could also be addressed through a well-designed planning process coinciding with the parallel trends towards the decentralization of decision making and the concern to involve the local communities in the decision making process. The effort made so far towards the improvement of main roads and rural roads is a necessary but not sufficient measure to enhance rural accessibility.

4.2. Tests of the time series Data

4.2.1. Stationary tests

Prior to any other type of econometric analysis concerning time series variables, it is mandatory to test the existence of unit root in the variables and establish the order of integration of the variables. A direct application of OLS to trended time series variables whether it is deterministic or stochastic time trend frequently exhibits false correlation rather than the actual one. The most commonly used solution for the stochastic trends in the time series data is estimating the relationship in the first difference instead of at level as was recommended by Enders (1995).

Many test procedures are available for testing for a unit root in a time series. However, in this study, the analysis is conducted by using the widely applied test procedure, namely Augmented Dickey-Fuller (ADF), and used to determine the order of integration of each series. The variables involved in unit root tests are the natural logarithm of real values of GDP (LRGDP), education expenditure (LRRE), health expenditure (LRHE), agriculture expenditure (LRAGI), road expenditure (LRRD) and non-poverty sectors expenditure (LRNP). The test results of ADF statistics for all the time series variables used in the estimation are presented in Tables 1 and 2 below.

Table 1. Unit Root Test Results of Variables in Levels

Variables in level		Without intercept and trend	With intercept	With intercept and Trend
Lrgdp		1.032626	1.783695	0.9999
Lrrd		1.825789	0.315784	-1.567875
Lrhe		1.130153	0.306166	-1.565662
Lred		1.394805	1.264062	-2. 139076
Lragi		1.559961	-0.922768	-3.131712
Lrnp		1.152864	-1.941829	-2.309230
Critical value	**1%**	-2.636901	-3.639407	-4.252879
	5%	*-1.951332*	*-2.951125*	*-3.548490*

**and **Denote rejection of the null at 5% and 1% significance level respectively*

Table 2. Unit Root Test Results of Variables in First Difference

Variables in First difference		Without intercept and trend	With intercept	With intercept and Trend
Lrgdpd1		-0.990339	-4,490366**	-3.466467
Lrrdd1		-5.228021**	-5.806879**	-6.145574**
Lrhed1		-5.399292**	-5.631185**	-6.145574**
Lredd1		-4.376707**	-5.631185**	-4.143948*
Lragid1		-6.571650**	-7.092327**	-6.984808**
Lrnpd1		-6.112224**	-6.404838**	-6.401683**
Critical value	**1%**	**-2.636901**	**-3.632900**	**-4.243644**
	5%	*-1.951332*	*-2.948404*	*-3.544284*

**and **Denote rejection of the null at 5% and 1% significance level respectively*

The decision rule is accept the null hypothesis if the ADF test statistics is less than the critical value, if this is the case the time series variables are non-stationary on the other hand reject if the ADF test statistics is greater than the critical values which indicates the stationary of the time series variables

As we can observe in Table 1 the values of ADF test is less than the critical values for all the variables in absolute terms at level so this confirms that none of the given variables are stationary at level. This indicates the existence of unit roots in all variables at level. But Table 2 the augmented Dickey Fuller test for the unit root results indicates that the dependent variable is non-stationary if no intercept and trend and with intercept and trend is included. However, if intercept is included in the test, Lrgdp become stationary. On the other hand, the results of unit root indicate that all variables are stationary at first difference at 1% level of significance, if intercept is included in the test.

The result also suggests that the variables are co-integrated at order I(1) and they move closely together overtime as well as the regression on the levels of the specified variables is not spurious. Therefore, the variables are stationary (I (1) series). As already discussed, information about the long run relationship between the variables is lost by running regression using a differenced data; and this is solved by conducting co-integration analysis. The Johansen maximum likelihood procedure is applied to determine co-integrating relationship between the dependent and independent variables. The variables used in the analysis need to be stationary and/or should be co-integrated in order to infer a meaningful relationship from the regression. Estimation of the co-integration relationship to be undertaken in the next section, which requires all the time series variables in the model to be integrated of order one.

4.2.2. Determination of the Lag Length

Co-integration test is usually preceded by a test of optimal lag length as the result of the test is affected by the number of lags included in the VAR model. In the Johansson maximum likelihood approach, the first step towards the co-integration analysis is the determination of an appropriate lag length that is going to be used in the VAR estimate. There are many tests that can be used to choose a lag length, The Likelihood Ratio test [LR], the Final Prediction Error test [FPE], the Akaike information criteria [AIC], the Schwarz information criteria [SIC] and the Hannan-Quinn information criteria [HIC] are used to determine the optimal lag length of the VAR model for co-integration test. The test results of the different lag selection methods indicate that the appropriate lag length in this study is one, at 5% level of significance and presented in Table 3 below.

Table 3. VAR lag order selection criteria

lag	logl	LR	FPE	AIC	SC	HQ
0	190.0552	NA	1.09e-12	-10.51 744	-10.25081	-10.42540
1	336.6320	234.5229*	2.03e-15*	-16.83612*	-14.96970*	-16.19183*
2	373.2624	45.79823	2.40e-15	-16.86071	-13.39451	-15.66418

** indicates lag order selected by the criterion*

To further confirm the relevance of the chosen optimal lag length for all variables, a test of lag exclusion [Wald lag exclusion test] is conducted. It shows that the inclusion of a single lag length for each variable individually and for all the system jointly is significant for all variables at 1% level of significance.

Table 4. VAR Wald Lag-Exclusion statistic

Variables	LRGDP	LRRD	LRHE	LRED	LRAGI	LRRNP	ALL
lag	1	1	1	1	1	1	
df	6	6	6	6	6	6	36
Chi2	32.08458	25.04364	27.20739	24.90402	19.21693	15.82621	182.2154
Prob>chi2	1.5.7e-05*	0.000335*	0.000132*	0.000356*	0.003813*	0.014718*	0.00000*

** indicates lag order failed to be excluded at 1% level*

4.2.3. Test for Co-integration

As Engle and Granger (1987) pointed out that linear combination of two or more non stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series are said to be co-integrated. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship among the variables. In this study the Johansen maximum likelihood testing procedure was applied to determine the number of co-integrating relations, which also includes testing procedures for linear restrictions on the co-integrating parameters for any set of variables that were used. Therefore, the numbers of co-integrating vectors are determined with the help of two statistics: the trace statistics and the maximum Eigen value. 'r', we proceeded sequentially from 'r = 0' to 'r = k-1' until we fail to reject, where k is the number of endogenous variables. The trace statistic tests the null hypothesis of 'r' cointegrating relations against the alternative of 'k' co-integrating relations, for r = 0, 1…

k-1. The alternative of k co-integrating relations corresponds to the case where none of the series has a unit-root and a stationary VAR may be specified in terms of the levels of the series. On the other hand, the maximum eigen value statistic tests the null hypothesis of 'r' co-integrating. The result of Johansen Co-integration test presented in the Tables 7 and 8 below.

Table 5. Cointegration Rank test

Null	Alternative	Eigen value	Trace statistic	5% critical value	prob	Hypothesized No. of CE(s)
Trace test						
r=0	r≥0	0.694158	110.0719	95.75366	0.0036	None*
r≤1	r≥1	0.656774	68.60789	69.81889	0.0622	At most 1
r≤2	r≥2	0.343193	31.1806	47.85613	0.6569	At most 2
r≤3	r≥3	0.258879	16.46730	29.79707	0.6790	At most 3
r≤4	r≥4	0.139432	5.981615	15.49471	0.6977	At most 4
r≤5	r≥5	0.020527	0.725927	3.841466	0.3942	At most 5
Maximum Eigen test						
r=0	r≥0	0.694158	41.46399	40. 07757	0.0347	None*
r≤1	r≥1	0.656774	31.42783	33.87687	0.880	At most 1
r≤2	r≥2	0.343193	14.71276	27.58434	0.7705	At most 2
r≤3	r≥3	0.258879	10.48568	21.13162	0.6981	At most 3
r≤4	r≥4	0.139432	5.255689	14.26460	0.7093	At most 4
r≤5	r≥5	0.020527	0.725927	3.841466	0.3942	At most 5

* *denotes rejection of the null hypothesis at 5% significance level.*

Number of lags used in analysis = 1
Variables entered unrestricted = constant
Vector AR-2 F (98, 53) = 1.3800 [0.0996]
Vector normality chi^ 2 (14) = 21.979 [0.0791]
Vector hetero chi^ 2 (784) =813.57 [0.2253]

Based on both the trace statistics and the maximum Eigen/likelihood ratio test results shows from the above Table 5, confirms that there is one co-integration relationship, which means that the existence of a long run equilibrium relationship between real government spending and real GDP growth, and the null of no co integrating vector is rejected at 5% level of significant in favor of at least one co integrating vector for equation. Therefore there is one co integrating vector in this model.

4.3. Estimation of the Long-Run Relationship

The cointegration rank test in the previous section suggests that existence of single long run equilibrium equation or one cointegrating vector. For the purpose of analysis table 9 is used to present the resulting long-run normalized α and β adjustment parameters for the real GDP growth equation

Table 6. Normalized long-run β and α Adjustment coefficients

Variable	**Lrgdp**	**Lrre**	**Lrhe**	**Lred**	**Lragi**	**lrnp**
Estimate **β** coefficients	1000	0.02106	0.23582	0.14829	0.61912	0.25061
α Adjustment coefficients	-0.591	-0.4811	-0.4201	-0.0028	-1.058	-0.4106

To identify the variables that are endogenously determined and conditional on other variables in the VAR, the test for weak exogenitey is conducted. This requires imposing zero restriction on the first column of α coefficient. This is to identify endogenous and exogenous variables in the model. Rejection of weak exogeneity implies that the variables under investigation are endogenous. The result of tests for weak exogeneity is presented Table below.

Table 7. Weak exogeneity test (Test for Zero Restriction on α-Coefficients)

α-coefficients	**Lrgdp**	**Lrre**	**Lrhe**	**Lred**	**Lragi**	**lrnp**
LR test of restriction Chi^2(1)	3.94326	3.44749	2.28980	0.25846	0.17945	0.52630
Probability value	0.04705*	0.06334	0.13022	0.54663	0.67184	0.46816

***denotes rejection of the null hypothesis of weak exogenity at 5% significance level.*

From the above Table 7 we can see that, after imposing the normalization restriction by the Johansen method, the result using the likelihood ratio test confirms that only the dependent variable LRGDP rejects the null hypothesis of weak exogeneity at 5% level of significance. All explanatory variables are not rejected from the rest result. Therefore, other than LRGDP, all explanatory variables are not endogenous to the system. Once the variables are identified as endogenous and exogenous, the next step is to define the long run relationship of variables in the model and test for the significance of the long run parameters. To identify the significance of the long run parameters, test of zero restriction on the long run parameters was conducted and presented in the Table 8 as follows

Table 8. Test of Zero restriction on the Long – run Parameters

β.-Coefficients	LR test of restriction Chi^2(1)	Probability value
LRRD	3.005688	0.0473*
LRHE	5.1607	0.0075*
LRED	7.12058	0.0069*
LRAGI	9.5823	0.0027*
LRNP	8.00604	0.0040*

** denotes rejection of the null hypothesis at **5%** significance level.*

The test statistics reported in Table 8 rejects the null hypothesis of β=0 for all explanatory variables, except for LRRD. All variables are statistically significant at 5% level of significance in explaining the long run relationship between real GDP and real Government Expenditure. It is clear that all the coefficients show the expected sign, and α11 representing the speed of adjustment to disequilibrium in the previous period, and the long run equation with their respective diagnostic test is depicted as follow.

The long run real GDP growth equation is given by:

LRGDP= 6.94123 + 0.0210 LRRE + 0.235LRHE + 0.1482LRED +0.6191LRAGI + 0.2506 LRNP
(0.2231) (0.047*) (0.0075*) (0.009*) (0.027*) (0.0089*)

AR 1-2 test: F (2, 28) = 7.85704[0.2237]
ARCH 1 F (1, 28) = 2.4556 [0.2929]
Normality Chi^2(12) = 19.965 [0.0677]
Hetero test: Chi^2(252) = 273.008 [0.1900]
RESET F (1, 24) = 0.508 [0.4830]

The results of various diagnostic tests [the Breush-Godfrey Lagrange Multiplier (LM) test for serial autocorrelation, the autoregressive conditional hetroscedasticity test, the Jarque-Bera test

for normality, the White's test for hetroscedasticity and Ramsey's general test of model misspecification] are reported and all tests did not detect any problem of serial correlation, hetroscedasticity, non-normality and model misspecification. Therefore, the long-run equation is reasonably acceptable.

As all variables are used in the logarithmic form, the estimated coefficients can directly be interpreted as long term elasticity. The regression result in the above long run equation shows that government expenditure on road (lrre), health (lrhe), education (lred), agriculture (lragi), and non pro-poor (lrnp) are significant and positive impact the real GDP growth in the long run.

Government road expenditure is found to be positive and significant effects on economic growth (GDP) in the long-run, According to the result a one percent increment in expenditure on road infrastructure in one year leads to about 0.021percentage increments in real GDP in the long run. This shows that public spending can be used as a main engine of growth in Ethiopia. Nowadays, the construction of roads [seasonal and all weathered] has made the supply of commodities easy and quick. This has improved the marketability of the commodities and the income of the farmers. This has, the researcher believed, contributed to the current five-to-six years of sustained growth in Ethiopia.

The recent trend of government spending shows that the government is showing strong commitment to expand and improve the current performance of road sector through financing on road project from as low level of 0.4 Billion in 1993/94 to 19.4 Billion in 2009/10 with increased outcome as measured by road constructed (MOFED, 2010).

The road sector plays a role of outstanding importance in any national economy, both through its own direct contribution to GDP and employment as well as through the provision of services which are indispensable for the development of all other economic sectors, modernization of agriculture requires supplying tools, machinery and fertilizers to rural farms, and moving food and other products to consumers. Increasing industrial production means bringing together greater volume of finished goods to consumers. Expanding output may be accompanied by an extension of the area from which materials are assembled as well as the area from which the increasing is marketed, and the total international trade to and from Ethiopia is also growing.

In Ethiopia, road infrastructure deficit has remained one of the major structural bottlenecks to economic growth. Increased public investment on road infrastructure has therefore been instrumental in enhancing the private sector competitiveness and encouraging further investment, which leads to increase in economic growth. The demand for road infrastructure is estimated to increase notably in the future. Better roads enlarging the market and making it more competitive will attract private investment and enhance service efficiency.

Government expenditure on education and health positively and significantly affects economic growth (GDP) in the long-run, According to the result a one percent increment in expenditure on health and education in one year leads to approximately 0.020 and 0.046 percentage increments in real GDP in the long run respectively. Currently the Ethiopian government has been raising public spending particularly pro-poor expenditure. This expansion of public expenditure, especially human capital (education and health) spending can significantly contributed to economic growth through improving productivity of the people, promotes economic growth of the country in general.

The above findings are in line with the study results obtained by Loto (2011), Tewodaj (2006), Fan & Rao (2003, 2004), Narudeen and Usman (2010), Nketia (2009), Barro (1990), Calvo and Dercon (2007), Bakare and Olubokun (2011), Jacob and Walid (2004) These studies concludes that government spending on education sector contributes to economic growth. The studies by Kweka and Morrissey (2000), and Shioji (2001) concludes that spending on education sector has negative effect on growth. Spending on health has positive significant effect on the long run and negative and insignificant in the short run, this was found by Wendwesen (2012) and Teshome (2006) studies, they conclude that government expenditure on Human capital particularly health sector has positive and significant long-run effect on real GDP. According to their finding, the possible reason was that government expenditure on human capital (HgY) has possibly improved human development outcomes thereby boosting long-run growth. The narrow base of health sectors and the highest priority given to basic preventive health care by government could probably explain the effect. The above findings are not consistent with the results and conclusion made by Amasoma et al (2011) and it shows that spending in health sector significantly effect on the economy growth.

The long run estimation shows that expenditure on agriculture has a significant and positive impact on the growth of GDP. Based on the result, a one percent increment in expenditure on agriculture in one year leads to approximately 0.079 percentage increments in real GDP in the long run. This reflects Agriculture is still the dominant sector and is contributing to the GDP and active labor force and over 90% of export earnings. It is also a sector supposed to lead the economic transition as expected in the Growth and Transformation Plan (GTP).

In Ethiopia, about 85% of the total population resides in rural area whose livelihoods depend on agriculture. This implies that the country's overall growth performance depends basically on the status of the change in the rural population. Public agriculture sector spending affects the majority through enhancing farmers' income directly by increasing agricultural productivity, which in turn improves the economic status of the rural community.

Agricultural expenditure is one of the most important government instruments for promoting economic growth of the country. This empirical finding is comparable with the previous study by Fan & Rao (2003, 2004), Lofgren and Robinson (2004), and Tewodaj (2006). The findings conclude that government spending on agriculture is positive and strong in promoting economic growth. And against with the findings with Teshome (2006), Wendwesen (2012) and kweke and Morrissey (2000) which concludes that agriculture expenditure has negative relationship with economic growth. Based on their findings, the reasons for this negative relationship between public agriculture spending on economic growth was the inefficient use of public funds. The result of this study, however, shows that agriculture has significant impact on economic growth over the period under study. So the findings of this particular study is different from the above study, this has emanate from the methodology adopted, the analysis that has made, the way government spending is disaggregated and time considered in the study.

In general, During PASDEP public spending, especially pro-poor expenditure has increased along with government revenue so as to accelerate economic growth and reduce poverty. The government continues to raise its expenditure under GTP to sustain macro-economic growth and hence significantly reduces the poverty and inequality redistribution of income. According to GTP, the government projected to increase human capital and agricultural expenditure on an average of 22 and 30 percent per annum, respectively. This reflects the government's recognition

of the importance of human capital and agriculture sector for national economic growth and for profiting to a maximum from the country's assets through improving the total productivity of the overall economy.

This agriculture sector spending was insignificant in the case of Teshome (2006), Wendwesen (2012) findings, but due to the above facts the agriculture sector spending has significant and positive effect on growth of economy in the long-run. Thus, Priority should be given to those sectors which public will have a positive high return in the long run.

4.4. Estimation of the Error-Correction Model

Having established that the variables of concern are of the same order of integration, an OLS regression was run for relevant variables and test for co-integration by testing the residual is *I*(0). After indicating the presence of long-run co-integration relationships by using the Johansen approach, the existence of co-integration allows analysis of the short-run dynamic model that identifies adjustments to the long run equilibrium relationship through the Error Correction Model (ECM) representation[8].

ECM enables to capture the short run dynamics of the model and formulated based on the identified long run relationships. The ECM has co-integration relation built into the specification, so that it restricts the long run behavior of the endogenous variable to converge to their co-integrating relationships while allowing for short run adjustment dynamics. The co-integrating term is known as the *error correction term* since the deviation from long run equilibrium is corrected gradually through a series of partial short run adjustments. Thus co-integration implies the presence of error correcting representation and any deviation from equilibrium will revert back to its long run path. As one long run co-integrating vector is determined, the VECM is formulated as follows:

$$\Delta LRGDP_t = \beta_0 + \beta_1 \Delta LRRE_t + \beta_2 \Delta LRHE_t + \beta_3 \Delta LRED_t + \beta_4 \Delta LRAGI_t + \beta_5 \Delta LRNP_T + \beta 6 ECT_{-1}$$

The short run equation is regressed with difference of log of real GDP at time t as the dependent variable against the lagged differences of log of all explanatory variables are lagged one times to capture the short run change in the corresponding level, and ECT_{t-1} in the lagged period represents

the error correcting term-which is designed to capture the speed of adjustment to the long run equilibrium.

Table 9. Short Run Dynamic (Parsimonious) Model

Dependent variable DLRGDP

I. Coefficients and Levels of Significance				
variables	**coefficient**	**Std.error**	**t-value**	**t-prob**
DLRGDG_1	0.854796	0.2643	3.29	0.0032*
CONSTANT	-0.00137	0.0006	-0.21	0.837
DLRRE	0.16797	0.1154	1.89	0.070***
DLRRE_1	0.13704	0.1187	2.13	0.041**
DLRHE	-0.13137	0.1248	-1.05	0.303
DLRED	0.18555	0.0992	1.99	0.074***
DLRED_1	0.297562	0.0896	-2.09	0.050**
DLRAGI	-0.16053	0.0420	2.33	0.037**
DLRAGI_1	-0.23649	0.0420	3.52	0.000*
ECT_1	-0.861036	0.2906	-2.19	0.047**
II. Model Criteria/Goodness of Fit				
R^2	0.71697	F(12,22) = 3.36 [0.007]*		DW = 2.04
log-likelihood	92.6682			
III. Diagnostic Tests				
AR 1-2 test: F(2,20)		1.0847	[0.3571]	
ARCH 1-1 test: F(1,20)		0.071241	[0.7923]	
Normality test: Chi^2(2)		4.4556	[0.1078]	
hetero test: Chi^2(24)		20.138	[0.6889]	
RESET test: F(1,21)		4.3022	[0.0505]	

****, **, * indicate level of significance at 10%, 5% and 1% respectively.*

The estimation results of using the Error correcting model is reported in the above Table 9. The overall significance/validity of the model of the short run which is tested using the F statistics, it confirms the fitness of the model to the required level, the short run equation model is jointly significant at 1% critical value, and no problem is identified in this regard. The other test that is commonly used for testing the appropriateness of the explanatory variables in terms of explaining the dependent variable is R^2 in the case of short run shows that 71 percent of the dependent (real GDP) variable is explained by explanatory variables in the model. Another test that is usually used in kind of analysis for checking the existence of close relationship between

explanatory variables is the Durbin Watson test (DW = 2.04) again in this regard there is no problem of autocorrelation in the model.

When it comes to the diagnosis test, the first diagnosis undertaken was normality-the test confirms the normality of the model by accepting the null hypothesis that there exists the normality through the Jarque-Bera test. Similarly, the White's test for heteroscedasticity did not reject the null hypothesis that the error term is homoscedastic. In addition, the test for autoregressive conditional hetroscedasticity (ARCH) points that no ARCH structure in the error term is detected. Failure to reject the null of no ARCH indicates the existence of constant variance. Moreover, the Ramsey RESET test for functional form mis-specification of the model accepts the regression specification of the dynamic model. Bera LM test is applied. The result of the test shows the Jarque-Bera statistics is not significant, indicating that the residuals from the model are normally distributed as indicated. In general, no problem is detected by the diagnostic statistics of the model which lends support to the reasonableness of the specification.

The speed of adjustment coefficient (ECT_{-1}) included in the model to capture the long run dynamics is statically significant at 5% critical value with the correct (negative) sign and as the theory predicts. It has important implication in linking the short- run periods to the long-run period. According to the estimate of coefficient indicates that, any short-run deviation of the real GDP growth from the long-run value this period will be adjusted (corrected) at speed itself by 86 percent per year towards the dynamic equilibrium long run co-integrating relationship.

The results of the short-run model reveals that the change in real GDP before one period (lagged one period) has a positive and significant effect on the current change in real GDP at 1% level of significant. A one percent change in the lag real GDP leads to 0.85 percent change on the current change in real GDP, the result indicates that the past real GDP performance of country plays a great role in improving the current economic growth (real GDP).

Government expenditure on road sectors, both current and past (lagged) one period have a positive and significant effect on the current change in real GDP at 10% level of significance. According to the result, a one (1) percentage change in government expenditure on road sector in the previous one period (lagged one period) and the current one period leads to 0.167 and 0.135 percent change in real GDP respectively.

Based on the findings, a positive effect on economic growth in the short-run, this is happened due to some reasons; the study conducted by ERA(2008) reveals that the economic impacts of road infrastructure are typically in terms of the change in local business activity occurring as a direct consequence of road project has brought to economy of the area, road projects takes account the direct purchases made within the region by the project, the number of people employed, and the effect of household incomes of those people, this leads to an increase in household expenditure. The indirect economic effect of road projects takes into account the fact that the supplying industries will also have to purchase more inputs, employ more labour and pay more wages. The supplying industries are those industries that supply building material and other resources to the construction companies and those firms involved in the road investment project. Hence, road construction projects create a demand for stone, cement, and other construction materials. These items may be imported from other regions, but if the demand is sufficient, local business will acquire such materials, hence stimulating local sales.

This study finding also supported by economic theory and empirical research suggest that investment in road infrastructure spurs economic growth. It is also expected to generate employment directly through the actual construction, operation and maintenance requirements but also through indirect multiplier effects across the economy. Economic theory identifies three channels through which road infrastructure can positively impact on economic growth: (i) as a direct input into the production process and hence as a factor of production; (ii) stimulating factor accumulation through, for example, providing facilities for human capital development; and finally, (iii) boosting aggregate demand through increased expenditure during construction, and possibly during maintenance operations.

In addition, this study finding is comparable to pervious findings of Fan & Rao (2003), Semmler *et. al* (2007), Nworji and Oluwalaiye O. B (2012), Ibrahim (2011), Dercon *et al*. (2008), Lofgren et al (2005), which concludes that government spending on road sector contributes to growth and it would be better to allocate more resources to develop road infrastructure, and this finding against with pervious findings of Wendwesen (2011), he concludes that government spending on road construction have insignificant effect on GDP. One of the biggest causes of different findings was the type of model used to estimate the effect of public investment.

In general, the government may play its major role in investing in road infrastructure that complements private investments. In the absence of significant private investment in a developing country like Ethiopia, public investments may be used as engine of growth. When we compare this with the one obtained from the long run analysis, we learn that the contribution of growth of road expenditure to GDP is only a short period phenomenon. Thus, all studies have done in Africa countries including Ethiopia argue that increase in government expenditure on socio-economic and physical infrastructures encourages economic growth, which is supporting the Keynesian theorist have generally assumed that, increase in government expenditure on physical capital (road infrastructures) leads to higher Economic growth. In most cases, good road infrastructure helps to raise productivity and lower cost of production of the economy. Thus, the government has to be expanding fast enough to meet the demand for road infrastructure in the early stage of development because of Construction expense for road sector is huge during construction period.

Government education expenditure positively and significantly affects economic growth in Ethiopia. The finding shows that a one (1) percentage change in government expenditure on education sector in the previous one period (lagged period year) and the current one period leads to 0.2975 and 0.1855 percentage changes in real GDP respectively. This empirical findings are in line with the previous studies Wendwesen (2012), Bakare and Olubokun (2011), Jacob and Walid (2004) which conclude investment in education sector contributes to growth and against with studies by Kweka and Morrissey (2000), Narudeen and Usman (2010), Nketia and Amphonsah (2009) and Loto (2011) who concludes that spending on education sector has negative effect on growth**.**

The Evidence from the empirical findings of investigates the positive relationship between government education expenditure and economic growth in different countries. As the authors suggest that an increase in education expenditures help to improve the economy's growth performance is economically sound. And as a caution, however, for education expenditures to have the intended results to the fullest, there has to be competent administration at lower level of government to formulate and execute the budget and to allocate resources efficiently within the education sector, otherwise, without this background, resources allocated to the education sector may not have appreciable positive impact on economic growth. In this regard, The positive

impact of expenditures on education spending on gross domestic product (GDP) in Ethiopia, this probably could be explained by the huge increased in investment on education at increasing rate significantly since 2007/08 could be ground for continuous positive relationship between growth and education sector spending. On the other hand, few studies revealed that the negative effects of public education spending on the growth of economy. The reason for these findings could be differs in the context of countries, methodology used and it is also considered different types of expenditures have divergent effects.

The study found that education sector expenditure has both short-run and long-run statistically positive-significant effect on growth. In this regard, the government has been increasing public expenditures on education in the past few years. Thus, the government is found to be the main factor that may generate economic growth in Ethiopia. This supports on the one hand Keynesian view that government investments on social sectors are causes of growth and on the other hand the argument of endogenous growth theories of the additional effects of human capital over the static (fixed) effect on the level of output that explains sustainable growth

The short run model results shows that the government expenditure on health sectors has found statistically insignificant effect on real GDP. However, government is giving special focus on health sector in recent years, health appear insignificant impact on the growth of real GDP growth in short run, This has happened most probably due to the fact that benefits from health is not realized in the short period of time, usually have long growth period whose growth impact not be seen in the short run even with good policy environment. These findings is also in line with a conclusion by Wendwesen (2012) and Amasoma *et al* (2011) who concludes that health sector spending insignificant effect on real GDP in the short- run. Over the past decade health spending increased from 0.9% to 1.5% of GDP; but the bulk of this increase took place almost 10 years ago, and recurrent per capita spending has been fairly stagnant since. Subsequent increases have taken place mostly on the capital budget; they have been volatile from year to year, and substantially under-spent in some years.

In the case of Agriculture, the government spending on agriculture sector has negatively and significantly affected the current change in real GDP, at 1 percent level of significance. The estimation shows that, a 1 percentage change in government expenditure on agriculture sector in

the previous one period and in the current period has decline 0.236 and 0.160 percent change in real GDP respectively.

Since agriculture being identified as one the top priority sectors; it is expected to stimulate industrial growth and to bring sustainable growth. This lies at the core of rural development agenda of the government. The various sub sectors components to which the public expenditure allocation goes includes, agricultural research, livestock and fishing, crop development, natural resources, food security, extension services and irrigation. As noted from the study of (IFRI and EDRI, 2006), even though the government allotted huge resource on the various sub sectors a pronounced changes are not exhibited in terms of productivity; for instance, The productivity level for cereals with the exception of few crops (maize) remained stagnant or even showing a declining trend in recent years, The investment in extension though responded positively in some high potential areas, with high input use of fertilizer and to some degree seed use. In addition, the investment in irrigation is limited and hence has limited impact for growth of agriculture productivity. In this context, the government has put heavy emphasis on the sector and subsequently in its sub sector development in terms of resource allocation but with subsectors there is an imbalance in investment, and those sectors have shown different pattern of productivity. When we look at the overall performance of the sector, agricultural productivity remains low. This reveals that the link between public expenditure in agriculture and performance in agriculture may not observe in the short run.

These findings have confirmed with the findings of Wendwesen (2012), Loto (2011), kweke and Morrissey (2000), Abu and Abdullahi (2010), Laudau (1986), Barro (1991). They conclude that in the short run government expenditure on agriculture sector was negatively related to economic growth, and against other Tewodaj (2006), Lofgren and Robinson (2004) and Fan and Rao (2003, 2004) who conclude that public spending on agriculture sector has positive impact on GDP growth.

With regard to, others non-pro-poor sector expenditures (which includes; government spending in general administration, defense, hotel and tourism, manufacturing, and Communication and transport etc…) have a insignificant effect on the growth of GDP in the short run, This might be due to, the trend of government budget allocation for the sector. For instance; During 1991/92 –

1997/98 the share of administration and general service, economic and social and also other services were nearly the same (about 26 percent each, on average). But for the years 1998/99 – 1999/00 the budget allocation for administration and general service was about 57% of the TGE of the two years expenditure due to the Ethiopia-Eritrea war and the focus was given for Defense and Security services. During 2000/01-2002/03 also, the share of administration and general service took bigger share (36 and 35% respectively) compared to the two sectors; and economic sector again had relatively better share compared to social sector expenditure from the TGE. Expenditure on food security and infrastructure took the lion share from the economic sector. From the year 2004/05 onwards the government redirects its focus and most of the budget allocation was in favor of pro-poor sectors. Consequently, the share of administration and general service increases at a decreasing rate. Since increasing share of these expenditures may have competed with pro-poor sectors spending. In this context, this study found that the government spending on those sectors was no effect the growth of GDP in the short run.

In general, the result of estimated ECM equation above shows that the short run changes in LRRE and LRED have positive impact on the short-run changes in LRGDP. While, the short run changes in LRAgi has a negative relationship in the short-run changes in LRGDP, on the other hand, and LRHE and LRN_p have insignificant relation in the short-run changes in LRGDP.

Government spending trend in Ethiopia has changed dramatically within the last ten years. Thus, it is important to monitor trends in the levels and composition of government expenditures, and to assess the impacts of the change over time. It is even more important to analyze the relative contribution of various types of government spending have differential impacts on economic growth sectors expenditures to GDP, as this will provide important information for more efficient targeting of these limited financial resources. Government spending on pro-poor sectors has generally increasing during the period under study. Expenditure on these sectors as a share of GDP increased from 4.02% in 1974/75 to 12.21% in 2010/11.

CHAPTER FIVE
CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1. Conclusions

This study investigated the impact of government road spending on economic growth in Ethiopia, during the period 1974/75- 2010/11. The general specification of the model is an augmented Solow growth model and endogenous growth model. The model specification used in this study is to investigate the impact of specific government road sector spending. And, hence the growth model is a function of government expenditure. However, spending on health, education, agriculture, and spending on non pro- poor sectors are also included to capture growth in the size of the components of government spending. The study reviewed theoretical and empirical researches related to the link between government spending and economic growth in general, road spending, in particular, in the context of Ethiopia, and some other countries experiences. It was found that government expenditure does cause the growth of GDP, which is compatible with the Keynesian's theory.

The econometric analysis of this study using VAR model, Natural logarithm of real GDP (LRGDP) is taken as dependent variable, while the share of government expenditure on road, education, health, agriculture and others non pro-poor sectors are taken as explanatory variables, each variables was tested for their time series property using Augmented Dickey-fuller (ADF) test of stationary and all variables are identified as I(1). The test for cointegration is performed using the Johansson Maximum Likelihood Estimation procedure, and the result confirmed the existence of long run relationship among the variables in the model. To estimate the model, co integration and vector error correction analysis was conducted and the test result used to analyze the long-run as well as the short-run relationship. The short run dynamics of the long run economic growth was examined by estimating an error correction model.

In the long-run, the econometric result showed that government road expenditure is found to be the most significant and positive impact on economic growth. This shows that public spending can be used as a main engine of growth in Ethiopia. Nowadays, the construction of roads [seasonal and all weathered] has made the supply of commodities easy and quick. This has

improved the marketability of the commodities and the income of the farmers. This has, the researcher believed, contributed to the current five-to-six years of sustained growth in Ethiopia. The government expenditure on education, health, non pro-poor and agriculture sectors also have significant and positively influences on real GDP growth.

The regression result of the short run showed that the change of government spending on road and education sectors significantly and positive effect on the change in current real GDP growth. The result of that of the change of agriculture and health spending indicates that in the short-run, it has negative effect on the growth of real GDP, whereas, the non pro-poor sector, the sector has insignificant negative relationship with real GDP growth. The study has found that education sector expenditure has both positive significant effects on the growth of real GDP in the short-run and long-run.

More generally, the major finding of the study found that public spending on road sector has significantly and positively impact on economic growth in the short-run as well as long-run. The study also found that the government is the key factor that promotes economic growth in Ethiopia and may stay to play its major role in the future.

On the basis of the above conclusions, the researcher recommends the following measures for policy makers,

5.2. Policy Recommendations

Based on the findings obtained, the following recommendations are sought necessary:

- ✓ Firstly, the finding shows that government road expenditure positively and significantly affects economic growth in the short-run as well as in the long-run. This shows that the government of Ethiopia may increase economic growth significantly by increasing its expenditure on road infrastructure. The government is found to be the main factor that may generate economic growth in Ethiopia. The government may play its major role in investing in road infrastructure that complements private investments. In the absence of significant private investment in a developing country like Ethiopia, public investments may be used as engine of growth. Thus, government should prioritized and further

increase its investment in road sector by allocating its funds to road projects at right time, as well as ensuring that the resources are properly managed and used for the development of road service

- ✓ Secondly, Ethiopia has a good growth performance in the post-1991 period. In particular, over the period 2004-2009, the economy averaged 10 percent growth rate of GDP, which signals the country‘s future economic prospects and lays down promising momentum for further economic growth. Keeping up the growth momentum and continuing its sustainability, currently the government has been rising public spending particularly on pro-poor expenditure such as road, education, health and agriculture sectors. This expansion of public expenditure has significantly contributed to economic growth through improving productivity of factor in the country. Therefore, the policies makers have to strengthen such policies so as to ensure the sustainability of economic growth and ensure that expenditure are properly managed in a manner that it will raise the nation’s production capacity and accelerate economic growth.

- ✓ Thirdly, the findings from the descriptive analysis indicate that the government in the recent decade is making a relentless effort towards expanding the road network of the country and improve the current performance. However, an important key indicator is the issue of accessibility. The country’s overall accessibility is far below from SSA countries. The issue of access is not a challenge for the urban population. Therefore, in order to improve the benefits of the accessibility of road or provision of public utilities, expanding the road network in rural areas would be the best way to reach the rural population.

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APPENDICES

Appendix A: Government Expenditure

I. Nominal average Government Expenditure (in millions of Birr)

year	GDPS	road	health	education	Agricul	non pro-
1974	10243.01	88.5	89	161.5	97.6	40.3
1975	10974.66	135.3	143.3	153.9	111.3	40.5
1976	12190.17	129	140.8	153.8	146.5	52.3
1977	12932.4	86.6	101.6	149	192	78.4
1978	14227.57	108.7	130.5	183.2	215.5	62.1
1979	15360.86	180.1	209.3	200.6	172.7	70.2
1980	15672.55	172.3	214.4	228.3	146.1	139
1981	16255.56	180	202.2	282	240.9	224.6
1982	18600.97	181.9	203.6	312.4	567.5	431.6
1983	16672.24	164.4	196.8	333.8	255.5	380.8
1984	19227.59	133.3	182	369.8	452.8	459
1985	20257.52	171.8	223.1	386.1	578.5	541.8
1986	21868.97	163	222.9	419	479.5	537.3
1987	22693.15	166.78	225.92	447.37	419.3	674.91
1988	24048.33	150.66	164.54	466.28	435.95	511.36
1989	25787.47	142.05	168.1	495.33	432.33	488.04
1990	29837.86	129.306	202.406	489.695	569.87	557.384
1991	32152.92	131.761	212.661	528.482	529.261	389.173
1992	40454.71	281.525	385.415	860	812.75	807.894
1993	41787.52	524.4	695.2	997	971.4	950.3
1994	49611.68	902.9	1059.8	1132.7	1093.7	1043.5
1995	55241	831.5	1004.7	1382.9	1159.4	1070.5
1996	57775.86	911.8	1073.6	1447.6	1198.4	1253.7
1997	55533.6	988.3	1298.9	1563.6	1326.8	823.9
1998	58788.62	1152.8	1533	1704	1486.5	771.8
1999	66648.33	890.9	1191.9	1646	1282.4	656.8
2000	68026.81	1573	1944	2179	1637.3	997.9
2001	66556.65	1645.7	2048.7	2316.9	1767.4	857
2002	73432.22	2035.424	2422.47	3292.994	2250.006	966.4972
2003	86660.95	1968.771	2368.479	4176.719	3150.767	796.328
2004	106472.8	2769.093	3333.27	4877.05	5155.806	1873.666
2005	131641.5	3643.577	4267.611	6385.307	6222.212	2556.239
2006	171989.1	5006.538	5829.358	8410.804	6597.598	1708.914
2007	240303	8376.128	9578.288	10011.49	8347.902	2510.665
2008	335392	10054.89	11371.79	12760.73	9774.08	2962.51
2009	382939	14139.76	15958.96	17248.67	11775.08	5427.714
2010	511157	18918.11	21221.19	23345.24	14183.64	6653.006

II. **Real Government Expenditure (in millions of Birr)**

year	rgdp	rroad	rheal	reduc	ragri	rnon pro
1974	36992.33	319.6152	321.4209	583.2525	352.4795	145.5423
1975	36905.2	454.9821	481.8842	517.5296	374.2758	136.192
1976	37040.36	391.9721	427.8269	467.328	445.1466	158.9158
1977	36891.6	247.0394	289.8292	425.0448	547.7087	223.6477
1978	38770.26	296.2084	355.6136	499.2216	587.2393	169.223
1979	41187.19	482.9035	561.1977	537.8703	463.0618	188.2278
1980	41467.91	455.8874	567.2795	604.0574	386.565	367.7792
1981	40834.79	452.1689	507.9364	708.398	605.1528	564.2063
1982	45391.75	443.8885	496.8427	762.3461	1384.864	1053.229
1983	42351.79	417.6184	499.9228	847.9381	649.0359	967.3302
1984	36476.24	252.8804	345.2681	701.5393	858.9967	870.7586
1985	40678.12	344.983	447.996	775.3081	1161.657	1087.961
1986	47267.21	352.3054	481.7722	905.6193	1036.383	1161.311
1987	47336.26	347.8909	471.2526	933.1811	874.6291	1407.813
1988	47693.96	298.7971	326.3247	924.7519	864.5998	1014.157
1989	49329.15	271.7291	321.5605	947.5226	827.0091	933.5775
1990	48031.66	208.151	325.8241	788.2892	917.3513	897.2519
1991	45042.17	184.5805	297.9111	740.3364	741.4276	545.1821
1992	50097.77	348.6312	477.2851	1064.995	1006.483	1000.469
1993	50478.16	633.4606	839.7823	1204.348	1173.424	1147.936
1994	52804.04	960.9988	1127.995	1205.586	1164.076	1110.646
1995	59194.88	891.0146	1076.611	1481.881	1242.384	1147.121
1996	61888.37	976.7025	1150.019	1550.641	1283.703	1342.939
1997	59748.15	1063.304	1397.476	1682.265	1427.493	886.4273
1998	62832.6	1232.099	1638.453	1821.216	1588.754	824.891
1999	66648.33	890.9	1191.9	1646	1282.4	656.8
2000	72181.1	1669.061	2062.717	2312.068	1737.287	1058.84
2001	73274.44	1811.806	2255.482	2550.753	1945.79	943.4999
2002	71690.92	1987.158	2365.026	3214.907	2196.651	943.5786
2003	81421.07	1849.731	2225.271	3924.177	2960.258	748.1787
2004	91044.09	2367.832	2850.256	4170.33	4408.693	1602.159
2005	100908.4	2792.946	3271.293	4894.591	4769.572	1959.458
2006	112468.5	3273.914	3811.979	5500.058	4314.352	1117.506
2007	124602.2	4343.199	4966.545	5191.169	4328.563	1301.833
2008	135570.3	4064.333	4596.643	5158.072	3950.824	1197.489
2009	152585.1	5634.101	6358.974	6872.87	4691.873	2162.716
2010	169641.5	6278.495	7042.836	7747.757	4707.231	2207.983