The Contribution of Agriculture Sector to Economic Growth of Ethiopia

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As thesis research advisor, I hereby certify that I have read and evaluated this thesis prepared, under my guidance, by Demelash Eshetu entitled ‘‘THE CONTRIBUTION OF AGRICULTURE SECTOR TO ECONOMIC GROWTH OF ETHIOPIA’’. I recommend that it be submitted as fulfilling the thesis requirement.

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DEDICATION

I dedicate this work to my Parents (dad and mom), who are not lucky to collect the fruit of what they have planted.

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ACRONYMS

AC	Autocorrelation
ACF	Autocorrelation Function
ADF	Augmented Dickey Fuller
ADLI	Agriculture Development-Led Industrialization
AfDB	African Development Bank
ALG	Agriculture-Led Growth
DF	Dickey Fuller
DGP	Data Generating Processes
EEA	Ethiopian Economic Association
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GoE	Government of Ethiopia
IFPRI	International Food Policy Research Institute
MDG	Millennium Development Goal
NEPAD	New Partnership for Africa's Development
OLS	Ordinary Least Square
SSA	Sub-Saharan Africa
R&D	Research and Development
WB	World Bank
WDI	World Development Indicators

Abstract

Agriculture is the backbone and the most important sector in the Ethiopian economy given its contribution to employment, foreign exchange and food security. This particular sector's performance determines the growth of all other sectors and consequently, the whole national economy. The main objective of this paper was to examine the contributions of agricultural sector to the economic growth in Ethiopia within a time frame of the preceding 32 years (1982-2013) using a multiple linear regression analysis. For this purpose, secondary source of data was appropriate in the study because of the nature of the study which was an analysis of the contribution of the agricultural sector for economic growth. The data on all the variables of interest were collected from the WB Data Base series. This study employed Ordinary Least Squares (OLS) estimation technique for the empirical analysis. Descriptive statistics and econometric analysis were the major tools of empirical analyses in the study. In the econometric analysis effort has been made to see the impact of various economic sectors (agriculture, industry and service) on the growth of real GDP. The Johanson Maximum Likelihood estimation procedure of co-integration analysis confirmed long run relationships between agriculture growth and GDP. Findings from the empirical analysis of the study indicate that the agricultural sector has a direct and significant effect on GDP of Ethiopia, thus, suggesting that agriculture is an engine of economic growth. The overall research outcomes suggest that the agriculture sector continues to be the dominant driver of GDP growth. Therefore, based on this finding, the study recommends that for Ethiopia to achieve higher GDP growth rate, it has to strengthen the agricultural sector to lead the growth in the Ethiopian economy.

Key Words: Agriculture sector, Economic Growth, Contributions, Ordinary Least Square, Ethiopia.

CHAPTER I: INTRODUCTION

1.1 Background of the study

Agriculture plays crucial roles for socio-economic development in Africa as the majority of the African population resides in rural areas, and at least 70 percent of the African workforce is engaged in agriculture. In many African countries, growth in agriculture is the most effective strategy for reducing poverty and promoting overall economic growth (Diao et al., 2007). Generally, the sector contributes to the development of an economy in four major ways: product contribution, factor contribution, market contribution and foreign exchange contribution (World Bank, 2007).

The study by Ditimi (2011) indicates that expenditure on agriculture had a significant influence on economic growth. Fan and Rao (2003) show that government spending on agriculture has provided a strong contribution to economic growth in Africa and Asia, and that agricultural production is critical for addressing poverty in rural areas. This view is supported by Diao et al. (2003) who show that spending on rural infrastructure (especially roads) have the most promise for growth in income in Africa. Globally, very few countries have achieved rapid economic growth without prior or accompanying growth in ariculture. Thus, improvements in agriculture can be a powerful engine for economic development and poverty reduction.

Sarris and Alexander (2001) reviewed the issues concerning the role of agriculture in promoting overall growth and poverty reduction. They found that the basic ingredients for faster agricultural growth are known, such as agricultural research and development, extension, rural infrastructure, education, etc. Fan (2005) asserted that the role of agriculture is dynamic and it changes over time. Rapid growth in agriculture is a precondition for the country to take off.

Agriculture is by far the single most important economic activity in SSA and it remains key to achieving the poverty targets of the MDGs in Africa. According to NEPAD (2011) for most countries in SSA, agriculture contributes an average of 30-60% of GDP. Eicher and Staatz (1984) envisaged that more inputs invested in agriculture will be accompanied by higher output, that is

higher expenditure in agriculture will be expected to result in higher contribution of the agricultural sector to economic growth and poverty reduction.

The overall development of a country depends upon the health of agriculture sector, because it provides food, raw materials, and also to earn foreign exchange which further push industrialization in the country (Johnston, 1970). The sector has a multiplier effect on any nation's socio-economic and industrial fabric because of the multifunctional nature of agriculture (Ogen 2007). In recent decades, the potential contribution of agriculture as one of the drivers of economic growth has been a subject of much controversy among development economists. While some contend that agricultural development is a pre-condition for industrialization, others strongly disagree and argue for a different path.

Ethiopia is one of the fastest-growing non-oil-producing economies in Africa (African Economic Outlook, 2012), and among the top-performing countries in Sub-Saharan Africa especially over the past decade (African Development Bank (AfDB, 2010)). Its agriculture served as the engine of long-term overall national economic growth and food security. It was the leading sector from the stand point of occupational distribution (in the share of employment), foreign exchange earnings and contribution to GDP. It directly supports 85 percent of the population, constitutes 43 percent of Gross Domestic Product (GDP), and 80 percent of export value. Nearly 16 percent of Government of Ethiopia's (GoE's) public expenditures are committed to the sector. Due to investments by the GoE and its development partners, the agriculture sector has witnessed consistent growth of over 8 to 10 percent per annum over the past decade (African Economic Outlook, 2012).

Ethiopia has great agricultural potential because of its vast areas of fertile land, diverse climate, generally adequate rainfall, and large labor pool. Despite this potential, however, Ethiopian agriculture has remained underdeveloped. Because of drought, which has repeatedly affected the country since the early 1970s, a poor economic base (low productivity, weak infrastructure, and low level of technology), and overpopulation, the agricultural sector has performed poorly.

Ethiopia has developed and implemented its Agricultural Development Led-Industrialization (ADLI) strategy which is an export-led development strategy aimed at promoting economic growth while coordinating agricultural and industrial development.

Empirical evidence suggests that GDP growth originating from agriculture is at least twice as effective in reducing poverty as GDP growth linked to the non-agricultural (industry and service) sectors (World Bank, 2007). The outputs of the major economic sector, agriculture, depend on the weather condition and as the result of this domestic income fluctuate following the change in weather. Thirtle et al (2001) concluded from a major cross-country analysis that, on average, every 1% increase in agricultural yields reduced the number of people living on less than US$1 a day by 0.83%.

Rostow (1960) argued that in the process of economic development, nations pass through several stages namely: traditional stage, the precondition for take-off, the take off stage, drive to maturity and the high mass consumption stage. Agriculture played crucial roles in the first three stages (Traditional society, pre-conditions for take-off and take-off stages). The agricultural sector has the potential to be the industrial and economic springboard from which a country's development can take off.

In any economy, successful economic development depends on open balanced interaction between various sectors over a period of time; often the process of interaction is such that some sector becomes more important than others, depending on the level and the stage of development. Economic history is replete with ample evidence that agricultural revolution is a fundamental pre-condition for economic growth, especially in developing countries (Woolf and Jones, 1969 and Eicher and Witt, 1964).

The agricultural sector stimulates the growth of other sectors in the economy. And understanding the contribution of agriculture sector and its linkages to the rest of the economy is important. This paper empirically investigates whether the contribution of agricultural sector has positive or negative relationship with economic growth in Ethiopia.

1.2 Statement of the Problem

In a long time perspective the contribution of agricultural sector to the national GDP of Ethiopia is declining from time to time. As an example, the percent share of agriculture in the national GDP was 74 percent in the year 1965, 62 percent in 1978, 50 percent in 1988 and 45.1 percent in the year 2001 (Abdella, 2002) and according to (Africa Economic Outlook, 2012), its share to GDP was 50.8%, 47.7% and 41.8% in 2009, 2010 and 2011 respectively. There is also sharp variation between the years with an increase by 15 percent in the good years and a decline up to 12 percent in drought years (EEA, 2005). The decline in the contribution to the GDP is not an indicator of the growth in another sector or replacement of agriculture by industry as a sign of development, because it is still source of livelihood for 85 percent of the population living in rural areas and also accounts for the largest share of employment opportunity (85 percent) and remains a key source of growth (Abdella, 2002 and African Economic Outlook, 2012).

The agricultural sector has been affected with numerous problems which has been the result of the poor performance of the sector itself. This has attracted various strategies including expansion of public expenditure on agricultural activities by government in the country. Ethiopia, as a developing country, has limited budget to allocate to the various sectors of the economy. The little that is available must therefore be used efficiently. This implies that the strategic sectors of the Ethiopian economy should get priority or precedence over the other sectors.

In terms of sectoral distribution, agriculture takes the lion's share of economic structure with other proportion of service and industrial sectors and it has remained the major constituent of the economy. Typically overall economic growth in Ethiopia has always been associated with the magnitude of performance of the agricultural sector which is largely dependent on exogenous factors such as drought. Hence, its unpredictable and erratic performance has led the country to irregular overall GDP growth. The sector uses little modern inputs and output per hectare is low. With the rural population increasing at a fast pace, land holdings have been increasingly fragmented, resulting in a large proportion of small land holdings, each with little, if any, capital investment.

There are many cross country empirical literatures devoted in identifying the role of agriculture sector on economic growth. Suleiman and Aminu (2010) conducted research on the contribution of agriculture and other sectors of the Nigerian economy and found out that agricultural sector is contributing higher than the other sectors. The positive relationship and statistically significance of agriculture to GDP according to Anyanwu et al (2013) is not surprising. This assertion confirmed the results of Umaru and Zubairu (2012) who variously affirmed the dominance of agriculture's contribution to GDP. This result is affirmed by the regression analysis where it is clearly shown that agriculture contributes more to the nation's GDP.

Yet, there are no sufficient studies that empirically assessed the contribution of agriculture for the economic growth of the country. There is a study in Ethiopia by Steven Block (1999) who made a four phase numerical simulation model to review agriculture's sector growth on other economy sectors. The sectors reviewed in his model are: Agriculture, Services, traditional Industry and modern Industry. He calculated the macroeconomic growth coefficients in Agriculture, Services, traditional Industry and modern Industry sector by shocking the incomes, and used the estimation model. The results of his studies indicate that the agriculture sector has the highest growth coefficient after industry sector.

The current study differs from the previous study in two ways. First, it uses an OLS estimation method based on Johansen Approach Cointegration to show the contribution of agriculture sector to the economic growth in Ethiopia. Second, it uses a more recent data.

It is with much significance to empirically assess the outcomes of the effort which has been made to close the literature gap in the topic. Therefore, this research empirically assessed the contribution of agriculture sector to the economic growth in Ethiopia by answering the following research questions.

- What are the determinants of GDP growth?
- Does the past performance of GDP growth have effect on the current GDP?
- What is the trend of real GDP?

1.3 Objective of the Study

The general objective of the study is to assess empirically the contribution of the agricultural sector on economic growth of Ethiopia. More specifically, to

- Investigate the determinants of GDP growth.
- Examine whether the past performance of GDP growth has effect on the current GDP growth of Ethiopia.
- To analyze the trend of agriculture sector and real GDP.

1.4 Significance of the Study

By utilizing some economic theory and empirical analysis, the study evaluated and analyzed the relationship between agricultural sector and economic growth in Ethiopia. Thus, the immediate outcome of this study would be to provide pertinent result and policy implication to policy makers. Besides, the study would provoke and pave a way for further study in the area and the document can be used as a source/ reference for academic purpose for other research work in the topic.

1.5 Scope of the study

This study focused on the association between agriculture sector growth and economic growth in Ethiopia. To achieve its objectives, the time series data ranging from 1982 to 2013 was used and as economic growth, real Gross Domestic Product (GDP) was used.

1.6 Limitation of the study

Although this study attempted to investigate the contribution of agricultural sector on economic growth, it suffers from some limitations. One of the main problems in this study has been availability of consistent and reliable data as data from different sources (institutions) but on the same variables is usually found to be inconsistent especially in developing countries like ours. Additionally, because of lack of data, it has been unable to use long period for the study. This study used data from World Bank Data Base (2015) for all the variables.

1.7 Organization of the paper

Following the introduction, the remaining part of the paper is organized (structured) in four chapters as follows. Chapter two is devoted to a brief review of relevant theoretical explanations and empirical literatures on the contribution of agriculture sector towards economic growth. This is followed by chapter three, which describes the details of the methodology to be applied in this study which contains the data source and the analytical tools with model specification. Chapter four presents the findings of the estimation obtained in this study and the discussion of these results from the empirical analysis using both descriptive statistics and econometric models, while the paper concludes in the last chapter five with the main concluding remarks and identifies the policy implications of the study. Supplementary information has also been annexed at the end of the thesis.

CHAPTER II: REVIEW OF RELATED LITERATURE

2.1 Theoretical Framework

The theoretical framework is supposed to help the reader make logical sense of the relationships of the variables and factors that have been relevant to the problem. It provides relationships between all the variables so the reader can understand the theoretical relationships between them. A theoretical framework guides your research study, determining what things researcher is going to measure, and what statistical relationships you have to look for. The literature on the interaction between agriculture and economic growth has commanded considerable attention and interest.

2.1.1 Agriculture

Agriculture sector is one of the sectors which is categorized in primary sector. Various people have defined Agriculture in different ways but common among these definitions is the fact that it is the production of food, feed, fiber and other goods by the systematic growing and harvesting of plants and animals. The role of agriculture in reforming both the social and economic framework of an economy cannot be over-emphasized. It is a source of food and raw materials for the industrial sector. It is also essential for the expansion of employment opportunity, for reduction of poverty and improvement of income contribution, for speeding up industrialization and easing the pressure on balance of payment Olaokun (1979). In effect, it has been the main source of gainful employment, which the nation can feed its teeming population, a regenerative source of foreign exchange earnings, a means of providing the nation's industries with local raw materials and as a reliable source of government revenue.

Development economists have focused on how agriculture can best contribute to overall economic growth and modernization. The physiocrats laid more emphasis on agriculture in the development of an economy. In their views, the development of an economy depends on the growth of the agricultural sector. The source of national wealth is essentially agriculture. The physiocrats believe that the fate of the economy is regulated by productivity in agriculture and its surplus is diffused throughout the system in a network of transactions. The agricultural sector to

the physiocrats is the only genuinely productive sector of the economy and the generator of surplus upon which all depends.

2.1.2 Agriculture and Economic growth

The relationship between agriculture and economic growth has being re-examined in the literature, in recent years. More recently, the relationship between agriculture and broader economic growth has been examined (Johnston and Mellor, 1961; Tiffin and Irz, 2006; Sandri et al., 2007; World Bank, 2008). Economic growth is enhanced by strengthening the agricultural sector and expansion of infrastructure. Growth in agricultural output can fuel growth in the non-agricultural economy through a variety of mechanisms, some direct and some indirect. Agriculture indirectly contributes to economic growth via its provision of better caloric nutrient intake by the poor, food availability, food price stability, and poverty reduction (Timmer, 1995). Johnston and Mellor (1961) observe that agriculture contributes to economic growth and development through five intersectoral linkages.

1. Satisfying the growing demand for food and other agricultural products, without which economic growth can be seriously impeded. I.e. supply of food for domestic consumption by reducing food prices in urban areas

2. Supplying of foreign exchange from agricultural products export earnings especially in the early stages of development to finance import of intermediate and capital goods.

3. Providing most of the surplus labor needed to firms by the industrial sector (manufacturing) and other expanding sectors.

4. Contributing to domestic savings in rural areas, allowing for mobilization of capital to finance industrial investment.

5. Enlarging the domestic market for industrial or non-agricultural products as the net cash income of the rural population rises.

The Johnston-Mellor model provided a strong narrative and conceptual argument for agriculture's role in growth. They claim that all successful countries pass through a phase of fast agricultural growth as the engine for their growth process (Timmer, 1988). This argument resonates still in policy narratives; for example the influential World Development Report 2008 (World Bank 2007) highlighted the essential role of agriculture in early stages of development and made the case for a much stronger public policy focus on this sector from a growth perspective.

The strong linkage effects of agriculture suggested that agricultural growth could lead to broader economic growth during the early stages of industrialization, even in more open countries. Hans Singer (1979) described a "balanced-growth" strategy that emphasized the "national development of agriculture as the primary sector and developing industries with strong emphasis on agriculture–industry linkages and interactions." Irma Adelman (1984) proposed an "agricultural-demand-led-industrialization" strategy that stressed the ability of increasing agricultural productivity to raise demand for intermediate and consumer goods produced by domestic industries and, in turn, help support the drive toward industrialization. Adelman also analyzed the distributional implications of agricultural development, arguing that broad-based participation in the growth process requires equitable ownership of productive assets, especially land, during the earliest stages of development.

2.1.3 Agricultural and non-agricultural sectors growth linkages

Hayami and Ruthan (1985) revealed that agricultural productivity growth requires fostering the linkages between the agricultural and non- agricultural sectors. According to Adelman (1984), because of the strong growth linkage effects, agricultural development can lead to a wider economic growth in many countries even open economics during the early stages of industrialization. The importance of intersectional linkage in the growth process had already been widely recognized. Hirschman (1958) was one of the theorists to emphasize linkage effect in the growth process although his analysis focused mainly on the backward and forward linkages created by investment in industrial sectors.

Albert Hirschman (1958) had already introduced the idea that intersectoral linkages could be important drivers of the growth process. Hirschman emphasized the backward and forward linkages created by investments in the industrial sector, but Johnson and Mellor (1961) pointed to the existence of both production and consumption linkages within agriculture and between agricultural and non-agricultural sectors.

According to Johnston and Mellor, the structural shift away from agriculture is stimulated by the application of modern technology to manufacturing, power generation, and transportation, which reduces costs and prices and thereby encourages added consumption of these goods and services. Raising agricultural productivity requires fostering linkages between the agricultural and non-agricultural sectors. Agricultural productivity growth requires fostering the linkages between the agricultural and nonagricultural sectors. Growth in agriculture therefore does not occur independently of growth in nonagricultural sectors, as theorists had originally supposed.

Agricultural production generates forward production linkages when its out-puts are supplied as inputs to non-agricultural production. Its growth can contribute to expanding agro-processing and processed food marketing, which provide new engines of growth and opportunities to substitute for imports. Agriculture also creates backward production linkages through its demand for inputs such as fertilizers and marketing services.

The consumption linkages generated by increased rural incomes are important in the early stages of the development process because rural households can provide a large and growing market for domestically produced manufactured goods and services. Surplus agricultural income finances investment in both urban and rural areas. Lower food prices, stimulated by technological change in agriculture, maintain low real wages in industrial sectors and thus foster investment and structural transformation.

The importance of intersectoral linkages in driving the growth process had already been recognized. Hirschman (1958) was one of the first theorists to emphasize linkage effects in the growth process, although his analysis focused on the backward and forward linkages created by investments in industrial sectors. By contrast, Johnson and Mellor (1961) emphasized the existence of production and consumption linkages, both within agriculture as well as between

agricultural and nonagricultural sectors. Agricultural production generates forward production linkages when agricultural outputs are supplied as inputs to nonagricultural production. Agricultural growth can therefore contribute to expanding agro processing and processed food marketing, which provide new engines of growth and opportunities to substitute for imports. Agriculture also creates backward production linkages through its demand for intermediate inputs such as fertilizers and marketing services. Both of these production linkages are likely to deepen as an economy modernizes, but decline in relative importance alongside agriculture's share of production (Haggblade, Hazell, and Brown 1989). The consumption linkages generated by increased rural incomes is the strongest linkage of agriculture in the development process (Thirtle, Piesse, and Lin 2003).

2.1.4 Factors causing low agricultural production

Reardon et al (1994) pointed out, the main agricultural environment associated problems are related to population pressure on natural resources and these include: soil erosion and loss of fertility, loss of biodiversity and the damage of natural ecosystems. Some major problems confronting developing countries agriculture are poor infrastructural facilities such as poor feeder roads and road network, storage facilities, rural electrification, poor manpower development, socio cultural factor like the land tenure system, poor government/regulatory policies etc.

The agriculture sector has had low production due to a number of factors such as illiteracy, insufficient finance, and inadequate marketing of agricultural products (Srikanth and sathyanarayana, 2011). According to Degefe (2000), the major factors behind the poor performance of Ethiopian agriculture are diminishing farm size and subsistence farming, soil degradation, inadequate and variable rainfall, climate-related disasters, tenure insecurity, weak agriculture research base and extension system, lack of financial system, imperfect agriculture markets and poor infrastructure. Ethiopian farming largely produces only enough food for the peasant holders and their family for consumption, leaving little to sell. Crops are the major production and sources of food in the country since most of the population depend on agriculture. Agriculture is the primary source of livelihoods for the majority of households in

Ethiopia. Most of these households operate their own farms; relatively few people are employed as agricultural wage workers. Farm size is extremely small. The reasons for the decline in agriculture growth rate in Ethiopia GDP are that in the sector the average size of the farms is very small which in turn has resulted in low productivity. Also the growth rate of the agriculture sector in Ethiopia GDP has declined due to the fact that the sector has not adopted modern technology and agricultural practices; and the sector has insufficient irrigation facilities. As a result of this, the farmers are dependent on rainfall, which is however very unpredictable.

2.1.5 Public investments and the agricultural sector

The fundamental rationale for public resource allocation in and for the agricultural sector is derived directly from the basic rationale for public investments in general and, even more generally, from the core reasoning underlying public-sector intervention in the economy. Different economic schools of thought put forward varied justifications for why the government should undertake policies affecting the economy. Fan.et al (2005) have modeled and estimated the impacts of different types of public investment on economic growth. For instance, they indicated channels through which public investment affect agricultural growth in different countries.

Tewodaj, M. et al (2006) and Fan et al. (2002) revealed that public spending on agriculture, health, education, and other sectors all lead to the development of public capital in related activities, which in turn affect agriculture productivity growth, production and reduced regional inequality. Agricultural spending, irrigation, and roads (infrastructure) contributed strongly to growth. All countries should increase spending in agriculture, particularly on production-enhancing investments, such as agricultural research and development (R&D) and extension. This type of spending not only yields high returns to agricultural production, but also has a large impact on poverty reduction since most of the poor still reside in rural areas and their main source of livelihood is agriculture (Fan and Rao, 2003).

Agriculture has a strong hold in an economy, for without it a country will always depend on foreign countries to feed its population, the potential contribution of agriculture to economic

growth has been an on-going subject of much controversy among development economists, several authors argue that growth in the overall economy depends on the development of agricultural sector (Gollin et al, 2002).

2.1.6 Ethiopian Agriculture

Agriculture in Ethiopia dominated mainly by subsistence farming, made up of low-input, low-output rain-fed farming systems. Droughts periodically reverse performance gains in the agricultural sector, with devastating effects on household food security and poverty levels. Low agricultural productivity can be attributed to recurrent droughts, limited access by smallholder farmers to agricultural inputs, financial services, improved production technologies, irrigation and agricultural markets and, more importantly, to poor land management practices and that have led to severe land degradation. The use of chemical fertiliser and improved seeds is quite limited despite Government efforts to encourage the adoption of modern, intensive agricultural practices. Ethiopia has one of the highest rates of soil nutrient depletion in sub-Saharan Africa. Land degradation is further exacerbated by overgrazing, deforestation, population pressure and inadequate of land use planning. Erratic and extreme weather conditions, coupled with, poverty and poor infrastructural development increases the vulnerability of the population to food insecurity and under-nutrition, and also reduces the benefits of development gains.

Agriculture, though an important source of growth and contributor to poverty reduction (Africa Economic Outlook, 2012), has seen its share diminish as the largest contributor of GDP to the service sector. Agriculture's share of GDP was 41.8% in 2011, a reduction from 47.7% and 50.8% in 2010 and 2009 respectively. Despite this reduction in agricultural growth, the government has demonstrated a very strong commitment to continued agricultural growth. Between 13 and 17 per cent of government expenditure (equivalent to over five per cent of GDP) has been channelled towards agriculture (including natural resource management) in recent years. For example, the government expenditure on agriculture in 2007 was 14.4% of the total, surpassing the minimum 10% benchmark of total government expenditure which it is expected would be devoted to agriculture as agreed in the (CAADP) in 2003. About 60 per cent of agricultural investments are funded from the Government budget, 30 per cent from grants, and 10 per cent from concessional loans. In 2010, donors contributed US$3.5 billion in official

development assistance (ODA), over half of total government expenditure in the sector (Federal Democratic Republic of Ethiopia Ministry of Agriculture and Rural Development, 2010).
The country's export is also highly dependent on agriculture. In the past four decades, about 80-90 percent of merchandise export earnings of Ethiopia were coming from primary agricultural products (Gemechu, 2002). Of the country's total export earning of 5.17 Billion Birr in foreign currency in the year 2003/04, the share of agriculture was 82.2 percent (coffee alone covered about 37.3 percent and the rest is from semi processed products) (EEA, 2005). According to the same source, except flower which joined the list of export trade very recently, the structure of export trade of the country remained the same for a very long time. Very few of the agricultural products (especially skins and hides, meat and sugar) are semi-processed export material while the bulks are in raw product form. The most important unprocessed agricultural export materials include; coffee, fruits and vegetables, pulses, oilseeds, live animals, and chat.

The performance of the agricultural sector also plays role in the level of inflation rate in the country. As compared to the other sub-Saharan African countries, rate of inflation in Ethiopia is low. The highest rate of inflation (21 percent) in the history of country's economy was recorded in 1991/92 as a result of major drought that hit the agricultural sector and highly reduced production (FAO, 2007). It is because of such hard facts that the government gave focus to the agricultural sector.

Agriculture's share of GDP has fluctuated over the years. The most recent decrease was a drastic decline from 50.8% in 2009 to 41.9% in 2011. Reduction in the agriculture's share of GDP may be due to growth in other sectors, specifically industry and services. Agriculture accounts for about 90% of Ethiopia's exports. The sector's annual growth rate improved from -1.8% in 2002 and -10.9% in 2003 to 16.9% in 2004, after which it steadily declined to 6.4% in 2011 (Table 2.1). Nevertheless, since 2004 growth in agriculture has been above the CAADP target of 6% per annum, which was agreed in the Maputo Declaration, 2003.

Table 2.1: Growth rates of agriculture and GDP in Ethiopia

YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
GDP	1.51	-2.16	13.57	11.81	10.83	11.45	10.78	8.80	12.55	11.17	8.64	10.49
AGR	-1.87	-10.8	16.94	13.54	10.90	9.44	7.501	6.36	5.13	9.01	4.92	7.09

Source: World Bank (2015), World Development Indicators.

By 2011 GDP growth had reached 11%, up from -2.2% in 2003, significantly higher than the Eastern Africa average of 6.7%. Ethiopia is highly dependent on agriculture. Although initially led by agriculture, growth in Ethiopia is now broad-based, with increasing contributions to GDP from the service sector and industry, in particular construction and manufacturing. The agriculture sector is the leading contributor to growth in Ethiopia, despite its decreasing share of GDP. Agricultural growth in 2009 was 6.4% – above the 6% CAADP target – while expenditure on agriculture as a proportion of government expenditure was 15%, above the 10% CAADP benchmark.

2.2 Empirical Literature Review

In this section we review the empirical literature on various countries regarding the contribution of agriculture sector on GDP growth. There have been quite a substantial volume of empirical researches directed towards analyzing the agriculture sector that beer significant association with economic growth so far in different periods and countries (developed and developing countries), using econometric and statistical method of analyses. These empirical literatures' results, however, varied from one research to another as different econometric analysis techniques and data set samples are adopted. Some of the empirical works reviewed are as follows.

Hussain et al (2011) studied the relationship between agriculture and GDP growth rates in Pakistan using an econometric analysis for the period 1961 – 2007. The main objective of the study was to ascertain the role of agriculture in the process of economic growth in Pakistan. A linear growth equation was specified by them and they employed the Ordinary least squares

(OLS) estimation techniques in their analysis. The key finding was that agriculture growth rate and GDP growth rate positively correlated. A one percent increase in the agriculture rate brings about 0.34 percent increase in GDP growth rate. They concluded that the government of Pakistan should make structural changes in the agricultural sector so as to ensure that agriculture leads overall growth in the Pakistan.

Wang, Wu and, Gao (2010) perform an econometric model analysis for China for the period 1952-2007. Their study shows that there has always been a positive relation between agricultural growth and economic growth and discuss how agriculture contributes to economic growth. Their study concludes that although the share of agriculture in GDP has declined significantly over time, the contribution of agricultural growth has maintained an upward trend and it has made an important market, foreign exchange, factor (finance and labor), and output contributions to non-agricultural growth and thus it remains as an irreplaceable driving force for economic growth. Therefore, agriculture still has a contributory role in economic growth.

Fan & Rao (2003) established that government spending on agriculture has provided a strong contribution to economic growth in Africa and Asia. Diao & Dorosh (2003) establish that increased investments on rural infrastructure and productivity enhancing investments in agricultural export crops and livestock have highest impact on growth in income in Africa. Fan, Hazell & Thorat (2000) investigated the relationship between government spending, agricultural growth and economic growth in India. They used data for the period 1965 to 1988. They established that there is a positive relationship between government spending on agriculture and economic growth.

Oji-Okoro (2011) employed multiple regression analysis to examine the contribution of agricultural sector on the Nigerian economic development. They found that a positive relationship between Gross Domestic Product (GDP) vis a vis domestic saving, government expenditure on agriculture and foreign direct investment between the period of 1986-2007.

Anthony (2010) presented an empirical analysis of the contribution of agriculture to GDP in Nigeria. In order to examine this impact, he specified a functional and operational form, and established a causal relationship between GDP and agricultural variables. His study findings

revealed that agricultural variables have significant impact on economic growth. Matsuyama (1996) empirically tested the impact of agricultural productivity on the long-run economic growth of the contemporary developing countries. He used Ordinary Least Squares (OLS) and panel data regression techniques. This effect is not strong enough to cause either a long-run negative relationship between economic growth and agricultural productivity.

Chang, Chen and Hsu (2006) reexamine the relationship between agricultural productivity and economic growth. Their study found that, under a proper condition, in which the revenue generation effect dominates the comparative advantage effect, higher agricultural productivity enhances industrialization and increases long-run economic growth. Moreover, the effect of agricultural productivity was quantitatively assessed, based on the experiences during early stages of economic development in Japan, Taiwan, and Korea. The results show that higher agricultural productivity will subsequently increase industrial sector's employment and thus will enhance economic growth.

Awokuse (2009) tried to bridge the gap by re-examining the relationship between agriculture and economic growth by applying recent advances in time series analysis to national data from a different group of fifteen developing and transition economies in Africa, Asia and Latin America. His basic model was an extension of the neoclassical growth model who consider agriculture sector as a major contributor to economic growth. He used autoregressive distributed lag error correction modeling approach to find out the short-run and long-run relationships between both. The results of his study show that agriculture and economic growth both have strong relationship and agriculture is an engine of economic growth.

A study by Anyanwu et al (2013) by disaggregating the Gross Domestic Product (GDP) of Nigeria into their different constituent parts used multiple regression analysis to examine the relationship existing between the Gross Domestic Product and the shares of the various sectors that constitute Nigerian GDP (i.e. Agriculture, Industry, Building and Construction, Wholesale and Retail Trade and Services) from 1960 to 2008 and found that one of the significant determinants of Nigeria’s GDP was agriculture sector.

Thirtle et al (2001) concluded from a major cross-country analysis that, on average, every 1% increase in agricultural yields reduced the number of people living on less than US$1 a day by 0.83%. According to various methodological approaches, to the exam of the agriculture contribution to the economic growth of the less developed countries or the developing countries, the works of Humpheries and Knowleses (1998) can be mentioned as an example for a sample of less developed countries, Henneberry et al. (2000) for the case of Pakistan.

Mellor (1995) found a positive and significant relationship between agriculture sector and non-agricultural sector. Therefore, agriculture contributes to economic growth through a variety of linkages (Johnston and Mellor, 1961). Tiffin and Irz (2006) found that there are sufficient evidences which supports the conclusion that agriculture is the main cause variable of overall growth rate. Timmer (2005) correlated poverty with growth in agricultural output and concluded that at the provincial level roughly two-thirds of the reduction in poverty was due to growth in agricultural output.

Suleiman and Aminu (2010) conducted research on the contribution of agriculture, petroleum and manufacturing sector of the Nigerian economy and found out that agricultural sector is contributing higher than both petroleum and manufacturing sectors. Their study reveals that agriculture is contributing 1.7978 units to GDP while petroleum is contributing 1.14 units to GDP, which is less than the contribution of agriculture. In addition, the work examined by Oji-Okoro (2011) revealed that foreign direct investment (FDI) on agriculture contributes the most (56.43) in terms of agricultural development in Nigeria. This means that for every unit of change in FDI on agriculture there is a corresponding change of 56.43 units in GDP in Nigeria. Ekpo and Umoh (2012) revealed that the contribution of agriculture to GDP, which was 63 percent in 1960, declined to 34 percent in 1988, not because the industrial sector increased its share but due to neglect of agriculture sector.

From the above empirical literature, the effect of agriculture sector on GDP growth is mixed. Therefore, it is difficult to conclude the relationship between agriculture and GDP growth from these studies. Moreover, it can be concluded that the various sectors (agriculture, industry and service) of an economy influence economic growth and development in one way or the other.

This paper seeks to examine the contribution of agricultural sector on economic growth in Ethiopia.

CHAPTER III: DATA AND METHODOLOGY

3.1 Data Type and Sources

To investigate the relationship between the agricultural sector and GDP in Ethiopia, the study was carried out using annual time series data set. The sample period for the econometric analysis spanned from 1982 to 2013 for all the variables in the model employed. The choice of this period was guided by the availability of complete data considerations for consecutive years and to empirically assess the significance or the extent to which agricultural sector contributes to the GDP. In effect, the sample size of the data was a total of thirty two (32) years which meets the central limit theory ≥ 30. Time series data from 1982 to 2013 on all the variables of interest was obtained from the World Development Indicators (WDI, 2015) website. The time series data used in the study were the sectoral components of the various sectors that constitute the Ethiopian GDP; with emphasis on the agricultural sector.

3.2 Model Specification

The theoretical framework for the methods used in this research is Johnston & Mellor (1961). Johnston and Mellor (1961) have introduced Inter Sectorial Linkages about the role of agriculture in economic growth which has later become the main basis for other researches.

To capture the impact of contribution of agriculture, several studies have been conducted. Some of these are Enu P. (2014), Hussin and Wuan Ching (2013), Patrick Enu et al (2013). In all these studies agriculture is treated as an independent variable. Similarly this study employed a growth model used by Mohammad and Sasan (2013) with some amendments to meet the objectives of the study that incorporates agriculture as a significant factor that influence economic growth through value added. The function is specified as

$GDP_t = f(AGR, IND, SER)$ ……..... (3.1)

Different studies which have explored agriculture on economic growth incorporated different explanatory variables. For example, Patrick Enu et al (2014) include agriculture, industry and service sector outputs in their model as explanatory variables. Fauzi Hussin and Chee Wuan Ching (2013) regressed GDP per capita on agriculture, manufacturing and service sector. Ahungwa et al (2014) include agriculture, industry, building and construction, wholesale and retail trade and service sectors.

But, this study introduced another variable that has received much attention in academic literatures in many empirical studies as a factor affecting the performance of economic growth of Ethiopia. This is one year lagged GDP.

Expanding the growth function in equation (3.1) by including the above mentioned variable, the growth function can be specified as follows:

$GDP_t = f(AGR, IND, SER, LGDP)$ ……..... (3.2)

For the purpose of estimation, the model is transformed into double log-linear form, and expressed as thus:

$$Log(GDP) = \beta_0 + \beta_1 Log(AGR) + \beta_2 Log(IND) + \beta_3 Log(SER) + \beta_4 Log(LGDP) + e_t \quad \text{……..(3.3)}$$

Where, Log (GDP) is the GDP logarithm (Economic growth)
Log (AGR) is the value added logarithm in agriculture sector
Log (IND) is the value added logarithm in industry sector
Log (SER) is the value added logarithm in services sector.
LGDP is one year lagged GDP
β_0 = Intercept
$\beta_1 - \beta_4$= Coefficients
e_t = Error Term (normally distributed with zero mean and constant variance)

On estimation, the intercept (β_0) and slope coefficients β_i's are expected, a priori, to have positive sign, $\beta_i (i = 0, 1, 2, 3, 4) > 0$, implying that each economic sector share of the GDP is expected to correlate positively with economic growth (i.e the expected effect of growth of agriculture, service, and industrial sectors are assumed to be positive).

3.2.1 Description of Variables

Gross Domestic Product (GDP)

As this study is primarily interested in investigating the contribution of agriculture sector along with other variables on economic growth in Ethiopia, economic growth shall be treated as dependent variable. I.e. how does the economy changes due to changes in the explanatory variables. The most common way to measure the economy is real gross domestic product (GDP) which measures the total value of goods and services produced in an economy or the total of all expenditures on final goods and services produced per period of time usually a year. The word 'real' shows that the value is adjusted to remove the effect of inflation.

Agriculture Sector

Agriculture value added is the net output of agriculture after adding up all outputs and subtracting intermediate inputs. Agriculture plays an important role in contributing to socio-economic development in many countries. It is the primary source of employment, livelihood, and food security for the majority of rural people. Understanding the role of agriculture and its linkages to economic growth is important. Therefore, this study examines the contribution and the importance of agriculture to economic growth in Ethiopia as a factor affecting economic growth.

Industry Sector

The industry sector, which includes manufacturing, construction, public utilities and mining, grew rapidly in Ethiopia with high increase in employment. This sector is one of the components of GDP of an economy. Thus, this sector is chosen as one of the variables to be analyzed in terms of its contribution to GDP in Ethiopia.

Service Sector

Service sector is an industry which does not produce raw materials or manufactured products but offers services. It is also known as tertiary sector in economy. The service sector is a more diverse sector composed of different components like wholesale and retail trade including hotels and restaurants; transportation and communications; electricity and tourism; banking and non-market services; and government, financial, professional, and personal services such as education, health care, and real estate services. The service sector is increasingly seen as a means to promote economic development and reduce poverty. It is fast becoming the largest sector, in terms of its share of GDP and employment, in most developing countries. Apart from agriculture and industry sector, services sector also contributed significantly to the national GDP. Since this sector contributes significantly to GDP in Ethiopia, therefore this sector should be included as one of the variables in this study.

3.3 Stationary Series, Unit Roots and co integration tests

In modern time series econometrics, most economic variables have mean and variance that are not stationary and the situation results into a spurious or nonsensical regression, with a very high R^2 value in excess of 0.9 and t-statistics that appear to be significant when we regress one time series variable on another time series variable, when in fact all that is being obtained is evidence of contemporaneous high correlations rather than any meaningful causal economic relationship between the variables (i.e. the results have no economic meaning). Inferences based on the standard statistical tests (i.e. t and f tests) for models with spurious regression will be invalid.

In an attempt to establish whether the variables of our interest are stationery, that is I(0), or first difference stationary, that is I(I), the study uses most popular test Augmented Dickey-Fuller (ADF) due to Dickey and Fuller (1979, 1981). So as to avoid the spurious problem, the difference of the variables has to be included for the co integration analysis. Therefore, to avoid the seemingly impressive and nice spurious regression results, this study employed the ADF stationary test to investigate the stationarity of each series included in this study.

A stationary series is a series whose data generating processes (DGP) such as the mean, variance, and auto-covariances are finite and independent of time.

$E(Yt) = \mu$

$Var(Yt) = \sigma^2$

$Cov(Yt, Yt\text{-}j) = \sigma_j$

When one or more of the above conditions fail, the process Yt is said to be non stationary. Any series that is not stationary is said to be non stationary. A time series Yt which is itself non-stationary but becomes stationary after first differencing.

Following the unit root test, this study employs degree of integration test if the result of unit root test shows the data was not stationary at level. The non-stationary data will be differentiated in the particular level until all of the variables are stationary.

3.3.1Tests for Stationarity

Most of the time series economic variables are nonstationary, containing a unit root (Gujarati, 1995). Empirical work based on time series data assumes that the underlying time series is stationary in their levels. According to Nelson and Plooser (1982), most of the time series that appear in the economy will have to be differenced in order to become stationary. Therefore, it is necessary to test for stationarity of time-series variables before running any sort of regression analysis.

Unit root test has become a widely popular approach to test for stationary. Among the methods of testing the presence of unit roots in the variables, Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) have been employed.

Given the Autoregressive Model of order 1 AR (1) as follows:

$$Y_t = \varphi Y_{t-1} + U_t \quad \ldots\ldots\ldots\ldots (3.4)$$

Equation (3.6) is the basic equation from which three alternative equations are specified to allow different possibilities of non-stationarity. Before writing these expressions, the AR (1) model should be transformed by subtracting Y_{t-1} from both sides and letting $\delta = (\varphi - 1)$ becomes

$$\Delta Y_t = \delta Y_{t-1} + U_t \quad \ldots\ldots\ldots\ldots (3.5)$$

This specification is pure random walk under the null hypothesis that does not allow any form of trend.

The hypothesis is formulated as follows;

H_0= δ =0 or (φ =1) the series has a unit root is the same for all the variants

H_1= δ <0 or (φ <1) the series is stationary.

If the series includes stochastic trend or a constant (drift parameter) to the regression is suggested, then

$\Delta Y_t = \alpha + \delta Y_{t-1} + U_t$ ..... (3.6)

Where α is a constant term.

However, if a series contains a deterministic trend, testing for stationarity using equation 3.8 is not valid. Therefore it is important to incorporate time trend as follows: (i.e. including both deterministic and stochastic trend)

$\Delta Y_t = \alpha + \delta Y_{t-1} + BT + U_t$ ..... (3.7)

Where T is the trend element

The series Y_t is non-stationary when $|\varphi| \geq 1$. A popular test of non-stationarity in the AR (1) model examines whether the series has a unit root i.e., whether φ=1.

Under the null hypothesis, Dickey and Fuller have shown that the estimated t value of the coefficient δ follows the τ (tau) statistic. For the above equations the parameter sigma δ is used while testing for stationarity where the decision is made using a τ-statistics. If the calculated value of τ is less than the critical value (reported by Dickey and Fuller) the null hypothesis is accepted and not if otherwise. Rejecting the null hypothesis implies that there exists stationarity. However, the DF test has a serious limitation in that it suffers from residual autocorrelation. In order to account for the possibility of serial correlation in the above specifications, the DF model is augmented with additional lagged first differences (changes) of the dependent variable. The purpose of 'augmenting' the Dickey-Fuller (DF) regression is to get white noise errors. The

augmentation is adding lagged values (k) of first differences of the dependent variable as additional regressors which are required to account for possible occurrence of autocorrelation. This is called Augmented Dickey Fuller (ADF). Thus incorporating lagged first differences of the dependent term in the above equations gives:

$$\Delta Yt = \boldsymbol{\delta} Y_{t-1} + \sum_{i=1}^{k} \theta_i \Delta y_{t-i} + Ut \quad \text{(3.8)}$$

$$\Delta Yt = \boldsymbol{\alpha} + \boldsymbol{\delta} Y_{t-1} + \sum_{i=1}^{k} \theta_i \Delta y_{t-i} + Ut \quad \text{(3.9)}$$

$$\Delta Yt = \boldsymbol{\alpha} + BT + \boldsymbol{\delta} Y_{t-1} + \sum_{i=1}^{k} \theta_i \Delta y_{t-i} + Ut \quad \text{(3.10)}$$

Where $\triangle y_t = y_{t-1} - y_{t-2}$, $y_{t-2} = y_{t-2} - y_{t-3}$ etc.
α is constant (drift), T is a trend, K is the lag length and $U \sim IID(0, \sigma^2)$.

The ADF test based on equation (3.10) is, therefore, appropriate especially when the assumption of uncorrelated error term is not reliable. In this study, the Augmented Dickey Fuller (ADF) test is applied which involves estimating the above regressions.

After estimating the equations using OLS, the resulting t statistics is compared with the respective critical values given in Ducky Fuller tables to be used to test for the presence of a unit root. In the Ducky Fuller tables, critical values are different for the three regressions. The ADF statistic, used in the test, is a negative number. The more negative it is, the stronger is the rejection of the hypothesis. The variable is stationary at first difference if ADF test value is lower than McKinnon critical value in the first difference.

If the variables are integrated of same order I (d), the next step is to find out whether they are co-integrated. The co integration test identifies long run equilibrium relationship. If the variables

have the same level of stationarity, there exists a long run equilibrium relationship between the variables.

3.3.2 Co-Integration Test

Mathematically, two or more variables are said to be co integrated if they are individually integrated of the same order, say I(p), and a linear combination of the variables exists such that their linear combination is stationary, *i.e.* I(0).

One possible means of avoiding spurious regression is the application of co integration techniques which allow the estimation of non spurious regressions with non-stationary data. The economic interpretation of co integration is that if two (or more) series are linked to form an equilibrium relationship spanning the long-run, then even though the series themselves may contain stochastic trends (i.e., non-stationary) they will nevertheless move closely together overtime and the difference between them will be stable (i.e. stationary) (Enders,1995).

Economic literature provides different methods for examining the existence of the long-run relationship between two or more time series variables. The two most widely used alternative approaches to test for the existence of co integration are the Engle-Granger two step procedures proposed by Engle and Granger (1987) and by Johansen and Juselius (1990) (the Johanson Maximum Likelihood Estimation procedure).

In the Engle-Granger two-step procedure, variables entering the cointegrating vector are tested for integration of the same order. Although the Engle and Granger procedure is easily implemented, it has several important defects. In the first place, the method has no systematic procedure for the separate estimation of multiple co integrating vectors. The method only allows for a single co integration equation. In fact, if there are n variables in a model there may be n or less co integrating vectors. Another serious defect of the Engle-Granger procedure emanates from the fact that it relies on a two step estimator. Thus, this method is basically to test for a unique co-integrating relationship, while the Johansen-Juselius method can be applied to test for existence of more than one co-integrating relationship.

The Johanson (1988) Maximum Likelihood Estimation procedure avoids the use of two step Engle-Granger procedure and can estimate and test for the presence of multiple co integrating vectors. Owing to its apparent superiority to that of the Engle-Granger methodology, in this study the Johanson Maximum Likelihood Procedure is applied for empirical analysis.

In Johanson procedure, the likelihood ratio (LR) test is used to test the significance of estimates of λ_i eigenvalues. Johansen and Juselius (1990) provide two likelihood ratio statistics to determine for the number of cointegrating vectors, *viz.,* the Trace Statistic and the Maximal Eigen value Statistics. These statistics are used to test the number of characteristic roots that are insignificantly different from unity. The trace statistic (λtrace), which tests the null hypothesis that the number of distinct cointegrating vectors is less than, or equal to, rank r (tests whether there is at most r co integrating vectors) against a general alternative. The maximum eigenvalue (λmax) statistic, which tests the null hypothesis of there are exactly r number of co integrating vectors as against the alternative hypothesis of r+1 co integrating vectors. To determine the number of co integrating relations r, we can proceed sequentially from r = 0 to r = n-1 until we fail to reject the hypothesis.

The λtrace and λmax statistics are given by the formula

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln (1-\lambda_i) \qquad \text{.....(3.11)}$$

r=0, 1, 2,.., n-2, n-1

$$\lambda_{max}(r) = -T \sum_{i=r+1}^{n} \ln (1-\lambda_{r+1}) \qquad \text{.....(3.12)}$$

r=0, 1, 2,…, n-2, n-1

Where λ_i is the estimated values of the characteristics roots (called eigen values) and T is the number of usable observations.

The tests identify the number of characteristics roots that are significantly different from unity using the equation (3.11) for λ_{trace} and (3.12) for λ_{max}. Equation (3.11) is called the trace test. In this test, λtrace equals zero when all λi are zero. Equation (3.12) is called the maximum eigen value test.

The calculated statistic will be compared to the critical value. To determine the exact number of co integrating vectors, we test λtrace (1) and λmax (1), λtrace (2) and λmax (2), and so on until we fail to reject the null hypothesis. Based on these results, we can establish the number of co integrating vectors. When we have established the number of co integrating vectors, the next step of this analysis is to estimate the long-run estimates. The long-run model equation is estimated using OLS technique.

3.3.3 Error correction model

This specification includes a short run dynamic process, consistent with data and converging to the long run equilibrium. The Error Correction Model (ECM) attempts to integrate economic theory useful in characterizing long run equilibrium with observed disequilibrium by building a model that explicitly incorporates behavior that would restore equilibrium. Error Correction Mechanism has the co-integrated relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their co-integrating relationships while allowing for short-run adjustment dynamics. The Error Correction Term is the one-period lagged value of the residual from a static model.

In this study therefore having established the co integration relationships among variables, an error correction model was estimated which initially consisted of one (1) lag length of each variable which was obtained with the choice of optimum lag length guided by the Akaike Information Criteria (AIC) and Schwarz Information Criteria (SIC).

3.3.4 Multivariate Granger Causality Test

Co-integration test merely shows the degree of association between variables and not the direction of linkage. The existence of co integration among the variables suggests that there must be Granger causality in at least one direction, but it does not indicate the direction. Therefore, in order to examine the direction of linkage, Granger causality tests have been conducted.

One method often applied to investigate direction of causal relationships empirically among variables is the Granger causality analysis. The basic principle of the Granger causality analysis (Granger, 1969) is to test whether or not lagged values of one variable help to improve the explanation of other variables from its own past.

We estimated the following models in order to test for Granger causality where the first equation has GDP as the dependent variable and the second has agricultural sector as the dependent variable. The test was conducted to test the causality direction that is whether Gross Domestic Product Granger causes agricultural sector and vice versa. The most important point is to know whether the values of GDP are influenced by the current and future values of AGR. The procedure is given by:

$$GDPt = \sum_{i=1}^{n} \alpha_i AGR_{t-i} + \sum_{j=1}^{n} \delta j \, GDP_{t-j} + Ui \quad \ldots\ldots (3.13)$$

$$AGRt = \sum_{i=1}^{n} \alpha_i GDP_{t-i} + \sum_{j=1}^{n} \delta j \, AGR_{t-j} + Ui \quad \ldots\ldots (3.14)$$

3.4 Method of Estimation

The econometric procedure in estimating the relationship among the variables of the model in this research work is via the ordinary least squares (OLS) techniques facilitated by the application of the statistical package for empirical econometric analysis, Econometrics views version 6.0 (E-views 6.0). The choice of OLS is guided by the fact that it possesses some optimal properties (which include linearity, neutrality, and sufficient least variance and mean square error); its computational procedure is fairly simple and it is also an essential component of most other estimation techniques. These desirable properties of estimators can be obtained from any techniques but minimum variance property distinguishes the OLS estimators as the best when compared with other linear neutral estimators from econometric techniques. This particular property of smallest variance is the reason for the popularity of the OLS method (koursoyiannis, 1997). Parameter test is done using t test while model specification test is done by F-test. Hence, before employing any estimation technique, it is pertinent to examine the time series characteristic of the economic variables.

3.5 Data Diagnostic Tests

According to Gujarati (2004), in order to have a good-fit estimation econometric model of OLS regression, the model (Classical Linear Regression Model) must meet up with certain econometric assumptions such as the residuals are normally distributed, linearity of variables, no exact co linearity or correlation among independent variables, no serial correlation among error terms, constant variance over the error terms, no specification bias (the model is correctly specified), etc.

Therefore, prior to running (estimating) the regression process, this study also conducted some major data diagnostic tests which are normality, multicollinearity, autocorrelation, heteroscedasticity, incorrect model specification (model testing) and model (parameter) stability. The purpose of these tests is to observe that the model is appropriate and confounds to theory, to make sure that the data is valid and the model is reliable for the next analysis, to ensure that this study will gain the finest results, and finally to make the result will end at a good conclusion and interpretation.

Chapter IV: Empirical Results and Discussions

Introduction

For the present study, Real Gross Domestic Product and Agriculture sector value added have been considered on annual basis from 1982 to 2013. First of all, to fulfill the research objectives, descriptive statistics like mean, median, standard deviation, skewness, Kurtosis, Jarque-bera statistic etc., are carried to show the nature and basic characteristics of the variables used in the analysis. Correlation is the next step to move towards the objectives of this study and finding any relationship between the values added of GDP and Agriculture Sector. Then the formal investigation is carried out by examining the stochastic properties of the variables by using Unit Roots Test to test the stationarity of the variables. In this context, the widely used technique is Augmented Dickey Fuller (ADF) test. If two variables i.e., GDP and Agriculture Sector (AGR) are both integration of same order, then the next step is to find out whether they are co-integrated. This has been done by using Johansen's Co-integration Approach. Then an error correction model (ECM) was performed to show the short run dynamic relationship. Finally, the causal relationship between GDP and AGR has been tested by applying Grangers Causality test.

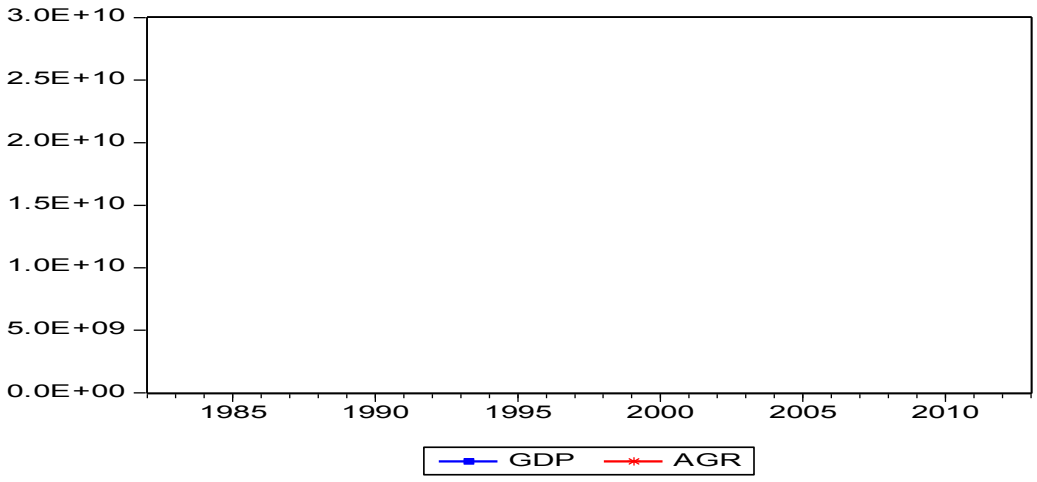
4.1 Descriptive Analysis of GDP and Agriculture

The correlation coefficient of the GDP and AGR is 0.9903, indicating that economic growth and AGR are highly related. Besides, as shown in appendix 1, mean value added of LOG (GDP) is 22.9802 with a standard deviation of 0.4796 and mean value added of Agriculture Sector is 22.1512 with a standard deviation of 0.3745. It clearly indicates that variation in the distribution of GDP is more than that of Agriculture sector. Comparatively higher positive skewness in the case of GDP indicates longer right tail of the distribution of GDP. Kurtosis of the GDP is higher than the kurtosis of Agriculture sector indicating higher abnormal peaks in the distribution of GDP values in the given period. Jarque-Bera statistic tests the null hypothesis that the given data has normal distribution. In the present case, the 'p' value of Jarque-Bera statistic is more than 0.10 which indicates that both the variables i.e., LOG (GDP) and LOG (AGR) have normal distribution.

4.1.1 Trends of agriculture Sector value-added and GDP

Trend analysis was utilized to compliment findings from regression analysis and also to familiarize with general pattern or trend of the data. The goal was to see if there are any systematic patterns over time.

Figure 4.1.Trends of GDP and agriculture value-added in Ethiopia (1982-2013).



Source: WB 2015 data

It can be observed in figure 4.1 that the rate of change of the economy had three sharp declines from 1982 to 2013 because of the combined effects of internal conflict, war and drought. The first contraction of the GDP was observed during the Ethio-Eritrean war of 1998-2000. It is obvious that during war some resources of the economy are directed to sustain the war and this greatly harms the economy of one country especially in poor countries like Ethiopia.

The second and third contractions of the economy occurred in 1984/85 and 2002/03 agricultural seasons where agricultural production was lower than the preceding seasons when drought has

occurred due to shortage of rainfall all over the country. The fluctuations reflect the vulnerability of Ethiopia to climatic changes. Obviously agriculture has the highest share in GDP of the country. Moreover the figure shows that GDP growth is greatly driven by the good performance of the agriculture sector of the country. This sector of the economy underperforms when drought occurs to drag GDP growth down with it. In other words, 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. Both real GDP and agriculture value-added in Ethiopia generally follow an overall upward trend in the period under analysis.

Although the observations made under trend analysis are revealing, they need to be confirmed by regression analysis. The next subsection discusses regression results.

4.2 Econometrics Analysis

This section presents the results of unit root (stationarity) tests, co integration tests, and error correction model and granger causality test. It relied on an econometric analysis of the relationship between economic growth and agriculture sector in Ethiopia. To achieve the major objective, the existence of a statistical relationship among the variables is carried out.

4.2.1 Stationarity Test Results

Model estimation begins with the analysis of the order of integration of each variable using ADF test for this analysis. The null hypothesis for this testing is that the series contains unit roots and the results are reported in table 4.1 below. The variables involved in unit root tests are real values of GDP, agriculture sector (AGR), industry sector (IND) and service sector (SER) over the period 1982 – 2013. From the table given below the test statistics at the levels shows the failure to reject the null hypothesis that is the calculated value is less than the critical or tabulated value.

Table 4.1: ADF test at level

Variable	Without trend (intercept only)	with trend	Conclusion
LOG (GDP)	2.490118	-0.487206	Has Unit Root
LOG (AGR)	0.642217	-1.957279	Has Unit Root
LOG (IND)	2.770026	0.429552	Has Unit Root
LOG (SER)	2.260613	-0.474755	Has Unit Root
LOG(LGDP)	2.339155	-0.481680	Has Unit Root

Source: Eviews 6.0 based on WB 1982-2013 data.

ADF test shows that all the variables which are non-stationary at level, becomes stationary at first difference. Most macroeconomic time series are difference stationary series. So the statistical test shows the rejection of the null hypothesis for the test. If a time series has a unit root, the first differences of such time series are stationary. Therefore, the solution here is to take the first differences of the time series.

Table 4.2: ADF test in first difference

Variable	without trend	with trend	Order of Integration
D LOG (GDP)	-3.949016	-3.753969	Stationary at first difference
D LOG (AGR)	-5.010986	-7.159181	Stationary at first difference
D LOG (IND)	-3.047043	-3.987148	Stationary at first difference
D LOG (SER)	-3.424722	-5.444959	Stationary at first difference
D LOG (LGDP)	-3.943065	-3.667045	Stationary at first difference

Source: Eviews 6.0 based on WB 1982-2013 data.

In table 4.2, the results for unit root tests on the first difference of the variables, suggests that variables are best characterized as being integrated of order one. This test implies that we can reject null hypothesis of unit root test. And, hence it is evident that all the variables are stationary at first difference.

Since all the series are integrated of the same order – integration of order 1 (I (1)) – the series can be further tested for the existence of long-run relationships among them using the co-integration technique. A necessary but not sufficient condition for co integration is that each of the variables should be integrated of the same order, and the order must be greater than or equal to one. We then proceed to discuss the results of cointegration between the explained and each of the explanatory variables.

4.2.2 Johanson-Juselius Maximum Likelihood Co-integration Test Results

Once the variables are checked for stationarity and are of same order, integration between them can be tested using co-integration methods. Economically speaking, two variables will be co integrated if they have a long-term, or equilibrium, relationship between them. The basic notion behind co-integration tests is that the variables must have a long-run equilibrium relationship, which means they must bear similar characteristics. The Long-run relationship among the variables is examined in a multivariate framework using co-integration approach based on the Johansen's Trace and Maximum Eigen value test. This test is considered to be better than other co-integration approaches as it is important when co integration is tested between more than two variables. By considering that all of the variables are best characterize by being integrated of order one, the long-run relationship among the variables were evaluated.

Table 4.3: Pair-Wise Co-Integration between GDP and Agriculture Sector (Trace Test) λtarce

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.696744	60.16623	47.85613	0.0023
At most 1	0.502268	26.75725	29.79707	0.1077
At most 2	0.222967	7.221843	15.49471	0.5520
At most 3	0.005634	0.158212	3.841466	0.6908

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Source: Eviews 6.0 output based on WB 1982-2013 data.

Table 4.4: Pair-Wise Co-Integration between GDP and Agriculture Sector (Maximum

Eigenvalue) λeigen value

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.696744	33.40898	27.58434	0.0079
At most 1	0.502268	19.53541	21.13162	0.0824
At most 2	0.222967	7.063631	14.26460	0.4816
At most 3	0.005634	0.158212	3.841466	0.6908

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
Source: Eviews 6.0 output based on WB 1982-2013 data.

Tables 4.3 & 4.4 provide the statistical results of Johnson's trace statistics and maximum eigen value statistics assuming linear deterministic trends in data with intercept. Trace test statistic has the null hypothesis of no co-integrating relations (r=0) against the general alternative of r>0. As indicated in table 4.3, the calculated value i.e., Trace test statistic value is more than critical value at 95% level of confidence. It can be concluded that there exists one distinct co integrating equation among the variables. The maximum eigen value test makes the confirmation of this result. This leads to make a conclusion that the variables in the regression are co-integrated which can also be expressed that there exists long term equilibrium relationship among the variables. Therefore, the co-integration model is valid.

4.2.3 Long Run Model Estimation

After co integration test has been conducted and its presence is confirmed, the next task is estimating the long run model.

Table 4.5 Long run model estimation

Dependent Variable: LOG(GDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.131138	0.208109	0.630139	0.5341
LOG(AGR)	0.556169	0.016236	34.25558	0.0000
LOG(IND)	0.153404	0.017785	8.625264	0.0000
LOG(SER)	0.286863	0.024075	11.91525	0.0000
LOG(LGDP)	0.044906	0.023415	1.917810	0.0662
R-squared	0.979967			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	1.534391			

Source: Eviews 6.0

As reported in table 4.5, all of the estimated coefficients in the model have their expected theoretical signs. Specifically, a 1% increase in the AGR value added would be accompanied by 0.57 % increase in the GDP growth. It is statistically highly significant at the 5% significance level since the p-value which is 0.0000 < 0.05. This implies GDP growth in Ethiopia is highly influenced by the agriculture sector growth rate. Thus, if we increase agriculture output, then GDP growth will also increase. The result is in line with (Umaru and Zubairu, 2012) and (Enu Patrick, 2014) that there exist a positive link between agricultural output and economic growth. Generally based on researches and observations agriculture has been known and statistically proven to have a positive impact on the Ethiopian economy. Similarly, a positive as well as significant relationship between services sector and economic growth was found. The result revealed the fact that if value-added for the service sector increases by 1%, real GDP in Ethiopia is expected to increase by 0.31 %. This finding is consistent with Oguchi (2008).

Industry also appeared to have a positive relationship with GDP growth. A 1% increase in value added of industry will cause 0.15 % increase in GDP growth. This finding is consistent with Hall (1998). This result is however, not surprising because the total contribution of the industrial sector to the GDP of the Ethiopian economy has been very low over the study period. The sector faces several challenges.

When lagged GDP is considered, the result showed that it has a positive and significant effect. This implies that GDP growth in Ethiopia is also influenced by the previous year's growth rate. The coefficient of one year lagged value is found to be 0.045 meaning that a 1% increase in previous year's real GDP would be accompanied by nearly 0.045 % changes in the current GDP growth.

In addition to the results of this long run regression, the model has a high R-squared value of 0.9799. We know that one of the measures of goodness of fit of a regression model is $R^{2.}$ The closer it is to 1, the better is the fit. 97.99% of the variation in the dependent variable is explained by the regressors in the model. It has a very good fit. Economically, the remaining 2.01% of the total variation in GDP growth is attributed to other factors. Overall, the regression equation is statistically highly significant since the F-statistic has a significant p-value. The F-statistic displays that all the coefficients jointly are different from zero or significant. All the three economic sectors jointly can influence economic growth. However, the most promising one is the agricultural sector, followed by the services sector.

From the results, it was realized that agriculture sector contributes more to GDP growth. This is consistent with the findings of Todaro and Smith (2009). [See also Oguchi, (2008) and Ogen (2003)]. Therefore, if the policy makers channel more investments into the agricultural sector, it will help increase GDP growth in Ethiopia.

In this model, all the three economic sectors together with the lagged GDP jointly can influence economic growth. Hence, it can also be said that past performance of GDP is a significant contributor to the current GDP of Ethiopia.

4.2.4 Diagnostic Test Results

The regression diagnostic will show the results of some special tests that have been conducted to make the result free from bias.

(a) Autocorrelation (Serial Correlation) test

The residuals were examined for serial correlation using Breusch-Godfrey Serial Correlation LM test. The F statistic from the serial correlation LM test has a p value of 0.5291 and there is no evidence to reject the null of no serial correlation; rather it leads to conclusion of no serial correlation in the residuals from the long run regression.

Table 4.6 Breusch-Pagan-Godfrey serial correlation test

Null hypothesis: there is no serial correlation among residuals.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.652409	Prob. F(2,26)	0.5291
Obs*R-squared	1.529186	Prob. Chi-Square(2)	0.4655

Source: Eviews 6.0 output based on WB 1982-2013 data.

(b) Heteroscedasticity

Such test is conducted to identify if heteroscedasticity exists in the residuals of our regression model. There are multiple alternatives to test heteroscedasticity and this study employed two of them namely Breusch_Pagan-Godfrey and white tests. The results from these tests lead us to accept the null hypothesis of homoscedasticity. The F-statistic and observed R-squared in both tests are statistically insignificant as their respective P values are large enough; they are 0.7214 and 0.6048 respectively.

Table 4.7 : Breusch-Pagan-Godfrey Test

Null hypothesis: There is homoscedasticity

F-statistic	0.405545	Prob. F(3,28)	0.7502
Obs*R-squared	1.332539	Prob. Chi-Square(3)	0.7214

Source: Eviews 6.0 output based on WB 1982-2013 data.

Table 4.8 :White Test

Null hypothesis: There is homoscedasticity

F-statistic	0.715892	Prob. F(8,23)	0.6755
Obs*R-squared	6.379627	Prob. Chi-Square(8)	0.6048

Source: Eviews 6.0 statistical output based on WB 1982-2013 data.

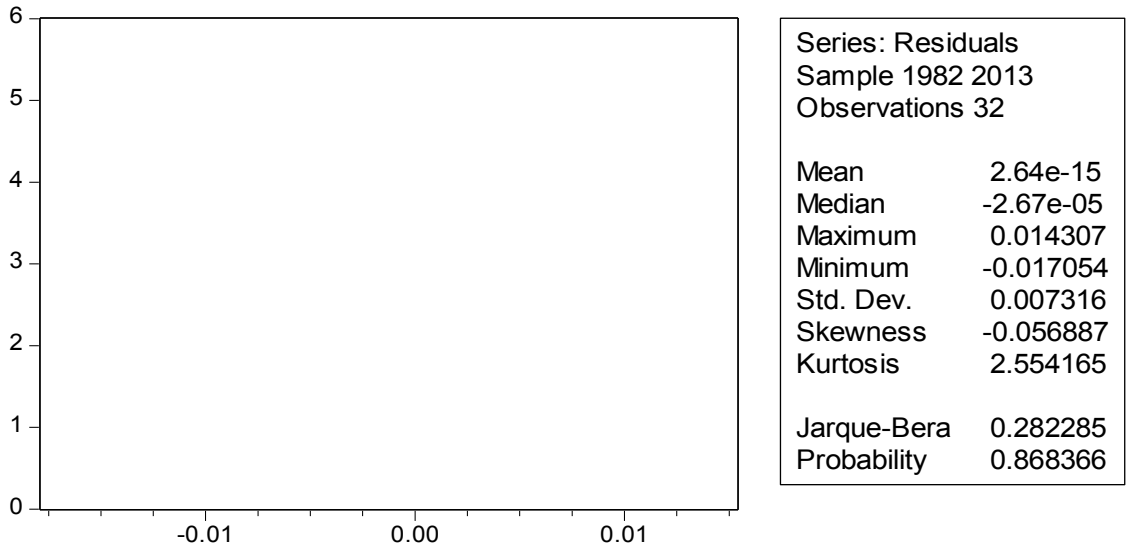
(c) Normality test of residual

Histogram of the residuals along with the Jarque-Bera statistics has been used to test if the residuals from the long run estimation are normally distributed around their mean values. The Jarque-Bera measures the skewness and kurtosis of the residual series. If the residuals are normally distributed, the histogram should be bell shaped and the JB statistic should not be significant. A small probability value leads to rejection of the null hypothesis of normal distribution.

$$\text{Jarque-Bera} = \frac{N}{6}\left(S^2 + \frac{(K-3)^2}{4}\right)$$

Where S is skewness and K is kurtosis.

Table 4.9: Normality test



Source: Eviews 6 statistical output based on WB 1982-2013 data.

The JB statistic is not significant as it is accompanied by a high probability value of 0.8683. Therefore, we fail to reject the null hypothesis for normal distribution.

(d) Ramsey RESET test for Model Specification

Ramsey RESET, Regression Specification Error Test, is employed for model specification error. It is a general test for omitted variables, incorrect functional form, correlation between the regressors and the residual term.

Table 4.10: Ramsey RESET test for model specification

Null hypothesis: The model has no omitted variables.

Ramsey RESET Test:

F-statistic	2.969002	Prob. F(1,27)	0.0963
Log likelihood ratio	3.338455	Prob. Chi-Square(1)	0.0677

Source: Eviews 6.0 based on WB 1982-2013 data.

As shown in table 4.10, the p-value for the F-statistic is high (0.0963), which is more than 5%. This shows that the F statistic is not statistically different from zero. As a result, we fail to reject the null leading to a conclusion of no omitted variable in the model.

(e) Stability test - The Chow Breakpoint Test

Table 4.11: Stability test

Chow Breakpoint Test: 1992
Null Hypothesis: No breaks at specified breakpoints

F-statistic	1.857647	Prob. F(4,24)	0.1508
Log likelihood ratio	8.631288	Prob. Chi-Square(4)	0.0710

Source: Eviews 6.0 based on WB 1982-2013 data.

The intention behind the chow breakpoint test is to examine if equations to different sub sample period are significantly different from the equation to the entire period that merges all the subsample periods. In other words, it tests whether there is a structural change in all of the equation parameters. The data collected for this period study passes through two regimes; therefore there is a need to test for stability. The null hypothesis for the test is- there is no structural change. The result of the test for model stability as shown in table 4.11 for the year 1992 has a P-value of 0.1508. Therefore, the null cannot be rejected implying the parameters in the estimated growth function are constant and do not change in the sample periods.

(f) Multicollinearity Test

Classical Linear Regression Models assume that there is no perfect linear relationship or sever co-linearity among explanatory variables. If multicollinearity exists, the result from the estimated regression function will be misleading. Strong multicolinearity decreases the precision of the OLS estimates, in which case some coefficients are not significantly different from zero, while others may have implausible negative values. It is therefore important to carryout diagnostic analysis to ascertain the presence or otherwise of multicolinearity.

The original OLS results did not give us any indication of the presence of multicollinearity judging from the t-ratios and R^2. However, we decided to do another test to confirm the above

results. Consequently, a test for multicollinearity is employed by producing correlation matrix. Table 4.12 gives the correlation matrix of all the regressors under investigation. The correlation of the variable with itself is one and seen on the main diagonal from left to right. The test revealed that all the correlation coefficients are tolerable as they are all less than 0.7; hence multicolinearity was not a serious problem in this model.

Table 4.12: Residual correlation matrix

	LOG(LGDP)	LOG(AGR)	LOG(IND)	LOG(SER)
LOG(LGDP)	1.000000	0.581327	0.602479	0.592265
LOG(AGR)	0.581327	1.000000	0.119657	0.111373
LOG(IND)	0.602479	0.119657	1.000000	0.091210
LOG(SER)	0.592265	0.111373	0.091210	1.000000

Source: Eviews 6.0 based on WB 1982-2013 data.

From the discussions of all the above results, it could be seen that this regression results were not suffering from the problems of multicollinearity (see table 4.12), autocorrelation (see table 4.6) and heteroscedasticity (see table 4.7). In addition, the regression result is not nonsense that is not spurious. Therefore, meaningful analysis and conclusions can be drawn from it.

4.2.5 Error Correction Model (ECM)

Having already obtained the long-run model and estimated the coefficients, the next step will be estimation of coefficients of the short-run dynamics that have important policy implications. Hence, an error correction model will be estimated that incorporates the short term interactions and the speed of adjustment towards long run equilibrium. In this model, we reviewed the move from short term fluctuations to long run and equilibrium. So each short term fluctuation is related to its long run value for different variables. The resulted equilibrium coefficient in this model will show how well these fluctuations move to long run stationarity. So, the error correction model has been estimated using the OLS technique and the results are summarized in table 4.13 below.

Table 4.13: Result of the Error Correction Model

Dependent Variable: Δ LOG(GDP)

Variables	Coefficient	Prob.
ΔLOG(GDP(-1))	-0.390835	0.1054
ΔLOG(AGR(-1))	0.730135	0.0961
ΔLOG(IND(-1))	0.097742	0.7750
ΔLOG(SER(-1))	0.529078	0.0821
C	0.032737	0.0539
ECM(-1)	-0.720812	0.0811

R-squared	0.482080
Adjusted R-squared	0.272096
Durbin-Watson stat	1.815374
Prob(F-statistic)	0.024263

Source: Eviews 6.0 based on WB data.

According to the estimation results of the short run error correction model in table 4.13 above, R^2 value of 0.482 (48.2%) shows that the variation in Ethiopian GDP performance is caused by all the explanatory variables included in the model while 51.8% is by other variables not included in the model. Furthermore, the F- statistics was significant at 5% with a probability of 0.0242 which implies that the model fit showing the joint significant of the variables included in the model and the Durbin Watson value of 1.815 implies that the model does not suffer from autocorrelation problem. In terms of the significant of the individual explanatory variables, it was observed that the past values of Agricultural value-added LOG (AGR(-1)) and Service value-added LOG (SER(-1)) are the two significant determinants of economic growth in Ethiopia for the period of analysis. Agricultural value-added was statistically significant at 10% and had a positive effect on economic growth. This agrees with the a priori expectation, meaning that in the short-run, agricultural value-added has a positive impact on economic growth in Ethiopia. Statistically, the result shows that holding other variables constant a 1% increase in agricultural value-added will lead to a 0.73% increase in economic growth. The lagged variable of the dependent variable ΔLOG (GDP(-1)) was insignificant and had a negative effect. This it means that the previous gross domestic product doesn't affect the current gross domestic product in the short run.

The coefficient of the error correction term is statistically significant at 10% with the expected negative sign and relatively large magnitude (-0.7208) with the speed of convergence to equilibrium fairly quickly at 72.08% of the past years deviation from equilibrium. This amount

of the fluctuations would be corrected in short term. This economic growth adjustment rate is essential for maintaining deviation from the long-run equilibrium in order to reduce the existence of disequilibrium each period and this indicates high speed in economic growth error correction.

4.2.6 Granger Causality Test Results

This test enables to identify the direction of causality between GDP and agriculture sector (AGR) at different lags. Table 4.13 shows the result of Pairwise Granger Causality test. Granger causality talks about the nature of relationship between variables. It answers the question – what is the type of relationship that exists between the variables? Granger causality test was conducted to see whether Gross Domestic Product granger causes Agricultural sector and vice-versa. The results suggest that the null hypothesis that Agricultural sector does not granger economic growth was rejected which indicated that causality runs from agricultural sector to economic growth because of the high F-statistic and low probability value. This also shows a unidirectional relationship between the two variables (Agricultural sector and economic growth). Consequently, from the results, it therefore means that economic growth does not cause expansion of agricultural growth rather; it indicates that agricultural growth raises the nation's economic growth.

Table 4.14: Pair Wise Granger Causality Test

Null Hypothesis	Lags	Obs	F- Statistic	Probability
D(LOG(AGR)) does not Granger Cause D(LOG(GDP))	1	30	0.83979	0.3676
D(LOG(GDP)) does not Granger Cause D(LOG(AGR))			0.12016	0.7315
D(LOG(AGR)) does not Granger Cause D(LOG(GDP))	2	29	2.72986	0.0855
D(LOG(GDP)) does not Granger Cause D(LOG(AGR))			1.73902	0.1971

D(LOG(AGR)) does not Granger Cause D(LOG(GDP))	3	28	1.40539	0.2691
D(LOG(GDP)) does not Granger Cause D(LOG(AGR))			1.39820	0.2711

Source: Eviews 6.0 based on WB 1982-2013 data.

The study has applied Granger causality test proposed by C.J. Granger (1969). Granger proposed that if causal relationship exists between variables, they can be used to predict each other. Since the Agriculture sector and GDP have become stationary at first difference, granger causality test is conducted on first differenced of Agriculture sector and GDP. As shown in table 4.13, when one year lagged data and three years lagged data are used to predict causality, there is no causal relationship between Agriculture Sector and GDP in both the directions. In other words, at all the three lags, we fail to reject the hypothesis that GDP doesn't granger cause AGR, and at lags one and three AGR doesn't granger cause GDP due to the respective large p values. On the other hand, the hypothesis for agriculture doesn't granger cause GDP is rejected at 10% level for lag two. I.e. When two years lagged data is used to predict the causality, the causal relationship is unidirectional at 10% level of significance indicating that the Agriculture sector granger cause GDP, but GDP does not granger cause agriculture sector. This leads to treat agriculture as exogenous variable to explain (influence) economic growth in Ethiopia.

CHAPTER V: SUMMARY, CONCLUSIONS, RECOMMENDATIONS

5.1 Summary and Conclusion

This study has investigated the association between the agricultural sector and economic growth in Ethiopia for 32 years ranging from 1982 to 2013. The study initially did an empirical testing. As revealed from the present study, there is a strong positive correlation between GDP and Agriculture Sector growth. To estimate the model, first the series was tested for stationarity. Johnson's co-integration test indicates that there is an existence of co-integration between GDP and Agriculture Sector growth. Hence, it can be inferred that the agriculture sector and GDP have

long-run equilibrium relationship between them. The result of granger causality test showed a unidirectional relationship between agriculture and economic growth.

The long run estimation depicted that agriculture sector positively and significantly affects economic growth of Ethiopia. A 1% increase in net agriculture output causes increase in the country's GDP growth by 0.55% in the long run. The result is analogous with studies that explored positive impacts of agriculture on economic growth such as Patrick Enu et al. (2013), Anwar and Abdul Qayyum (2011), Hussian et al. (2011) and Umaru and Zubairu, (2012).

As supported by the literature, such positive influence of agriculture could affect the economic performance of Ethiopia through its direct and/or indirect impact (Johnston, 1970; Olaokun, 1979; Johanson and Mellor, 1961), and explained that agriculture provides raw materials for industries, earn foreign exchange which in turn results in promoting economic growth. It also leads to the creation of higher population in employment opportunities. On the other hand, besides its direct impact at macro level, agriculture is also a source of food. This apparently supports the effort to reduce poverty and in turn improves income distribution in developing countries like Ethiopia.

Besides, in addition to agriculture sector, economic growth in Ethiopia is well explained by the previous year's growth rate. This is reported through the positive and significant coefficient of one year lagged real GDP. A 1% increase in the previous year's GDP results in a 0.045 % increase in the current year's GDP of Ethiopia. The empirical findings showed that industry and service sectors also play positive and significant role in the economic growth of the country. A 1% increase in the service sector output and industry sector output will increase the GDP by 0.28 % and 0.15 % respectively.

The results revealed that all the explanatory variables are statistically significant in improving economic growth while agriculture is the most influential over the years under review. That is the agricultural sector is contributing higher than the other sectors, though they all possessed a positive impact on economic growth of the economy. A good performance of an economy in terms of economic growth may therefore be attributed to a well-developed agricultural sector capital. Therefore, for Ethiopia to attain higher GDP growth rates as its key dream, more of its

resources have to be channeled into the key sectors of the economy. Therefore, more emphasis is needed on these issues in order to gear up the country's economic status and help the country to achieve its Vision 2025 so as to move from low income country to middle income country by 2025.

In order to achieve balanced economic growth and the transformation of a predominantly agrarian into an industrial Ethiopian economy, surplus production in the agricultural sector should be encouraged through capital intensive technologies, and practices. These include the provision of innovative technology, high-tech inputs (seedlings, machinery and fertilizers), better transportation, communications, storage or financial services in this sector.

5.2 Recommendations

This particular study explores significance of agriculture in Ethiopia. Based on findings of the study, the researcher forwards the following policy implications.

- For Ethiopia to achieve higher GDP growth rate, Ethiopia needs to stimulate the agricultural sector as it is the engine of growth and the sector has to be modernized for further growth like the provision of innovative technology.

- The peasant farmers who live in the rural areas and who are the major providers of food for the nation need to be adequately provided by making the rural areas more conducive and habitable by the provision of adequate infrastructural facilities such as good roads, pipe borne water and electricity. The provision of these facilities will no doubt impact positively on the rural farmers' productivity.
- Concerted effort has to be made by policy makers to increase the level of productivity and efficiency of agricultural sector in Ethiopia by improving policies aimed at the industry supporting the agriculture sector so as to boost the growth of the economy.
- Bottlenecks for the sector such as insufficient irrigation facilities, low supply of agricultural inputs, insufficient finance have to be solved so as to maximize the contribution from the sector.
- Government is advised to evolve policies toward diversifying the economy and encourages the campaign for improvements in the agricultural sector of the economy and needs to implement a strategy at promoting balanced economic growth among the economic sectors.

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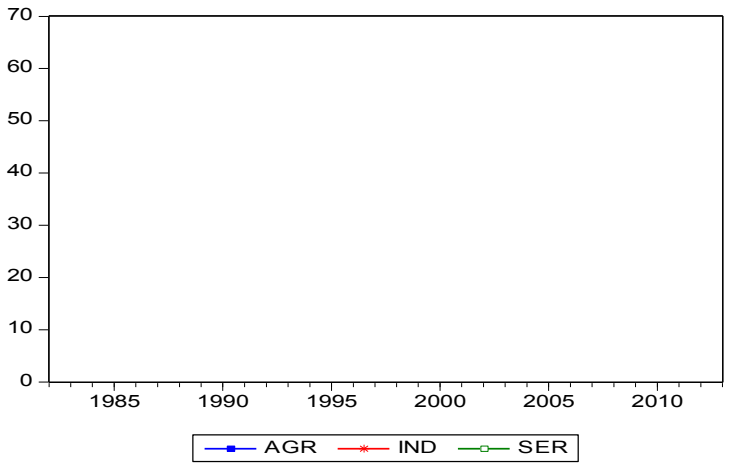
APPENDICES

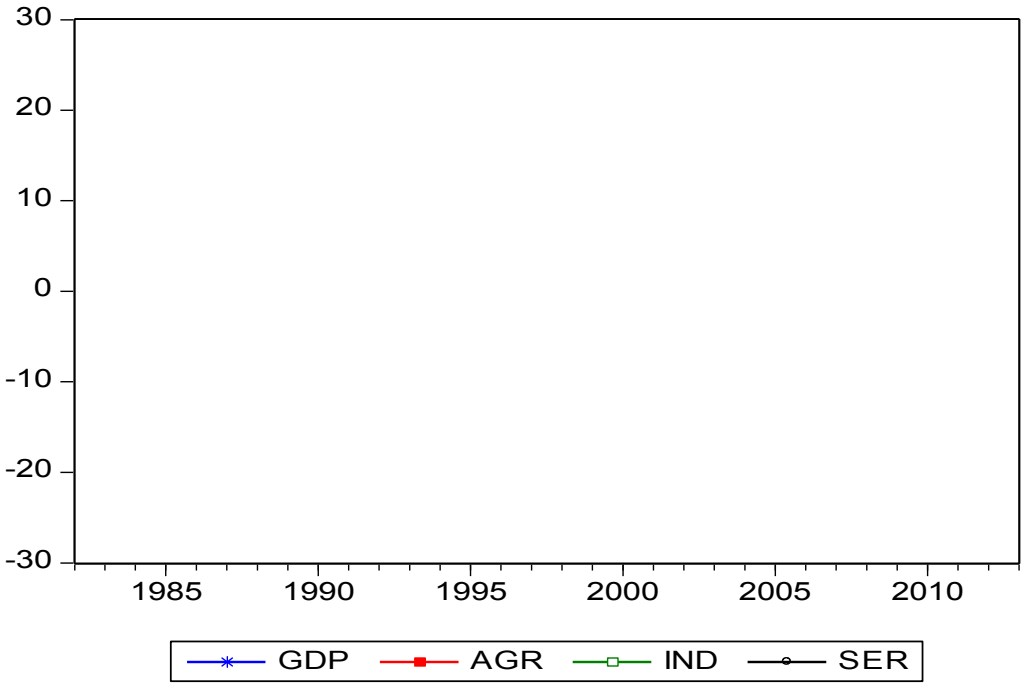
Appendix 1- Descriptive Statistics Results

Descriptive Statistics	LOG(GDP)	LOG(AGR)
Mean	22.98021	22.15121
Median	22.83961	22.07403
Maximum	24.04610	22.93450
Minimum	22.40714	21.52533
Std. Dev.	0.479674	0.374570
Skewness	0.851014	0.637895
Kurtosis	2.504056	2.397105
Jarque-Bera	4.190482	2.654833
Probability	0.123041	0.265161
Sum	735.3668	708.8386
Sum Sq. Dev.	7.132715	4.349394
Observations	32	32

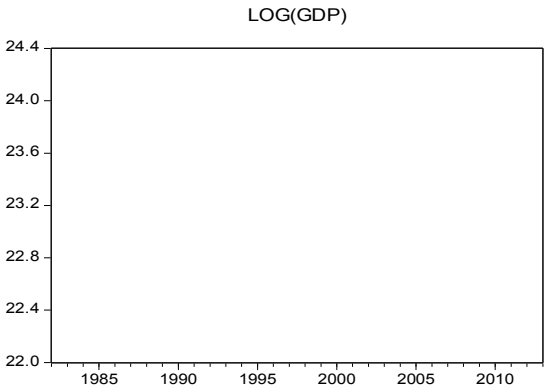
Appendix 2- Sectoral contributions to GDP

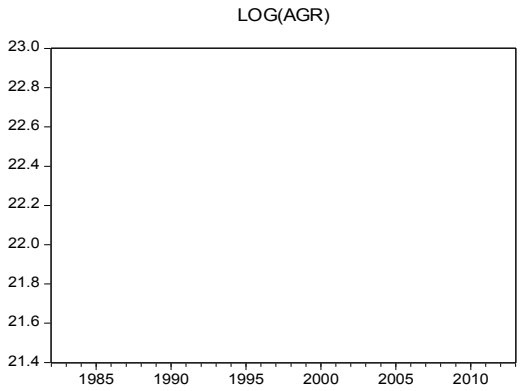


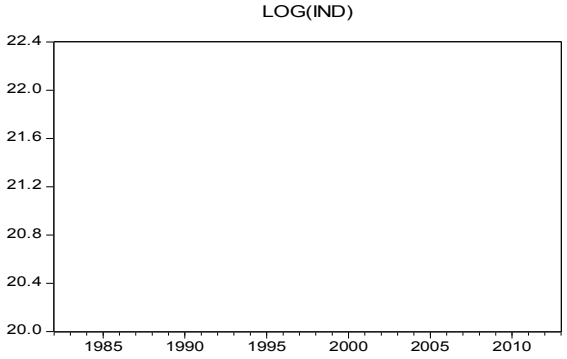
Appendix 3- Growth Rates of Economic Sectors and GDP Growth

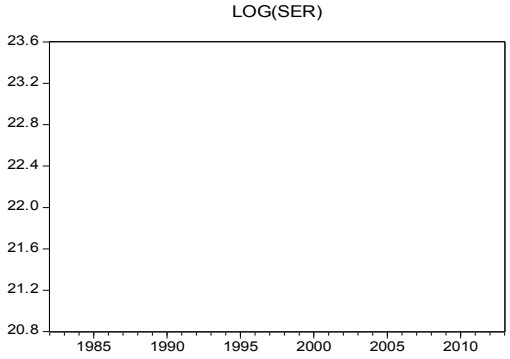


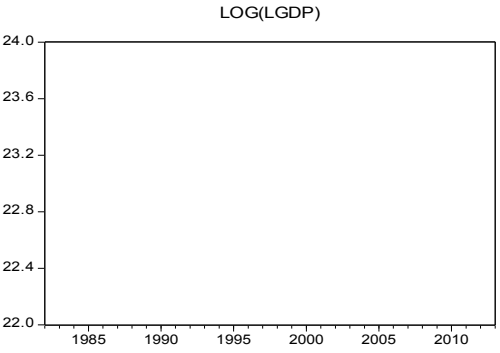
Appendix 4- Graphs of the Variables at Levels and First Differences.

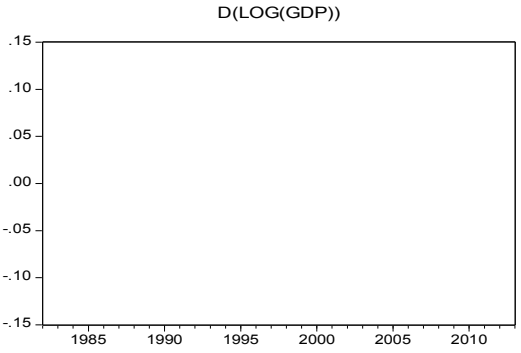

LOG(GDP)
24.4
24.0
23.6
23.2
22.8
22.4
22.0
1985
1990
1995
2000
2005
2010

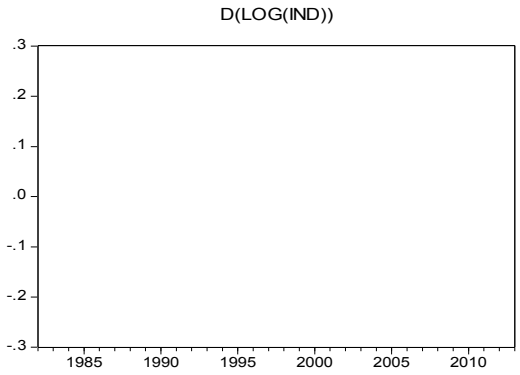

LOG(AGR)
23.0
22.8
22.6
22.4
22.2
22.0
21.8
21.6
21.4
1985
1990
1995
2000
2005
2010

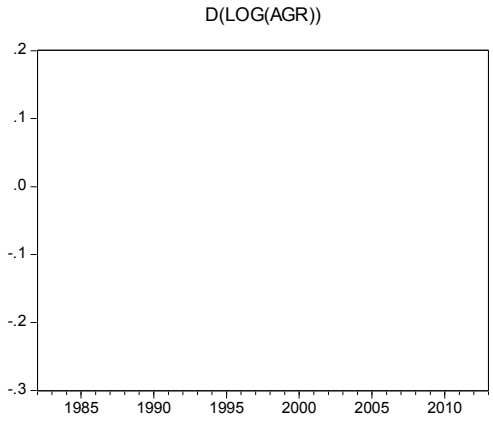

LOG(IND)
22.4
22.0
21.6
21.2
20.8
20.4
20.0
1985
1990
1995
2000
2005
2010

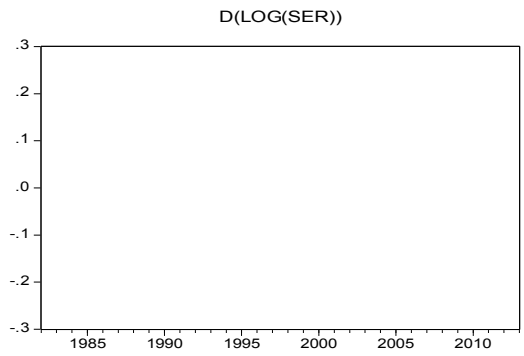

LOG(SER)
23.6
23.2
22.8
22.4
22.0
21.6
21.2
20.8
1985
1990
1995
2000
2005
2010

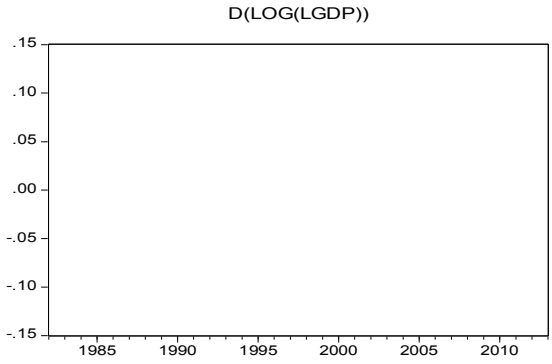

LOG(LGDP)
24.0
23.6
23.2
22.8
22.4
22.0
1985
1990
1995
2000
2005
2010


D(LOG(GDP))
.15
.10
.05
.00
-.05
-.10
-.15
1985
1990
1995
2000
2005
2010

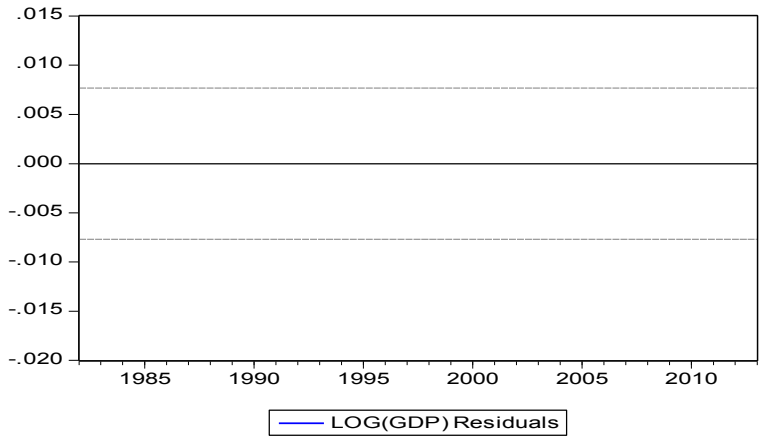








Appendix 5: Residual graph



6. Declaration

I, the undersigned, declare that this thesis is a result of my original research investigations and findings. Sources of information other than my own have been duly acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

Declared by:

Name: Demelash Eshetu

Signature: _____

Date: _____

Confirmed by Advisor:

Name S.V. Rao (PhD)

Signature _____

Date: _____

Place of submission: Adama Science and Technology University, June, 2015.