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ASSESSMENT OF PUBLIC EXPENDITURE AND ITS IMPACT ON AGRICULTURAL GROWTH IN ETHIOPIA

BY

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A research Thesis submitted to Addis Ababa University College of Business and Economics, School of Commerce, department of economics for a partial fulfillment of requirements for MASTER DEGREE IN DEVELOPMENT ECONOMICS.

Addis Ababa, Ethiopia

LETTER OF CERTIFICATION

I hereby certify that Eden Wondmagegne has carried out her project work on the topic of "Assessment of Public Expenditure and its Impact on Agricultural Growth in Ethiopia" under my supervision. This work is original, and it is suitable for Submission in partial fulfillment of the requirement for the award of a Master's Degree in Development Economics.

Dr. Sisay Debebe (Advisor) _____

Signature

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Date

Addis Ababa University

Addis Ababa

February, 2021

DECLARATION

I, the undersigned, declare that this Master's thesis paper, entitled "Assessment of public expenditure and its impact on agricultural growth in Ethiopia" is my original work, prepared under the guidance of Sisay Debebe (PhD). All sources of materials used for the thesis paper has not been submitted either in part or in full to any other high learning institution for earning degree.

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List of Acronyms

ADF	Augmented Dickey Fuller
AOI	Agricultural Orientation Index
ARDL	Auto-Regressive Distributed Lag
AU	African Union
CAADP	Comprehensive Africa Agricultural Development Programme
ECM	Error Correlation Model
EGM	Engle-Granger Model
EPRDF	Ethiopian People's Revolutionary Democratic Front
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
ICT	Information and Communications Technology
MoFED	Ministry of Finance and Economic Development
NBE	National Bank of Ethiopia
NPC	National Planning Commission
OLS	Ordinary Lease Square
ReSAKSS	Regional Strategic Analysis and Knowledge Support System
UNDP	United Nations Development Programme
3SLS	Three Stage Least Squares

ABSTRACT

This research deals with identifying those public expenditure factors affecting agricultural growth in Ethiopia. The study is based on a time series data of 38 years from 1980/81 to 2018/19. During this period, the country's economy has experienced both upswing and downswing in its agricultural sector. Government expenditure in different sectors including agriculture and its allied activities, education, health and roads construction is expected to promote agricultural growth. Here ARDL approach to co integration and an error correction representation of the ARDL model have been used due to certain advantages. The result of the Bounds test indicates the presence of a long-run co integrating relationship between the variables in the study. The results reveal that in the long-run, the effect of public expenditure through recurrent expenditure, on agricultural growth is significantly negative, while expenditure on education and health to enhance agricultural growth are significantly positive on the short-run that is in line with several earlier studies. Public expenditure in capital and roads construction to enhance agricultural growth is significantly negative in the short-run however public expenditure on capital, education, health, and roads construction to enhance agricultural growth do not significantly affect agricultural growth in the long-run. The discoveries reveal that prudent utilization of government expenditure cans possibly accelerate agricultural development and improve its efficiency.

Key words: *Non-agricultural public expenditure, Agricultural public expenditure, Agricultural growth, ARDL, Ethiopia*

Chapter One

1. Introduction

1.1 Background of the Study

In most African nations agriculture and poverty are closely related, as most of poor rely on agriculture for their livelihood. Public spending is a key instrument in advancing agricultural growth. The significance of agriculture for poverty reduction has been perceived by African leaders. CAADP has set an objective of accomplishing at least 6 percent annual growth rate in agriculture. In support of such targets, African leaders have signed the Maputo declaration requiring a 10 percent budget allocation to agriculture by 2008 as a major aspect of their responsibility to the CAADP objectives (ReSAKSS, 2008).

According to CAADP key commitments, in east Africa region the overall average score is 4.46 which indicates that region is on track in meeting the CAADP targets when assessed against the 3.94 benchmark for 2017. This score is based on national reports of the seven countries that submitted their reports. Among these seven countries, five are on track and these include Burundi, Ethiopia, Kenya, Uganda and Rwanda. But Djibouti and Sudan are not on track (AU, 2017).

Regarding the Commitment of allocating at least 10% of annual public expenditures to agriculture, member states have allocated public spending in agriculture at various rates but ranging from 1.2 % to 17.6 %. Only seven member states namely Malawi (17.6%), Ethiopia (16.8 %), Angola (14.8%), Sudan (13.4 %), Mali (12.4%), Senegal (11 %), Burkina (10.5 %) and Equatorial Guinea (10.5%) have met the expected target (AU, 2017).

Public expenditure patterns in Ethiopia since the origination of ADLI in 1993 only partially reflect the agricultural development direction of the government's strategy. While those sectors seen as critical to poverty reduction (agriculture, natural resource development, health, education, road infrastructure, etc.) have been absorbing an increasingly larger share of other spending, among these sectors, the extent of expenditure on agriculture first declined until 1996 and then respectably increased (Tewodaj et.al, 2006).

But agricultural growth has been persistently decreasing in Ethiopia; For instance, according to NPC (2019), the contribution of agriculture to value added fell from 64.30 percent in 1980/81 to 32.91 percent in 2018/19 while the contribution of the services sector increased from 27 to 39 percent during this time. On the other hand; the manufacturing sector continues to contribute a small share of GDP.

Furthermore, the food security circumstance in Ethiopia deteriorated sharply in 2017. The assessed food insecure population expanded from 5.6 million in December 2016 to 8.5 million in August 2017, with delayed dry spell, conflict and insecurity, and crop disease among the primary drivers (Thematic report, 2018).

Even if Ethiopia scores 5.3 out 10 and being on the track in implementing the Malabo declaration on agricultural transformation in Africa, since the benchmark is 3.94 which is the minimum overall score for a country to be on track in 2017, the Government should sustain public expenditure in agriculture sector above the CAADP target of 10% (AU, 2017).

Despite of agricultural public expenditure, the different kinds of public expenditure including spending on agricultural research and development (R&D), extension, education, health, and infrastructure lead to the advancement of public capital in related exercises, which thus influence agriculture productivity and production (ReSAKSS, 2008).

The composition of public expenditures in Ethiopia, in support of food and agriculture has been unequally balanced, with 70 percent allocated to agriculture-specific expenditures as opposed to 30 percent for agriculture-supportive spending (rural education, health and infrastructure) (FAO, 2014).

The portion of recurrent spending declined from 9.1 percent of GDP in 2007/08 to 7.5 percent in 2013/14, which is seen in spending in pro-poor sectors as well as other sectors. Regarding share in total expenditure, the recurrent spending for poverty sectors represented around one-fifth of total expenditure (or practically 50% of recurrent spending). In the poverty sectors, education has a relative stable share in percent of GDP averaging 2.4 percent per annum. In 2007/08-2012/13,

the average real growth of recurrent spending was only three percent while capital spending expanded by eight percent (World Bank, 2016).

In accordance with its overall development strategy objectives, Ethiopia is contributing intensely to decrease poverty and promote social development. The proportion of public spending on pro-poor sectors has expanded from 57 percent in 2004/05 to two-third in 2016/17. Among these sectors education and roads are main concern sectors, each getting more than one-fifth of the government total budget. Ethiopia needs to continue this attention on poverty while guaranteeing the productivity of asset usage and its adequacy in having the essential effect. An appropriate balance ought to likewise be kept up among recurrent and capital spending (UNDP, 2018).

To this effect, the study examined which components of public expenditure have significant contribution to agricultural growth in Ethiopia. The objective of this paper is to assess the impact of public expenditure on agricultural growth, using an alternative and flexible theoretical framework and methods of analysis.

1.2. Statement of the Problem

An administration could build the public expenditure by an enormous sum however this doesn't imply that it would have a viable outcome on economic and social turn of events; the nature of this spending likewise matters (Lenorado, 2011).

Public expenditure affects rural poverty through numerous channels, For instance, public expenditure in agricultural research, rural education, and infrastructure increases agricultural productivity, which directly increases farmers' incomes and in turn reduces rural poverty (Fan et.al, 2008).

Since, public spending is a key instrument in advancing agricultural growth, in this way, monitoring agriculture spending is essential. Agricultural growth additionally relies on non-agriculture expenditures such as in rural infrastructure, health and education. It is important to screen spending in these sectors as well (ReSAKSS, 2008).

Moreover, there is an argument that the allocation of public resources (10%) to agriculture does not necessarily compare to effectiveness in expenditure. Evidence suggests that investment in

public goods is the significant driver of agricultural growth, competitiveness and poverty reduction (Meebelo, 2019).

Therefore, it's necessary to conceptualize the link between the public spending decision and agricultural production decision as: direct, where public spending affects factor productivity; and indirect, where public spending affects the use and amount of factors and inputs (or factor accumulation). For instance, public expenditure on research, extension and education prompting enhancements in the supply of modern technologies, knowledge and human capital would be expected to raise productivity of all factors of production. Also, public expenditure on infrastructure would also be expected to greater factor accumulation as well as higher value of production. Public expenditure on the transport sector can likewise have other multiplier impact where it improves access to education, health, and other production support services (Samuel et.al, 2009).

A large portion of past researches on the effect of public expenditure on economic growth in Ethiopia frequently centered on the education, public health, defense, industrial and agricultural sectors at aggregate level. This research seeking to find the composition of public expenditure that maximizes the rate of agricultural growth recognizes parts of government that in general slow the agricultural growth.

Thus, the composition of expenditure on agriculture matters as much as the amount actually spent on the sector. Investments in different functions of the government can lead to very different outcomes (Helder et.al, 2011). In fact, studies by Fan et.al (2004), Utpal and Dahun (2018) suggested that government spending on rural roads (transport) and education has a large impact on growth in agricultural productivity or a reduction in rural poverty. Public expenditure in healthcare however does not significantly affect agricultural output or a reduction in rural poverty.

Research outputs often conflict with one another on some issues. For instance, Fan et.al (2004) has identified agricultural research and extension (part of agricultural expenditure) improved agricultural production considerably. This type of expenditure had the biggest estimated returns to growth in agricultural production. But, Utpal and Dahun (2018) revealed that public expenditure through agriculture and allied activities, on agricultural output is significantly

negative. Another research which was conducted by Samuel et.al (2009) on the impact of public expenditure on agricultural productivity identified formal education was negatively associated with agricultural productivity.

Besides, a research which was conducted by Manyise et.al (2015) showed that agricultural capital expenditure had positive impacts, but recurrent expenditure has been found to be adversely connected with agricultural gross domestic product. However, current expenditure was found to be growth impeding for the agricultural sector if its increase is at the expense of capital expenditure. Purokayo and Umaru (2012) found similar results which point out that output of agriculture is positively related to capital expenditure on the sector. An appropriate balance should also be maintained between recurrent and capital expenditure.

According to Teshome (1992), changes in the level and structure of government expenditures in Ethiopia influence agricultural expenditures and can be estimated from various perspectives. One of the most common measurements is the allocation of agricultural expenditure between capital and recurrent expenditures. Factor identifies with the structure of capital expenditure which influences agricultural productivity and has significant economic growth implications. Higher current expenditures at the expense of capital goods and services which is viewed as counterproductive and growth impeding. Therefore, it is the composition rather than the level which is important.

Even though there are researchers, who have studies on impact of public expenditures on economic growth in Ethiopia, most of them were interested to functional (sectorial) classification of public expenditure. Though these studies identified public expenditure on agriculture is negatively correlated to growth or statically insignificant (see Bazezew 2014, Wendwesen 2012, Melesse et.al 2014).

Empirical studies carried out in this area reached at different and often conflicting conclusions. There is no universal agreement on which composition of the expenditure has direct effect on growth. There is little research that provides guidance to public investment in Ethiopia which based on either the effect of changes in overall public expenditure, or else is concentrated on how sectorial public spending affects economic growth.

As I have tried to describe above, there have been researches done in Ethiopia to show the effect of components of government expenditure on economic growth. Apart from academic researches on public expenditure, a range of policy, reports and review papers produced by international organizations (e.g. World Bank 2008 and 2016, FAO 2014), the academic researchers have not carried out researches that combines recurrent agricultural expenditure, capital agricultural expenditure and non-agricultural expenditures to carry out their impact on agricultural growth in Ethiopia.

Coincident with the above fact, the distinct feature of this study is that it tries to include dis-aggregated data of agricultural expenditure and non-agricultural expenditure data. Moreover, this study attempts to examine the impacts of recently growing government agricultural and non-agricultural spending on agricultural growth and their long run relationship by using recent data sets and set out to investigate and fill the gap in the literature on the effect of public expenditure components like recurrent agricultural expenditure, capital agricultural expenditure and non-agricultural expenditures (education, health and roads construction) on agricultural growth in Ethiopia.

1.3. Research Questions

Based on the aforementioned facts, the researcher attempts to answer the following questions:

i. What is the impact of agricultural public expenditures (recurrent and capital) on agricultural growth in Ethiopia?
ii. What is the impact of agricultural supportive expenditures (educational, health and roads construction expenditures) on agricultural growth in Ethiopia?

1.4. Objective of the Study

The primary objective of this thesis is to analyze recent fiscal development in Ethiopia within the context of public expenditure identifying the relationship between agricultural growth and public investment on pro-poor sectors. More specifically the study has the following objectives to:

i. Investigate the impact of agricultural public expenditures (recurrent and capital) on agricultural growth in Ethiopia.
ii. Investigate the impact of public expenditure on education on agricultural growth in Ethiopia.
iii. Find out the impact of public expenditure on health on agricultural growth in Ethiopia.
iv. Investigate the impact of government expenditure on roads construction on agricultural growth in Ethiopia.

1.5. Scope and Limitation of the Study

Multidimensional factors affect agricultural growth and there are multidimensional approaches that lead to agricultural growth. One of the ways to accomplish this goal is agricultural and non-agricultural public expenditures. This paper focused on the impacts of agricultural government expenditures and non-agricultural public expenditures such as education, health and roads construction on agricultural growth of Ethiopia during 1980/81-2018/19.

Due to the current Coronavirus pandemic social distancing practices was enforced and this meant field research originally being conducted face-to-face, had to be transferred to online platforms such as organizations websites and email address. Thus, the researcher was forced to communicate with the organizations through their email address but this made it hard for the researcher to gather information and data because most of the e-mail address did not work and also their response was not prompt. In addition to this, the researcher intended to segregate the agricultural data in accordance to expenditure on research, extension, irrigation and input subside etc. but due to the lack of response and data from the organizations the researcher could not segregate the data accordingly. Therefore, the researcher followed a remedy to segregate the data according to the economical classification of agricultural expenditures and was able to collect the data from MoFED.

1.6. Significance of the Study

One of the significant points of interest of this study is that it integrates the most recent data and employs both qualitative analysis and a more advanced econometric technique to consider the impact of agricultural government spending and non-agricultural government spending on

agricultural growth. In this manner, the prompt result of this study might give appropriate outcome and policy implication to policy-makers by bridging the aforementioned gap.

Finally, it might be helpful for other researchers who work related to this area that would forward valuable ideas that enhance agricultural growth, food security and poverty reduction in Ethiopia.

1.7. Organization of the Study

The first chapter deals with general introduction and it introduced the problem in the context against related and theoretical backgrounds. The aim, research questions, objectives, scope and limitation, significance and organization of the study are presented. In chapter two previous researches that had been done in the area of the impact public expenditure on economic growth and agricultural growth are rigorously investigated and properly reviewed. Chapter three covers methods and methodologies to estimate components of public expenditure that affects agricultural growth in Ethiopia and contain a conceptual framework for this study. Chapter four presents data analysis in impact of public expenditure on agricultural growth in Ethiopia. In chapter five summary, conclusions, and recommendations are presented.

Chapter Two

Literature Review

2. Introduction

In this chapter theoretical and empirical literature on impact of public expenditure on economic growth and agricultural growth is briefly reviewed. The chapter is divided into four sections. The first section (2.1) deals with definitions of basic concepts and terms. The second section (2.2) looks at theoretical literature relevant to the current study while the last section (2.3) looks into empirical literature or empirical findings which are relevant for the current study.

2.1. Definition of Basic Terms and Concepts

Expense brought about by the public central authorities, state and local self-governments are called public expenditure. Such expenditures are made for the support of the legislatures just as to assist the public as entirety. In this manner, public expenditure has both monetary and social targets. It is important to guarantee that the administrator's use is made exclusively in the open intrigue and doesn't serve any person's advantage or that of any ideological group or a gathering of people (Gaurav, 2011).

Government expenditure (like use by private sector firms) can be arranged into either current expenditure or capital expenditure. Economic Classification of expenditure which aims to provide elements to assess the economic effect of transactions in the public sector. It is clustered in two types of outlays:

i. Current expenditure is use on factors of productions, for example: salaries, miscellaneous expenses, travelling, entertainment, etc. Current spending is short-term and has to be renewed every year, and it is at times known as recurrent expenditures.
ii. On the opposite side we have capital consumption; it is otherwise called development expenditure. This kind of investment is generally on physical resources models such as roads, bridges, hospital buildings and in some cases equipment. The impact of capital use can last as long as one year before deterioration happens. It can possibly build the GDP growth of the economy over the long run subsequently prompting continues development (Valery, 2018).

Recurrent expenditures are more effective for counter-cyclical stimulus than capital expenditures since they can be handled easily. On the other, hand overseeing capital expenditures are somewhat difficult in view of their tendency of setting aside some effort to start just as requiring more time to discontinue if an economy were to begin once again warming. Along these lines capital expenditures are more effective in raising the growth capability of an economy though current expenditures are more qualified in tending to shortfalls in demand that hold back realizing such a potential (John, 2003).

Government expenditure on agriculture can be considered either as an input of the production function or as affecting the relationship of the other inputs with agricultural output (Walter et.al, 2004).

Public expenditures that add to the agricultural sector improvement by supporting rural areas are thus classified as agriculture-supportive expenditures. This grasps health and education in rural areas but also rural roads, hydraulic infrastructures, and energy plants (FAO, 2014).

The principal reason for public expenditure is to advance quick economic development. Economic development is respected interchangeable with industrial advancement however agrarian advancement gives the base and must be given top need. Government needs to acquire part of use in the agricultural area, e.g., on water system and power, seed farms, manure industrial facilities, distribution centers, and so forth (Aarcha, 2020).

Government expenditure is expected to be a method for decreasing the negative effects of market failure on the economy. But, distributions of public expenditure with absence of attention for the earnest needs of the nation may endanger greater distortion in the economy which may be detrimental to growth. Economic growth is expected to bring about a better standard of living of the nation through arrangement of better infrastructure, health, housing, education services and improvement in agrarian productivity and nourishment (food) security (Loto, 2012).

Economic theory doesn’t naturally create solid decision about the effect of government spending on economic performance. In reality, there are conditions in which lower level of government spending would upgrade economic growth and different conditions in which more significant levels of government spending would be attractive (Teshome, 2006).

2.2. Theoretical Literature

There are different theories of public expenditure that suggest economic growth is the end product of prudent management of scarce financial resources. Some of the acceptable public expenditure theories are:

2.2.1. The Keynesian theory

Keynesian economics is an economic theory of all out spending in the economy and its consequences for yield and expansion. As per Keynes' hypothesis of financial boost, an infusion of government spending in the end prompts included business movement and much additionally spending. This hypothesis recommends that spending helps total yield and creates more income. In the event that laborers are happy to spend their additional salary, the subsequent development in the total national output (GDP) could be significantly more noteworthy than the underlying improvement sum (John et.al, 2013).

The classical economists whose thoughts and convictions are the bases for the neo-classical way to deal with public policy had the unwavering faith in the capability of market to create efficient outcomes as far as the utilization and distribution of productive resources are concerned. While fluctuations in the economic activity were not precluded yet they would be tended to by the forces of self-correction activated by the economy itself. Consequently, endeavor to intercede would add up to infusing the sources of instability (Khan, Mohd and Aziz, Ghazala, 2011).

Neo-classical school concurs with the Keynesian school on the presence of the connection between government spending and economic growth, but contradicting it toward this relationship. While the Keynesian contend that the effect of government expenditure on economic growth is positive, the allies of the neoclassical school recommend that the connection between the two is negative (Mohammed and Suraya, 2019).

2.2.2. Musgrave and Rostow's Development Model

The economic expert, Musgrave, and the economic antiquarian, Rostow, (independently) proposed that the development of public expenditure may be identified with the outline of economic growth and improvement in social orders (Adina and Plesea, 2010). Three phases in the advancement procedure could be recognized:

i. The early advancement stage where impressive expenditure is required on education and on the infrastructure of the economy (otherwise called social overhead capital) and where private saving is deficient to back this fundamental use (in this stage, government use should hence be a high extent of all out yield);
ii. The period of quick development wherein there are enormous increments in private saving and open venture falls proportionately; and
iii. High income social orders with expanded interest for private products which need correlative public investment (for example the engine vehicle and urbanization).The expanding need in high pay social orders for talented work drives instruction to turn out to be progressively a venture useful for society overall. Expanded populace developments lead to the advancement of urban ghettos. Such factors and others lead by and by to an expansion in public expenditure corresponding to add up to yield. These perspectives are intriguing corresponding to hypotheses of development and improvement however are fairly too broad to even consider providing a very remarkable manual for ongoing involvement with developed industrial countries.

2.2.3. Wagner's Law

In 1883, Adolph Wagner, a German social researcher, set forward a thought which got known as Wagner's law of expanded government action. It says, there would be an inescapable increment in the portion of government expenditure in all out yield, in spite of the fact that he recognized a few cutoff points to this expansion. Basically, he was contending that an extending government would essentially go with social advancement and rising incomes (Kanono and Sello, 2016).

The essential reactions of Wagner's law have concerned his perspective on history and of the connection between the state and its residents. Peacock and Wiseman additionally questioned whether Wagner's thoughts could be applied to all social orders consistently and recommended that the time example of real public expenditure development didn't fit well with Wagner's law.

2.2.4. Wiseman and Peacock hypothesis

As indicated by Wiseman and Peacock, (1961) the development of public expenditure doesn't increment in a smooth and persistent way. The expansion of public expenditure after some time as happened in rascals or step-like way. At the point when social orders are not being exposed to

bizarre weights, individuals' thoughts regarding passable weights of tax assessment, converted into thoughts of sensible expense rates, tend likewise to be genuinely steady. Fixed, assuming low, paces of tax collection are clearly good with developing public expenditure if genuine yield is developing, so that there might be some association between the rate of growth of genuine yield and the rate of growth of public expenditure. Significantly more quick rate of expenditure growth are impossible; in settled occasions, thoughts about tax collection are probably going to be more compelling than thoughts regarding attractive increments in expenditure in choosing the size and rate of growth of the public sector.

2.2.5. Harrod-Domar Growth model

The model stresses the dual role of capital. It holds that capital can make beneficial productive capacity as well as effective demand. The model is an endeavor to determine how much national income relies upon capital and labor for example Y = f (K, L). While labor is abundant in developing countries, capital is scant. Consequently, capital is a constraining element to growth which could be sourced locally or from abroad. A decrease in the rate of growth of capital formation will be related with a decrease in total yield is an overall understanding, since it relies upon both capital and the degree of its use (Oga, 2016).

2.3. Empirical Literature Review

There have been numerous studies on the role of government spending in the long-term growth of national economies and agricultural growth.

Samuel et.al, (2009) gave exact proof on the agricultural productivity returns to various sorts of public expenditure across different agro ecological zones of Ghana. They concentrated on various district and regional level public goods and services expenditures (agricultural expenditures and non-agricultural expenditures such as education, health and feeder roads) and household level production data over the period from 2001 to 2006. A three-stage least squares (3SLS) econometric approach was applied to simultaneous-equations approach in this examination. The discoveries demonstrated that expenditures on agriculture, rural roads and health to be positive and statistically significant effect on agricultural growth. Formal education is negatively related to agricultural growth although insignificant.

Utpal and Dahun (2018) examined the short and long run relationship between government expenditure on agriculture and its allied sector and agricultural output of Meghalaya. The investigation depends on a period arrangement data of 30 years from 1984-85 to 2013-14. During this period, the state economy has encountered both rise and downswing in its agricultural sector. Government consumption in various segments counting agriculture and its partnered exercises, education, transport, and so on is expected to advance agricultural production. Here ARDL ways to deal with co-integration and error correction representation of the ARDL model have been utilized because of specific favorable circumstances. The consequence of the Bounds test demonstrates the presence of a long-run co-integrating the connection between the factors in the examination. The outcome reveal that in the long run, the impact of public expenditure through agriculture and unified exercises (forestry, dairy and irrigation), on agrarian yield is significantly negative, while expenditures on education furthermore, transport on agricultural output are significantly positive that is in accordance with a few prior investigations. Public expenditure in healthcare however doesn't fundamentally influence agrarian yield.

Abel et.al (2019), investigated public expenditure and their relationship with economic growth in Ghana from 1980-2017. It considered the major sub-components under recurrent expenditure (thus interest-payment and non-interest recurrent expenditure) and the entire capital expenditure. They employed a Stock-Watson Dynamic OLS estimation to analyze the government expenditure-economic growth relationship. The results from the estimation confirm capital expenditure as a growth-enhancing variable while non-interest and interest-payments recurrent expenditures are detrimental to the growth of the economy.

Switching to the sub-components of recurrent expenditure, the non-interest recurrent expenditure revealed that the variable is statistically significant and has a negative sign. Interest-Payment, another sub-component of the recurrent expenditure is also considered as one of the main variables of interest in this study. The coefficient for interest-payment revealed that its sign is negative and in line with the a priori expectation and statistically significant. The coefficient of real effective exchange rate is found to be negative which is contrary to a priori expectation and significant. The estimated coefficient for domestic credit from banks is also significant and has a positive sign.

Okezie et.al (2013) using a time series data from 1980 to 2011 made an assessment of Nigeria expenditure on the agricultural sector. It employs the Engle-Granger two step modeling (EGM) procedure to co-integration based on unrestricted Error Correction Model and Pair wise Granger Causality tests. The assessment indicated that the causality between total government expenditure on agriculture and agricultural output is negative and statistically significant.

Manyise et.al (2015) compared the impact of public expenditure on agricultural growth in South Africa and Zimbabwe based on the error correction model approach. Time series data from 1981 to 2006 was used for Zimbabwe, while data from 1983 to 2011 was used for South Africa. Capital expenditure on agriculture shows a positive relationship with agricultural gross domestic product for both countries. Recurrent expenditure has been found to be negatively associated with agricultural gross domestic product for both Zimbabwe and South Africa. Non-agricultural expenditure had a positive relationship with agricultural gross domestic product for South Africa but negative for Zimbabwe.

Suleiman and Aminu (2012) assessed the impact of capital expenditure on agriculture and credit to agricultural sector on the output of agriculture in Nigeria. In the econometric investigation exertion has been made to see the effect of capital expenditure on agriculture and credit on the growth of agriculture for the period 1990- 2004, utilizing Augmented Dickey-Fuller (ADF) Technique to verify the unit root property of the series. It is discovered that capital expenditure has a long-run significant positive effect on the growth of agriculture while, long-run negative effect of credit to agriculture on the output of agriculture.

Bazezew (2014) utilized a multivariate co-integration and error correction model to examine the marginal effect of expenditure to see the growth impact of government sectorial expenditure over the period from 1975 to 2013, with a specific spotlight on sectorial expenditure on education, health, agriculture and defense. The examination found that government spending on education positively affects economic growth over the long run yet an insignificant effect in the short-run. Spending on defense has a negative and insignificant effect on economic growth both over the long-run and in the short-run. Government spending on agriculture is negatively correlated to growth over the long run however is insignificant in the short-run. Spending on health and the impact of consumer price index is seen as irrelevant both over the long-run and the short-run. In

this way, the outcomes propose that the assignment of government expenditure towards the education sector ought to be supported so as to upgrade maintainable economic growth.

Wendwesen (2012) attempted to quantify the impacts of sectorial public spending – human capital and agriculture, on economic growth; utilizing yearly informational index on GDP and government expenditure for the period 1960/61-2010/11. The investigation utilizes co-integration and error-correction model to inspect the short and long run correlation among GDP and government sectorial spending (human capital and agriculture). It is discovered that education sector expenditure has both short-run and long-run statistically positive-significant effect on growth while health sector spending has negative insignificant relation. Concerning agriculture, the outcome shows that it has negative relationship with growth. The relationship of road sector spending was found to be positive and insignificant. Non-poverty sectors spending, has insignificant negative relationship with economic growth. The outcome additionally found the presence of long-run connection between the segments of government spending and economic growth.

Review of earlier works on the growth and functional (sectorial) classification of public expenditure. There are no sufficient studies pertaining to economic classification of public expenditure studying and growth at agricultural sector in Ethiopia. With government spending still on the rise in many economies, on the one hand, and declining economic growth rates in these economies, on the other, the debate on whether government spending has a positive, negative or neutral impact on economic growth is still raging today, but most of these studies use functional classification of expenditure data. The distinct feature of this study is that it uses economic classification of expenditure and recent data to analyze the effect of public expenditure on agricultural growth in Ethiopia and tries to include non-agricultural public expenditures (agricultural supportive public expenditures).

Table 1: Summary of the Various Empirical Studies and Results

Author(s)	**Sample and method**	**Explanatory variables**	**Main Results**
Samuel et.al (2009)	Ghana, data's from 2001 to 2006, three-stage least squares approach	Public expenditure on agriculture, education, health and rural road	Public expenditure on agriculture= positive and significant Public expenditure on education=negative and significant Public expenditure on health and rural roads=positive and significant
Utpal and Dahun (2018)	Meghalaya, Time series data, 1984-85 to 2013-14, ARDL approach, error correction and Bound test	Agriexp, Edu, Health, Rudev and Trans	Agriexp= significant and negative Health=positive and insignificant Edu, Rudev and Trans= significant and positive effect on agriculture output.
Abel et.al (2019)	Ghana, Time series, 1980-2017, Stock-Watson Dynamic OLS estimation	CAPEX, LNREX,LINTX, INF, REER and DCB	Capital expenditure=positive and significant Non-interest recurrent expenditure=negative and significant Interest-payment recurrent expenditure=negative and significant Inflation= negative and insignificant real effective exchange rate=negative and significant Domestic credit from banks=positive and significant
Okezie et.al (2013)	Nigeria, Time series, 1980 to 2011, Engle-Granger two step modeling, unrestricted Error Correction Model and	TGA (natural log of total government expenditure on agriculture)	TGA= negative and significant

	Granger Causality tests		
Manyise et.al (2015)	South Africa and Zimbabwe, Time series, 1981 to 2006 (Zimbabwe) and 1983 to 2011 (South Africa), Error correction model approach	Capital expenditure on agriculture, recurrent expenditure on agriculture and non-agricultural expenditure	Capital expenditure-=positive and significant for both countries Recurrent expenditure=negative and significant for both countries Non-agricultural expenditure= positive and significant for south Africa, negative and significant for Zimbabwe
Suleiman and Aminu (2012)	Nigeria ,Time series, 1990-2004,Augmented Dickey-Fuller (ADF) Technique	capital expenditure on agricultural sector (CEA) and credit on agricultural sector (CAG)	CEA= positive and significant CAG= negative and significant
Bazezew (2014)	Ethiopia, Time series,1975 to 2013,multivariate co-integration and error correction model	TEXPEDU, TEXPHE, TEXPAGRI, EXPDEF, CPI	Education=positive and significant, but insignificant (SR) Defense=negative and significant Agriculture=negative and significant but insignificant(SR) Health=negative and insignificant Consumer price index=negative and insignificant
Wendwesen (2012)	Ethiopia, Time series, 1960/61-2010/11, OLS regression analysis	Ed,He,Ag,Rd and Np	Education=positive and significant Health=negative and insignificant Agriculture=negative and insignificant Road sector=positive and insignificant Non-poverty sector=negative and insignificant

Chapter Three

Research Methodology

3. Introduction

This chapter starts by specifying the model and the methodology to examine the relationship between government recurrent and capital expenditures on agriculture and non-agricultural expenditures with agricultural growth in Ethiopia. It is followed by an explanation of sources of the data, variables used, and the diagnostic tests that are employed in the study.

3.1. Data Types and Sources

The study aims at establishing the impact of economic classification of agricultural public expenditures and agricultural supportive expenditures on agricultural growth in Ethiopia. The study intends to use secondary time series data collected from three sources for the period from 1980/81-2018/19. Public agricultural spending, public investment in education, health and roads construction are national-level expenditures data. Hence, the data for total and segregate government expenditures on agriculture and non-agricultural expenditures were obtained from Ministry of Finance and Economic Development (MoFED), National Bank of Ethiopia (NBE) and the data of GDP by economic activities from National Planning Commission (NPC). The reason for the use of 1980 as a cutoff point is because it is only starting from this year that consistent data could be found in the Ministry of Finance and Economic development (MoFED) and National Bank of Ethiopia (NBE) for most variables used in this particular study.

3.2. Method of Data Analysis

This study utilized both descriptive and econometric data analysis methods such as the augmented dickey fuller, ARDL bounds test for co-integration test, Autoregressive Distributed Lag (ARDL) approach and Granger causality to analyze the long run and the short run dynamics of the model. Also, this study takes agricultural GDP as a proxy for growth of the sector as applied in various public expenditure impact studies.

3.3. Model Specification

From the foregoing discussion, the economic classification of government expenditure is an important determinant of growth. The specification of the model is based on the empirical literatures of Tajudeen and Ismail (2013). Although this model is adjusted in line with the objectives of this paper to fit the context of government recurrent and capital expenditure on agriculture and agricultural supportive public expenditures.

Thus, the model expresses Agricultural economic growth (GDP) as a function of various components of government expenditure that include: government recurrent and capital expenditures on agriculture and agricultural supportive expenditures.

$\mathrm{RAGDP} = \mathrm{f}(\mathrm{ARE}, \mathrm{ACE}, \mathrm{EDU}, \mathrm{HEALTH}, \mathrm{ROADS}, \mathrm{e})_t$ ..... Eq (1)

RAGDP= Agricultural Gross Domestic Product growth rate

ARE = Government recurrent expenditures on agriculture

ACE = Government capital expenditures on agriculture

EDU= Government expenditures for education

HEALTH= Government expenditures for health

ROADS=Government expenditures for roads construction e = error term

Government recurrent and capital expenditure on agriculture regressed against agricultural Gross Domestic Product growth rate (RAGDP). Log transformation makes the relationship among dependent and independent variables more linear and essential for easy interpretation of the slope parameters (Endaylalu, 2019). So, we need to have log transformation and the transformed model would be;

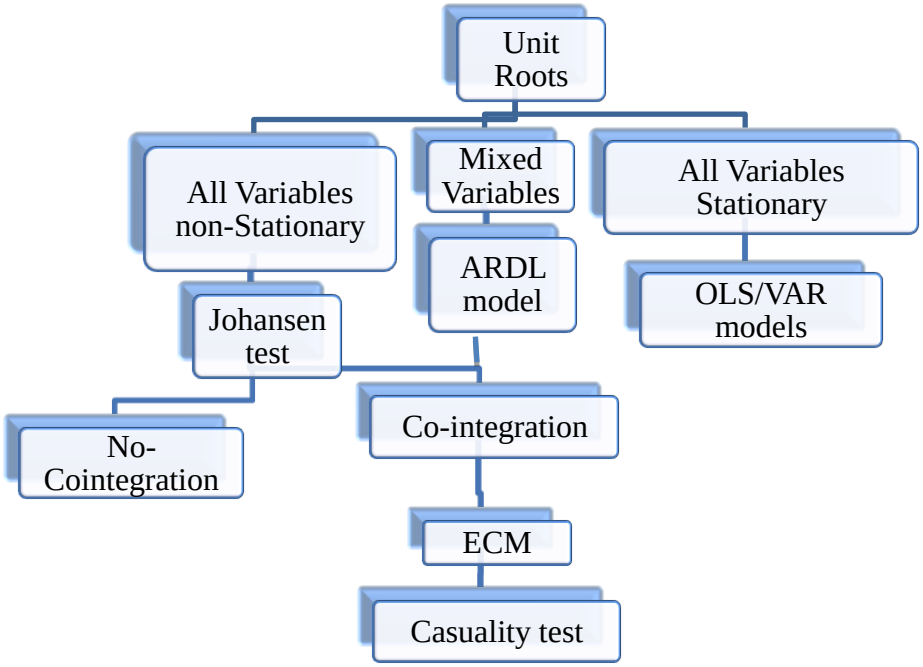
$$\mathrm{RlnAGDP}_t = \alpha + \beta_0 \mathrm{lnARE}_{t-k} + \beta_1 \mathrm{lnACAE}_{t-k} + \beta_2 \mathrm{lnEDU}_{t-k} + \beta_3 \mathrm{lnHEALTH}_{t-k} + \beta_4 \mathrm{lnROADS}_{t-k} + e_t \text{.....Eq (2)}$$

Now, equation (2) becomes simpler for interpretation as well as better in describing the linear relationship between variables.

Prior to estimation of the model above, standard econometric tests like stationarity and co-integration tests are conducted in order to avoid the generation of spurious regression results. Also employ ARDL approach to analyze both the short and long run impact of government economic expenditures on agricultural growth, since ARDL approach can be applied without taking into account whether the explained variables are I(1) or I(0). Also, ARDL approach allows estimation of different variables with dissimilar optimal number of lags.

Applying appropriate methodology for the time series data is most crucial part of the time series analysis as wrong specification of the model or using wrong method provides biased and unreliable estimates. Following is a general methodological framework for time series analysis.

Figure 1: Method selection for time series data



Source: Min and Guna, (2018)

3.4. Definition and Measurement of Variables

Excluding the error term, the research has six variables, one dependent variable and five independent variables.

i. Dependent variable

Agricultural Gross Domestic Product growth rate: it is the value of currently produced goods measured at constant price (Seida, 2016).Thus, this paper uses the agricultural GDP growth rate as the measure of agricultural growth in this study (Imo et.al, 2012), therefore:

$$\mathrm{AGDPGR}_n=(\mathrm{AGDPGR}_{n2}-\mathrm{AGDPGR}_{n1})/\ \mathrm{AGDPGR}_{n1}$$

ii. Independent variables

Government recurrent expenditures on agriculture: This is the share of expenditures consists of expenditures items, which are recurring in the process of delivering government economic and social services. Wages and salaries, operation and maintenance, pension and price subsidies, and debt servicing are among the major components of recurrent expenditures (Seida, 2016). In this paper, government recurrent expenditures on agriculture rate would be proxy by total government recurrent expenditures divided by agricultural gross domestic product (Imo et.al, 2012). The rate indicates a reflection of government recurrent expenditures on agriculture that goes into enhancing agricultural growth in Ethiopia.

Government capital expenditures on agriculture: refers to those expenditures which results in creation of fixed assets. They are in the form of investment. They add to the net productive assets of the economy. Capital expenditures are also known as development expenditures as it increases the productive capacity of the economy. It is investment expenditure and a non-recurring type of expenditure (Seida, 2016). In this paper, government capital expenditures on agriculture rate would be proxy by total government capital expenditures divided by agricultural gross domestic product (Imo et.al, 2012). The rate indicates a reflection of government capital expenditures on agriculture that goes into enhancing agricultural growth in Ethiopia.

Non-Agricultural public expenditures: refers to expenditures which are agricultural supportive. In this paper, agricultural supportive expenditures (education, health and roads construction) rate is represented by total educational, health and roads construction public expenditures divided by agricultural growth domestic product respectively (Imo et.al, 2012). The rate indicates a reflection of non-agricultural public expenditures that goes into enhancing agricultural growth in Ethiopia.

3.5. Conceptual Framework of the Study

Based on the literature review five independent variables are developed and presented. As the paper focus on how the allocation of different types of public expenditure to stimulate agricultural growth, the study conceptualizes it around two fundamental issues: agricultural public expenditures and agricultural-supportive public expenditures.

Agricultural public expenditures: all public expenditure quantifies that create financial transfers to agricultural agents (producers, consumers, input suppliers, trades, processors and transporters) or the sector as a whole (e.g. in form of research, extension services etc.) (FAO, 2013).

Agriculture-supportive expenditures: public expenditure quantifies that are not strictly specific to agriculture sector, but that have strong impact on agricultural sector development, such as rural education, rural health or rural infrastructure (FAO, 2013).

In a study by Hassen et.al (2019) on accessibility of rural public infrastructures (road, health centers, education centers, ICT, protected water sources, agricultural extension services, electricity, and irrigation) and food security among rural households in Kersa district, south western Ethiopia, the result of the study depicted evidence of an accessibility of public infrastructures and food security are directly related with each other.

Agriculture expenditure included capital and recurrent annual budget allocations to the agricultural sector as recommended by the IMF's internationally recognized classification of functions of government (Manyise et.al, 2015).

The literature, including those reviewed above, shows that agricultural growth is influenced by several variables. They include: recurrent agricultural expenditures, Capital agricultural expenditures and non-agricultural public expenditures (Utpal and Dahun, 2018; Manyise et.al, 2015 and Samuel et.al, 2009).

Table 2: Conceptual Framework

Variables	Description	Expected signs
Recurrent agricultural expenditure	Annual recurrent agricultural expenditure	+/-
Capital agricultural expenditure	Annual capital agricultural expenditure	+
Public expenditure on education	Share of expenditure in education to total government expenditure	+/-
Public expenditure on health	Share of public expenditure on health to total government expenditure	+
Public expenditure on infrastructure	Share of expenditure in infrastructure to total government expenditure	+

Source: Utpal and Dahun (2018); Manyise et.al, 2015 and Samuel et.al, 2009

3.6. Method of Data Estimation Techniques

3.6.1. Descriptive Analysis

Several statistical methods such as graphical comparisons and percentage changes were used for measuring trends of public expenditure and agricultural growth. As the main objective of this study relies best on the descriptive analysis of the data, the following descriptive statistics were analyzed:

- The share of agricultural expenditures in the total government expenditures pattern
- Government recurrent expenditures on agriculture pattern
- Government capital expenditures on agriculture pattern
- Government expenditures on education pattern
- Government expenditure on health pattern
- Government expenditures on roads construction pattern

Changes in the level and structure of government expenditures influence agricultural expenditures and can be estimated from various perspectives. The most well-known estimations of these progressions incorporate the level (and rate of change) of total government expenditures, share of agricultural expenditure in the total government expenditure, and the allocation of agricultural expenditure between capital and recurrent expenditures (agricultural capital/recurrent expenditure) ratios and Ethiopian data suggests the above possibilities. The first ratio looks into the sectorial allocation of government expenditures and the second affects economic productivity and has profound economic growth implications. (Teshome, 1992).

Also, the statistical method uses Agriculture Orientation Index (AOI), defined as the Agriculture share of Government Expenditure, divided by the Agriculture value added share of GDP, where Agriculture refers to the agriculture, forestry, fishing and hunting sector. The AOI index takes into account a country's economic size, Agriculture's contribution to GDP, and the total amount of Government Expenditure (FAO, 2020).

$$AOI = \frac{\text{Agriculture Share of Government Expenditures}}{\text{Agriculture value added Share of GDP}}$$

Where

$$Agriculture\ Share\ of\ Government\ Expenditure = \frac{\text{Central Government Expenditure on Agriculture}}{\text{Total Central Government Expenditure}} * 100$$

$$Agriculture\ value\ added\ Share\ of\ GDP = \frac{\text{Agriculture value added}}{\text{GDP}} * 100$$

An Agriculture Orientation Index (AOI) greater than 1 reflects a higher orientation towards the agriculture sector, which receives a higher share of government spending relative to its contribution to economic value-added. An AOI less than 1 reflects a lower orientation to agriculture, while an AOI equal to 1 reflects neutrality in a government's orientation to the agriculture sector (FAO, 2020).

3.6.2. Econometric Analysis

i. Time series property of data

This examination utilized time-series data and inherently it might exhibit some strong trends, the non-random disposition of the series might undermine the use of some of the econometrics tests such as F and t-tests. This is because they can cause rejection of a hypothesis that would have

otherwise not been rejected (John et.al, 2013). This study intends to conduct stationarity and co-integration tests to mitigate such situations. Time series for economic data is commonly stochastic or has a pattern that isn't stationary, implying that the data has a root unit.

ii. Autoregressive Distributed Lag (ARDL) Approach

To empirically analyze the impact of public expenditures on agricultural growth in Ethiopia, the ARDL model specification is used to show the relationships and dynamic interactions between public expenditures and agricultural growth using Autoregressive Distributed Lag (ARDL) co-integration test popularly known as bound test. The bounds of ARDL approach are valid regardless of whether the variables are integrated I (0) or I (1). The ARDL model is valid by taking a sufficient number of lags. The optimal lag length for the first difference of regressions is selected by the minimum value of Akaike (AIC), Schwarz (SIC) and Hannan-Quinn (HQC) (Pavlos and Nikolaos, 2014).

After the co-integration is realized then the following test process is finished by utilizing error correction method. If there are various degrees of integration between the test factors, the test is done jointly between the long-term equations with the error correction equation, after it is realized that in the co-integration variable happens (Agus et.al, 2017).

However, the regression equation only gives us the short-run relationship between the variables. It does not give any information about the long run behavior of the parameters in the model. This constitutes a problem since researchers are mainly interested in long-run relationships between the variables under consideration, and in order to resolve this, the concept of co-integration and the ECM becomes imperative (Emeka and Aham, 2016).

The Error Correction Model (ECM) can be derived from ARDL model through a simple linear transformation, which integrates short run adjustments with long run equilibrium without losing long run information. The associated ECM model takes a sufficient number of lags to capture the data generating process in general to specific modeling frameworks. The result gives the short-run dynamics and long run relationship of the underlying variables (Emeka and Aham, 2016).

The ARDL model that is used in this study is the following:

$$\Delta \text{RlnAGDP}_t = \beta_0 + \beta_1 RlnAGDP_{t-1} + \beta_2 lnARE_{t-1} + \beta_3 lnACE_{t-1} + \beta_4 lnEDU_{t-1} + \beta_5 lnHEALTH_{t-1} + \beta_6 lnROADS_{t-1} + {}_{i=1}^{\rho}\sum\theta_{i1}\Delta RlnAGDP_{t-1} + {}_{i=1}^{\rho}\sum\theta_{i2}\Delta lnARE_{t-i} + {}_{i=1}^{\rho}\sum\theta_{i3}\Delta lnACE_{t-i} + {}_{i=1}^{\rho}\sum\theta_{i4}\Delta lnEDU_{t-i} + \varepsilon_t$$

Where, β_0 is the drift component, ε_t is the stochastic error term, Δ is the first different operator, the parameters β_{0-6} denote the long-run parameters, while θ_{1-6} represents short-run parameters of the model to be estimated. RlnGDP is the natural log of agricultural GDP growth rate, lnARE is the natural log of agricultural recurrent expenditures, lnACE is the natural log of agricultural capital expenditures, lnEDU is the natural log of educational expenditures, lnHEALTH is the natural log of health expenditures and lnROADS is the natural log of roads construction expenditures. ρ is the optimal lag length and β_{1-6} are the coefficients to be estimated in the model.

iii. Unit Root Test

All economics data are mostly non-stationary. Undertaking regression on non-stationary time series may give a spurious result in which estimators and test statistics are misleading. Even if there is no real relation between variables the result may show a high R^2 and a significant relationship between variables. So checking for the stationarity of the data is mandatory before regressions are undertaken (Seida, 2016). To avoid estimating and getting spurious results, the study intend to conduct test for stationarity. This study employed augmented dick fuller test and look out for stationarity and establish the order of integration (John et.al, 2013). The Augmented Dickey-Fuller (ADF) test is considered superior because of its popularity and wide application to check for stationarity.

The (ADF) test for stationarity in a series of say Y, involves estimating the equations:

$$\Delta Y = \alpha_1 + \alpha_2 t + \beta Y_{t-1} + \sum_{i=1}^{m} a_i \, \Delta Y_{t-i} + \varepsilon_t$$

Where, ΔY_t is the first difference of the series Y, ε_t is a stochastic error term, α_1 is a constant, t is the time, and α_2 and β are the parameters. The null hypothesis is that the variable has a unit root or it is not stationary (Utpal and Dahun, 2018).

iv. Testing for Co-integration

In this paper ARDL based co-integration test is applied using bound test method. The ARDL co-integration technique is used in determining the long run relationship between series with different order of integration (Pesaran and Shin, 1995, and Pesaran et al. 2001). If one co-integrating vector (i.e. the underlying equation) is identified, the ARDL model of the co-integrating vector is reparameterized into ECM (Emeka and Aham, 2016).

If the dependent and independent variables are non-stationary, the deviations (i.e., the residuals from the estimation of the equation) are stationary. As per Engle and Granger, if there is co-integration, the condition with non-stationary variables is best estimated by the Error Correction Model (ECM) for long-run equilibrium and short-run dynamics. Co-integration refers to a circumstance of a long-run equilibrium relationship between variables that do not drift too far apart over time (Wendwesen, 2012).

The ECM shows how much of the disequilibrium is being corrected, that is, the extent to which any disequilibrium in the previous period is being adjusted in dependent variable. A positive coefficient indicates a divergence, while a negative coefficient indicates convergence (Emeka and Aham, 2016).

v. Granger Causality Test

Granger causality shows whether the past values of say X can be able to predict current or future values of Y is checked. Granger causality test is used to test the causal direction. However the number of lagged terms to be included in the model during causality test is an important part of the test. I.e. the direction of granger causality may depend on the number of lagged terms involved in the model. Given two variables X and Y, X is said to Granger causes Y if lagged values of X predict Y well (Bazezew, 2014).

Chapter Four

Results and Discussion

4. Introduction

In this study annual time series data covering the period from 1980/81 to 2018/19 is used. The variables under consideration are agricultural gross domestic product and economic classification of agricultural expenditures, total government expenditures on education, health and roads construction. This section presents descriptive and econometric findings and analysis, interpretation and discussion of results.

4.1. Descriptive statistics Results

4.1.1. Descriptive Analysis of Public Expenditures

4.1.1.1. Agricultural Government Expenditure pattern

Agricultural government expenditure recorded 8.74 percent of total government expenditure in 1980/81. Notable declines were recorded of 8.34 and 8.98 percent respectively, in 1999/00 and 2000/01. However, it remains well above the 10 percent threshold recommended by the declaration of African heads of state in Maputo except in 1980/81, 1999/00 and 2000/01.

In fact, over the 2008/09 period, 22.93 percent of total government expenditure was recorded to agricultural sector; this is the highest percentage share recorded between 1980/81 and 2018/19. Among the various measurements concerning capital expenditure, the sectorial capital allocation and agricultural capital to recurrent expenditure ratios depicted in table 3.

During the period 1980/81, the yearly share of agricultural capital expenditure in the total capital expenditure was 31.82 percent. It reaches it picks in 1982/83 by sharing 48.49 percent of total capital expenditure. As, in the below table (Table 3) agricultural capital government expenditures are 363 percent of agricultural recurrent government expenditures in 1980/81.

Concerning higher agricultural capital expenditures to recurrent expenditures ratio over the study period, especially in 1985/86 which accounted 944 percent, agricultural capital expenditures are much larger than recurrent expenditures.

Table 3: Sectorial and Economic allocation of Agricultural Expenditures

Year	Share of agricultural expenditure in Total government expenditure (%)	Agricultural capital expenditure/Total capital expenditure (%)	Agricultural capital/recurrent expenditure (%)
1980/81	8.74	31.82	363
1981/82	11.78	36.97	513
1982/83	17.18	48.49	1026
1983/84	11.63	33.49	493
1984/85	15.90	46.39	803
1985/86	18.06	46.16	944
1986/87	16.28	42.19	701
1987/88	14.71	43.72	557
1988/89	12.80	32.46	514
1989/90	12.96	39.58	424
1990/91	11.80	37.70	369
1991/92	12.68	42.88	292
1992/93	15.78	37.25	368
1993/94	13.69	26.77	288
1994/95	13.04	23.93	224
1995/96	12.69	21.94	206
1996/97	11.28	15.17	214
1997/98	11.26	21.29	172
1998/99	11.24	27.23	217
1999/00	8.34	24.86	166
2000/01	8.98	16.11	133
2001/02	11.45	20.45	182
2002/03	10.65	16.45	124

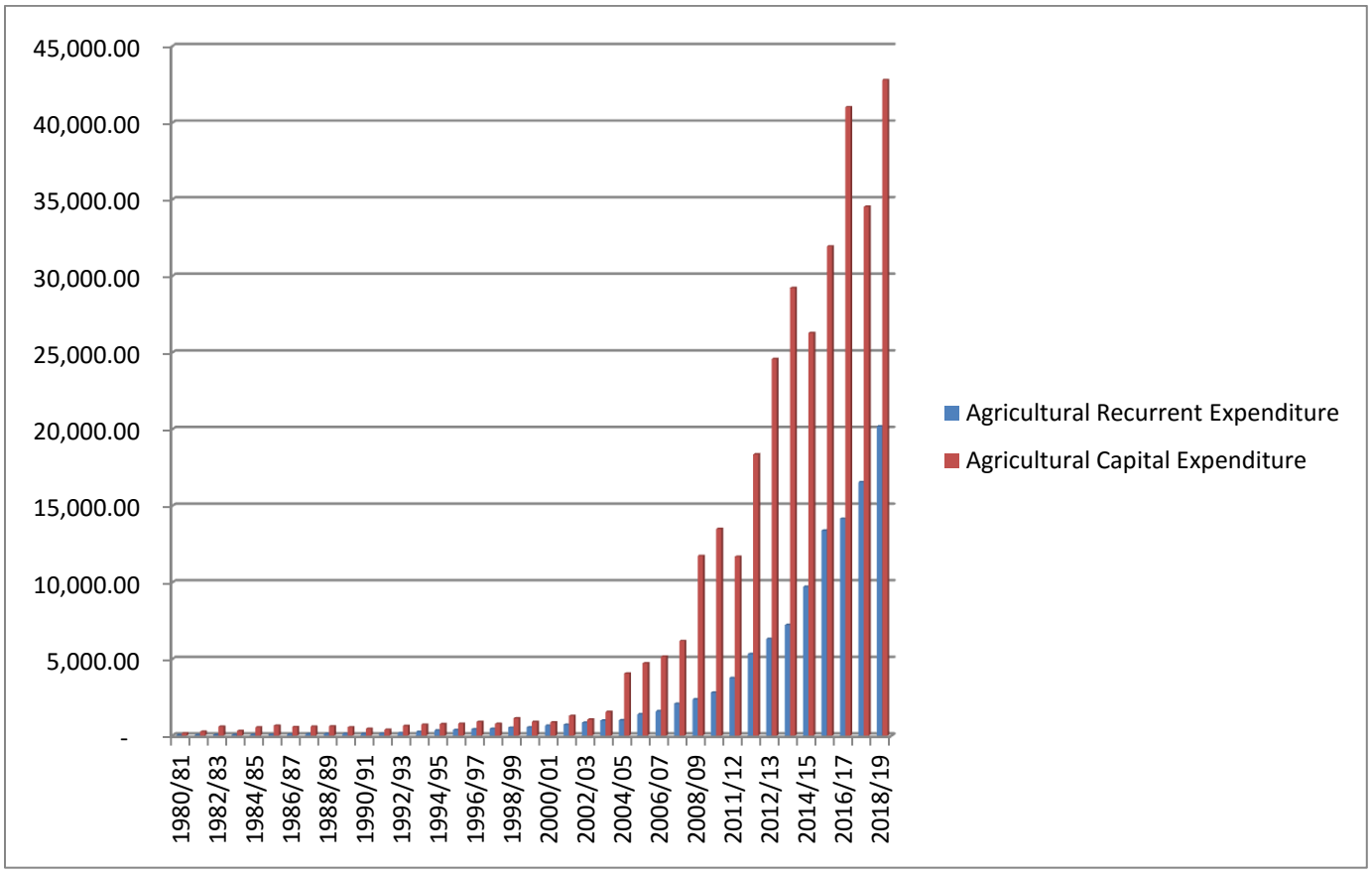
2003/04	11.84	18.17	157
2004/05	20.79	37.30	401
2005/06	19.05	31.46	340
2006/07	19.26	28.80	324
2007/08	17.58	26.03	298
2008/09	22.93	33.41	494
2009/10	20.62	28.56	480
2010/11	15.87	20.93	310
2011/12	17.68	23.42	344
2012/13	18.90	25.16	390
2013/14	18.97	25.68	405
2014/15	15.76	22.11	270
2015/16	16.07	24.14	238
2016/17	16.75	27.10	290
2017/18	14.42	24.02	209
2018/19	15.24	24.46	212

Source: Author, using data from MoFED

The government of Ethiopia has consistently increased its spending on agricultural recurrent and capital expenditures. Agricultural recurrent expenditures increased from 42.78 million birr in 1980/81 to 121.40 million birrs in 1990/91. After EPRDF, agricultural recurrent expenditures increased from 135.10 million birr in 1991/92 to 20,182.50 million birrs in 2018/19. This spending category was about 2.4 percent of total recurrent expenditures of the government in 1980/81 and increased to 8.9 percent in 2018/19.

The government of Ethiopia spent 448.47 million birrs on agricultural capital expenditures in 1990/91, an increase from 155.08 million birr in 1980/81. From 1991/92 to 2018/19, a major increase in agricultural capital expenditures have been recorded which accounted 394.16 million birr and 42,791.99 million birrs respectively. In 1980/81 and 2018/19 agricultural capital expenditures accounted for 31.82 percent and 24.46 percent of total capital government expenditures respectively.

Figure 2: Agricultural Recurrent and Capital Expenditures in million ETB Pattern



Source: Author, using data from MoFED.

4.1.1.2. Educational, Health and Rural Roads Government Expenditure

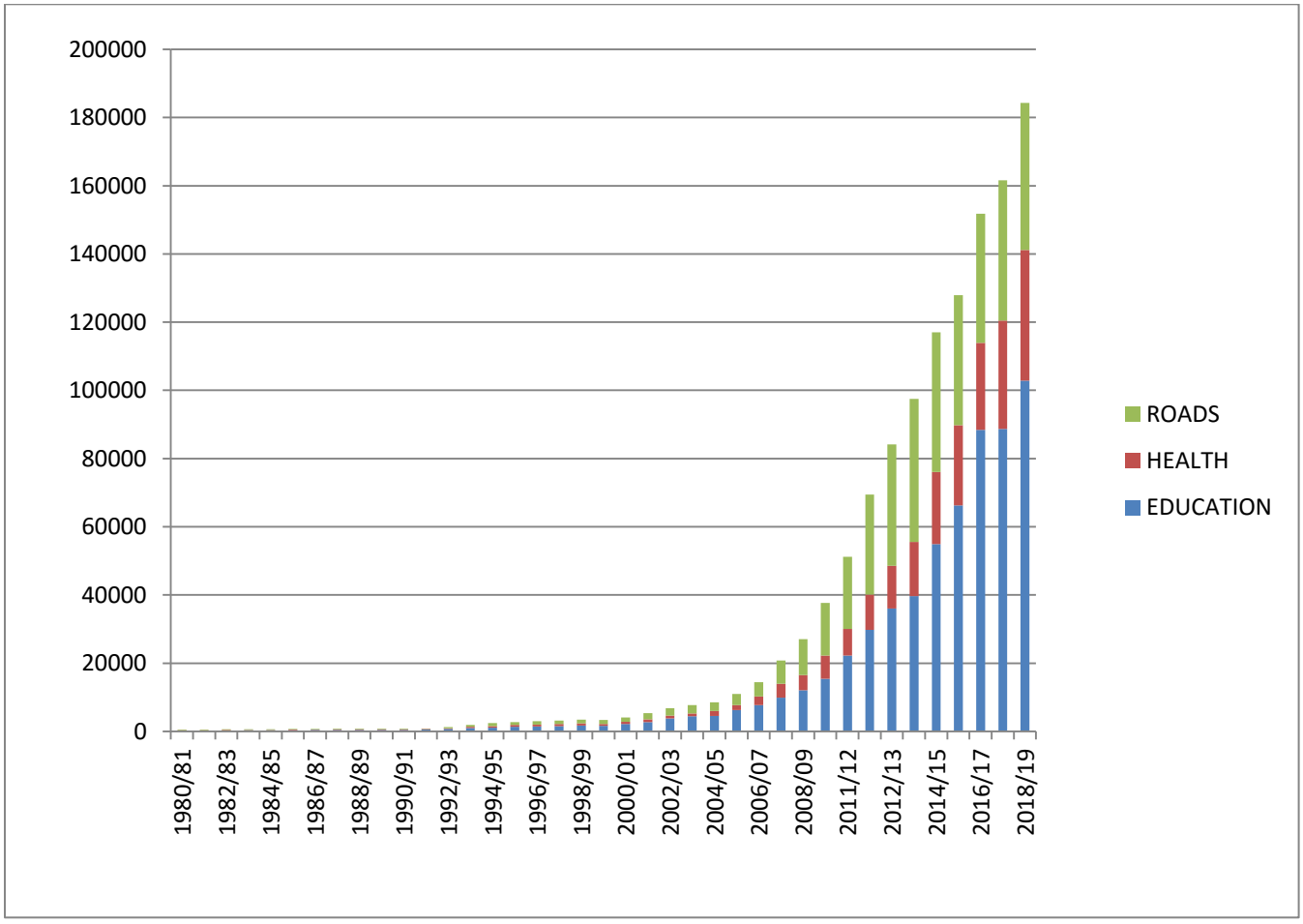
The total actual federal budget in the educational and health sector grew from 228.16 million birr and 96.64 million birrs respectively in 1980/81 to 102,816.22 million birr and 38,381.58 million birrs in 2018/19 respectively. Actual spending in rural roads has also increased significantly in the analyzed period. Indeed, the actual federal budget to roads construction increased from 189.39 million birr in 1980/81 to 43,060.28 million birrs in 2018/19.

An analysis of the total actual budget for education, public health and roads construction reveals an almost constant upward trend over the period from 1980/81 to 2018/19.

For instance, educational expenditure increased from 0.29 percent in 1980/81 to 16 percent in 2018/19 that goes into enhancing agricultural growth in Ethiopia. Thus, the relative actual budget for public health sector improved from 0.12 percent in 1980/81 to 6.15 percent in 2018/19 that

goes into enhancing agricultural growth in Ethiopia. Expenditure on roads construction that goes into improving agricultural growth in Ethiopia also increased from 0.24 percent in 1980/81 to 7 percent in 2018/19.

Figure 3: Educational, Health and Roads Construction Government Expenditure in million ETB Pattern



Source: Author, using data from MoFED

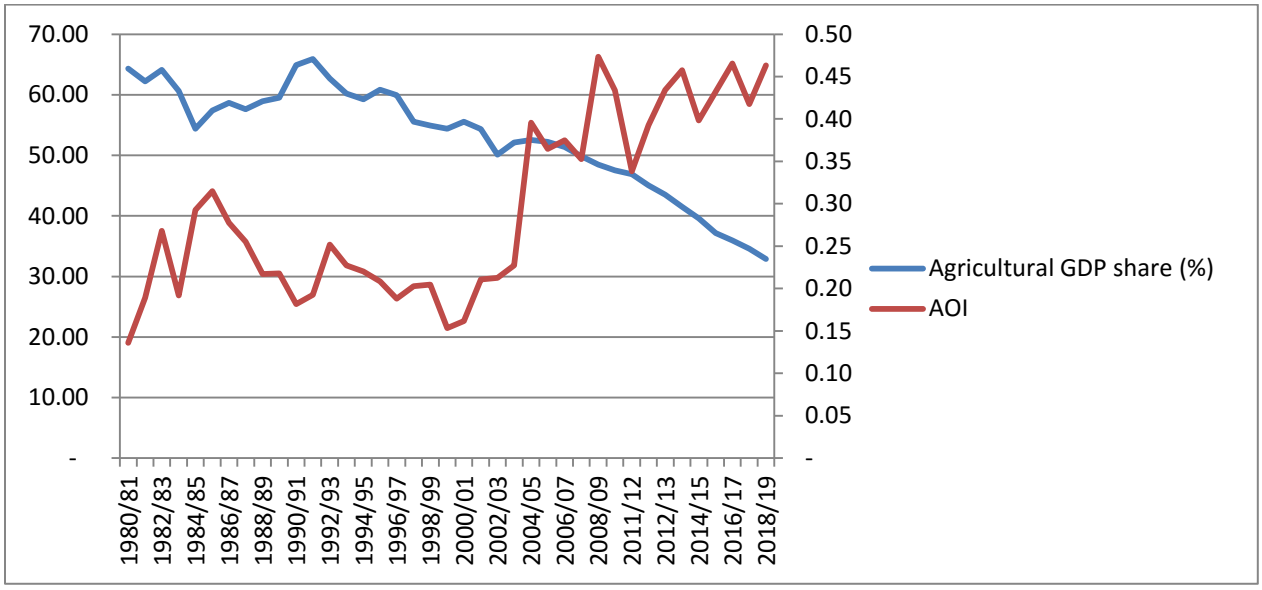
4.1.1.3. Agricultural Orientation Index (AOI)

An indicator that quantifies the Agriculture share of government expenditure neglects to consider the relative contributions of the agricultural sector to a country's GDP. But, AOI considers a country's economic size, Agriculture's contribution to GDP, and the total amount of Government Expenditure. As such, it takes into consideration the setting of general and feasible objectives (Brian and Sangita, 2016).

The share of agriculture to GDP increased over the 1980/81-2007/08 period, as agriculture makes up over 50 percent of GDP. But after 2007/08, agriculture value added as percent of GDP recorded less than 50 percent.

An analysis of agricultural orientation index starting from 1980/81 indicates that Ethiopia had a lower orientation by its central government to the agricultural sector relative to agriculture's economic contribution, since AOI < 1. However, agricultural orientation index increases over time, the index recorded 0.14 and 0.46 in 1980/81 and 2018/19 respectively.

Figure 4: Agricultural value added as percentage of GDP and AOI



Source: Author, using data from MoFED.

4.1.1.4. Economic Variables in Nominal Terms

Agricultural growth domestic product (GDP) is a dependent variable, whereas, the other variables are determinant factors of agricultural GDP. They are all expressed in logarithm form for the sake of econometric analysis.

Table 4: Descriptive Statistics of the Economic Variables in Nominal Terms (1980/81-2018/19)

Variable	Mean	Std. Dev.	Min	Max
AGDP	239792.1	183669.2	59202.96	623802
ARE	2953.922	5071.072	42.78	20182.52
ACE	8276.084	12686.1	155.078	42791.99
EDU	15721.49	27592.96	228.16	102816.2
HEALTH	5552.721	9746.938	96.64	38381.58
ROADS	9950.787	15416.26	115.883	43060.28

Source: Author's own calculation using STATA.

They are all expressed in millions of local currencies (Ethiopian Birr). The agricultural GDP averages 239,792.11 million birr and varies from 59,202.96 million birr to 623,802 million birrs with a standard deviation of 183,669.20 million birr. Agricultural recurrent expenditure averages 2,953.92 million birr and goes from 42.78 to 20,182.52 million birr. Similarly, agricultural capital expenditure averages 8,276.08 million birr and ranges from 155.08 to 42,791.99 million birr. Education expenditure, with a mean of 15,721.49 million birr, also varies from a minimum of 228.16 to a maximum of 102,816.20 million birr. Also, public health averages 5,552.72 and ranges from 96.64 to 38,381.58 million birr. Finally, the mean of roads construction is 9,950.79 million birrs. It varies from its minimum value 115.88 million birr to 43,060.28 million birrs with standard deviation of 15,416.26 million birr.

4.2. Econometric Analysis

4.2.1. Unit Roots Result

As noted earlier in section 3.6.2 above, before estimating the regression equation, it is vital to understand the data first. The time series under consideration should be checked for stationarity before one can attempt to fit an appropriate model. The stationaity of the data in this study is checked using Augmented Dickey fuller (ADF) test.

The hypothesis to be tested is:

H_0: The series is non-stationary or has a unit root against the alternative hypothesis

H_1: The series is stationary or has no unit root

Table 5: Augmented Dickey Fuller test results at level and first difference

VARIABLES	ORDER OF INTEGRATION	ADF TEST	CRITICAL VALUES	CONCLUSION
RlnAGDP	I (0)	-5.673 ***	1% level (-4.270) 5% level (-3.552) 10% level (-3.211)	Stationary
lnARE	I (0)	-1.061	1% level (-4.260) 5% level (-3.548) 10% level (-3.209)	Non-Stationary
lnACE	I (0)	-2.345	1% level (-4.260) 5% level (-3.548) 10% level (-3.209)	Non-Stationary
lnEDU	I (0)	-1.771	1% level (-4.260) 5% level (-3.548) 10% level (-3.209)	Non-Stationary
lnHEALTH	I (0)	-1.623	1% level (-4.260) 5% level (-3.548) 10% level (-3.209)	Non-Stationary
lnROADS	I (0)	-2.197	1% level (-4.260) 5% level (-3.548) 10% level (-3.209)	Non-Stationary
dlnARE	I(1)	-5.521***	1% level (-4.279) 5% level (-3.556) 10% level (-3.214)	Stationary
dlnACE	I(1)	-4.245**	1% level (-4.279) 5% level (-3.556) 10% level (-3.214)	Stationary
dlnEDU	I(1)	-5.071***	1% level (-4.279) 5% level (-3.556) 10% level (-3.214)	Stationary
dlnHEALTH	I(1)	-4.549***	1% level (-4.279) 5% level (-3.556) 10% level (-3.214)	Stationary
dlnROADS	I(1)	-3.981**	1% level (-4.279) 5% level (-3.556) 10% level (-3.214)	Stationary

Notes: Null hypothesis: series has unit root. *Rejection at 1 % level. ** Rejection at 5%&10 % and *** Rejection at (1%, 5% & 10%) level. Source: Author's own calculation using STATA

Table 5 shows the result of the Augmented Dickey Fuller test. The ADF test is applied on both at level and first difference respective to the consideration of constant and trend. The null

hypothesis of a unit root at all common significance was rejected at level except growth of agricultural gross domestic product. Therefore, to transform the variables into stationary the first difference is taken and the result on the first difference shows from the table that all variables are stationary at first difference. Moreover the first difference shows that all variables are stationary at 1%, 5% and 10% significant level except agricultural capital expenditures and road construction expenditures are stationary at 5% and 10% significant. Series are integrated of different orders. That is, having a combination of both level and first difference stationarity.

The appropriate co-integration test for these kinds of case is the bound test as suggested by Pesaran, Shin and Smith (2001).

4.2.2. Co-Integration Test Analysis

Having tested the variables for stationarity, the following step of time series analysis is testing for co-integration, which is whether the linear combination of the variables is also stationary or not.

The hypothesis is stated as:

H_0: No co-integration equation

H_1: H_0 is not true

4.2.2.1. Lag Order Selection Criteria

Prior to assessing the model, it is basic to pick the order of the model that yields a good model and thus precise estimate. The easiest way to select lag criteria is to decide using a criterion like the Akaike or Schwarz and choose that model that gives the lowest values of these criteria (rule of thumb). For determining the appropriate lag length for the model Akaike information criterion (AIC) is used. In Table 5.2, the lag length selection criterion is tabulated.

The AIC test suggest appropriate lag length for the model is two (2).That is, the best fitting model is the one that minimize AIC where the bolded row in table 6 indicates that the optimal lag length for the model selected by the criterion is equal to two.

Table 6: Optimal Lag Length Criteria

Lag	LogL	LR	FPE	AIC	HQ	SC
0	82.9829		5.6e-10	-4.27683	-4.18471	-4.01291
1	254.795	343.62	3.0e-13*	-11.5788	-11.1771*	-9.9745*
2	**286.418**	**63.247***	**4.6e-13**	**-11.8219***	**-10.3813**	**-8.14783**

* indicates lag order selected by the criterion: Author's own calculation using STATA

Having got the stationarity at level and at first difference and the optimal lag length, the next step is the analysis of co-integration test result.

Table 7: ARDL Bounds Test

Bound Test for the model (1 0 1 1 1 2)		
Test statistic	**Value**	**K**
F-statistic	15.473	5
Critical Value Bounds		
Significance	**I(0) Bounds**	**I(1) Bounds**
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source: computed by author using STATA.

Table 7 above represents the bounds testing to co-integration between the variable of interest. The result of the computed F-statistic for the model when growth of agricultural gross domestic product is normalized as the dependent variable is equals to 15.473 which is higher than the upper critical values at 10%, 5% and 1% levels of significance, indicating that there is a long-run relationship between the variables in view.

4.2.3. Estimated Short-Run Analysis Using ARDL Approach

Table 8 presents the result of the short-run dynamic of model; the short-run result reveals a negative and significant association between growth of agricultural domestic product and agricultural recurrent government expenditure at 5% and 10% level of significance. Agricultural

recurrent expenditure is significant and coefficient of -0.016 signifies that if agricultural recurrent expenditure is increased by one percent, agricultural gross domestic product growth rate is decreased by 0.016 percent. This finding is in conformity with previous study like Manyise et.al, (2015).

The short run also shows that negative and insignificant relationship between growth of agricultural domestic product and agricultural capital government expenditure. However, one year lag of agricultural capital government expenditure is found to be negative and significant with growth of agricultural domestic product at 10% level of significance. The result is in contrast with study conducted by Manyise et.al (2015). This result might be due to excess spending by the government on capital agricultural expenditure at the expense of other productive expenditures, resulting in diminishing returns. The short-run coefficient of educational expenditure is found to be negative and significant with a coefficient of 0.036 which implies that if education expenditure is increased by 1 percent, the agricultural gross domestic product growth rate is expected to decrease by 0.036 percent but positive in one-year lag of educational expenditure at 1%, 5% and 10% level of significance. The finding is in line with the result of previous studies like Samuel et.al (2009), Utpal and Dahun (2018) respectively.

Table 8: Short Run Analysis

Model (1 0 1 1 1 2) Dependent variable: RlnAGDP		
Regressor	**Coefficient**	**P-value**
Constant	0.0322837**	0.012
lnARE	-0.0157773**	0.013
lnACE	-0.0003622	0.949
lnACE (-1)	-0.0109561*	0.061
lnEDU	-0.0357812***	0.000
lnEDU (-1)	0.0455429***	0.000
lnHEALTH	-0.017438**	0.027
lnHEALTH (-1)	0.0296579***	0.000
lnROADS	-0.0031956	0.606
lnROADS (-1)	0.011366	0.156
lnROADS (-2)	-0.008634*	0.094
ECM (-1)	-0.8100686***	0.000

Notes: * denote significance level at 10%, ** denote significance level at 5% and 10%, *** denote significance level at 1%, 5% and 10%. Source: computed by author using STATA.

The coefficient of the one-year lag of health government expenditure depicts a positive and significant nexus with growth of agricultural domestic product at 1%, 5% and 10% level of significant. This implies that the performance of the health expenditure in the previous year influences the current level of agricultural gross domestic product growth rate in Ethiopia. This finding is in line with a result found by Samuel et.al (2009). Further, the coefficient of roads construction expenditure in the short run is found to be negative and significant at 10% level of significance.

A value of (-0.8101) for the ECM coefficient suggests that a fast speed of adjustment strategy of roughly 81%. This means that approximately 81% of discrepancy the previous year is adjusted for the current year i.e. approximately 81% of disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year.

4.2.4. Estimated Long-Run Analysis Using ARDL Approach

This time the non- developmental expenditure (agricultural recurrent government expenditure) variable is only significant at 5% p-value and negative. This implies that a 1% increase in agricultural recurrent expenditure is associated 0.01948% decline in growth of agricultural gross domestic product. Other variables are insignificant at all level of significance.

Table 9: Error correction representation for the selected ARDL model

Model (1 0 1 1 1 2) **Dependent variable: RlnAGDP**		
Regressor	**Coefficient**	**P-value**
Constant	0.0322837*	0.012
lnARE	-0.0194765*	0.010
lnACE	-0.0139721	0.120
lnEDU	0.0120505	0.157
lnHEALTH	0.015085	0.184
lnROADS	-0.0005724	0.904

Note: *** Indicates significant at 1%, 5% and 10% level of significance, * indicates significance level at 5%. Source: computed by author using STATA.

The regression for the ARDL model fits very well at R^2 of 94%. The reason for being a good fit is that it is statistically above the bench mark of 50 percent. As the adjusted (R^2) tends to purge the influence of the number of included explanatory variables, the (R^2) of 0.9187 shows that having removed the influence of the explanatory variables, the model is still of good fit and the dependent variable explained by the equation by 91.87 %, hence, in terms of the goodness of fit, it can be conclude that the test is fair.

4.2.5. Granger Causality Test

Table 10 below represents the empirical outcome of the dynamic granger causality test which revealed a one way causal link flowing from agricultural recurrent expenditures to agricultural gross domestic product growth. The implication is that agricultural recurrent expenditures are the dynamic driver of agricultural growth.

Table 10: Granger Causality Test

Null hypothesis	Causality	Prob.
RlnAGDP does not Granger cause lnARE	-	0.153
lnARE does not Granger cause RlnAGDP	lnARE→ RlnAGDP	0.056
RlnAGDP does not Granger cause lnACE	-	0.464
lnACE does not Granger cause RlnAGDP	-	0.392
RlnAGDP does not Granger cause lnEDU	-	0.264
lnEDU does not Granger cause RlnAGDP	-	0.605
RlnAGDP does not Granger cause lnHEALTH	-	0.103
lnHEALTH does not Granger cause RlnAGDP	-	0.690
RlnAGDP does not Granger cause lnROADS	-	0.159
lnROADS does not Granger cause RlnAGDP	-	0.169

Source: computed by author using STATA.

It's also used to test for exongineity and enables the study to know whether the study should estimate the model using simultaneous or single equation. In this study, it's predicted that the composition of recurrent agricultural expenditures predicts the agricultural growth. But on the same breath the agricultural growth cannot as well influence the agricultural recurrent expenditures and this can lead to our model is not suffering from simultaneous bias.

4.2.6. Diagnostic Tests

The study conducted diagnostic tests for specification, normality, heteroscedasticity, autocorrelation, and stability tests for the model which are presented in Table 11. The study tested for model misspecification using Ramsey RESSET test and the results reveal that the models are correctly specified. Using a significance p-values the RESET test is not significant, indicating there are no omitted variables in the model with probability value of 0.4817.

Table 11: Diagnostic Tests Results

Test	Results	Prob.
Ramsey RESET Test	1.02	0.4817
Normality test	0.5216	0.7704
Heteroskedasticity Test	37.00	0.4226
Breusch-Godfrey LM Test	0.019	0.8906

Source: computed by author using STATA.

Further, the diagnostic tests also reveal that the model is normally distributed using Jarque-Bera normality test. In the same manner, the model pass the test for heteroscedasticity using white's test. Breusch–Godfrey LM serial correlation test is conducted and the result indicates that null hypothesis cannot be rejected as the F-statistic for test for the model is found to be 0.019 with probability value of 0.8906, indicating that there is absence of serial correlation in the model.

4.2.7 Stability Test

A graphical and tabular representation of the recursive residual is also established, to determine to test whether there is a structural break. Finally, figure 5 and table 12 display tests for stability of the ARDL models using the cumulative sum test for parameter stability. The results reject the null hypothesis of no structural break.

H_0: No structural break

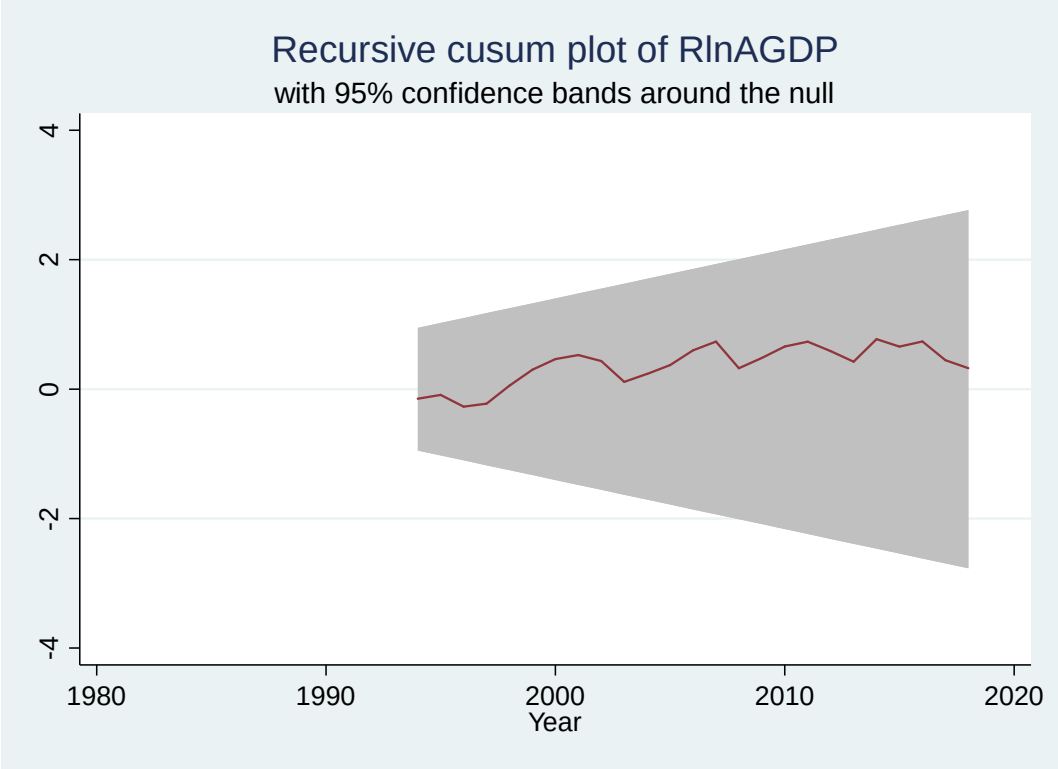
Table 12: Stability Test

Cumulative sum test for parameter stability			
Test Statistic	**1% Critical value**	**5% Critical value**	**10% Critical value**
0.3465	1.1430	0.9479	0.850

Source: computed by author using STATA.

The red line is the cumulative sum. If the red line is in the shaded area, the test would have not rejected the null hypothesis at the 5 percent level. Since the result shows that the cumulative sum line is in the shaded area the model lies within the 5% significant level indicating that the null hypothesis that the model is stable cannot be rejected.

Figure 5: Cumulative sum test for parameter stability



As can be seen from the above figure, the graph of statistical cumulative sum is within the critical values at 5% significance level, which means that all the coefficients in ECM are stable.

Chapter Five

Summary, Conclusions and Recommendations

5. Introduction

In this chapter a summary of the study, conclusion and recommendations of the study findings as stipulated in the research objectives are presented. Discussions and conclusions of the study findings are drawn upon which recommendations are made.

5.1. Summary of Major Findings

In the view of descriptive statistics result it was discovered that agricultural orientation index in Ethiopia has been less than one with in the study period. This implies more prominence to non-agricultural sectors. The agricultural capital expenditure to total government expenditure ratio decreased to the level of 0.31 for the period 1980/81 and during 2018/19 the yearly average share reaches 0.24. Agricultural capital expenditures are 363 percent of agricultural recurrent expenditure in 1980/81 and it decreased to 212 percent in 2018/19.

The econometric results revealed that both recurrent and capital expenditures that goes into enhancing agricultural growth have significant negative impacts on agricultural growth in Ethiopia while capital expenditure of the government that goes into enhancing agricultural growth has a negative, but insignificant impact on the agricultural growth of the nation in the long-run.

Public expenditures on education and health that goes into enhancing agricultural growth have significant positive impact on agricultural growth, but expenditure on roads construction is another significant and negative on agricultural growth in Ethiopia in the short-run. The results reveal that in the long-run, the effect of public expenditure through education, health and roads construction on agricultural growth is insignificant.

5.2. Conclusion

The study was conducted on the effect of agricultural public expenditures and non-agricultural public expenditures on agricultural growth in Ethiopia. This study was motivated by the fact that there is limited research on the impact of agricultural and non-agricultural public expenditures on

agricultural growth in Ethiopia. Further the only research done on the impact of public expenditure on agricultural growth concentrated on a region and led an examination just on the matter of the relationship between public expenditure on infrastructures and agricultural growth. Thus, the study tried to fill in the aforementioned gap.

The examination was led to inspect the public expenditure variables affecting the agricultural growth. In the wake of related literature and level of stationarity, the ARDL model where chosen. After the model was run in STATA, all the variables were insignificant in the long run except agricultural recurrent expenditure. This suggests that expenditures to these programs has both immediate and long run effect, but other variables don't take some time to be effective however they give immediate effect on agricultural growth in Ethiopia.

5.3. Recommendation

It is therefore recommended that relevant authorities should set a proper system of checks and monitoring on disbursement of funds for capital purposes and execution of projects on agriculture so as not to have short-fall of the allocated funds, also productive government expenditure components may turn unproductive if applied excessively and appropriate capital expenditure was not being used. Delays in road construction projects widely lead to cost overrun, time overrun, and litigation. By addressing these delay factors, the government can avoid extra cost and ensure their profitability.

Construction of roads may leads to displacement of people from land, house, roadside shops and businesses which impact their income source and livelihood. So it is necessary to looking carefully for alternative road designs that may be feasible to reduce the impact. Also, after, the takeover of EPDRF the public expenditure has put much into the construction of asphalt roads. Particularly after 2001, there is a critical growth in asphalt road length. Notwithstanding, there is negative growth in gravel road length. Governments should take conscious efforts to reduce spending in unproductive sectors but should instead increase their spending in sectors like education and health, also gravel road expansion has to be made to meet the target of improving agricultural productivity. Finally, government should ensure that expenditures are properly managed in a manner that it will raise the nation's production capacity and accelerate agricultural growth.

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Appendix

Agricultural Recurrent and Capital Expenditures in million ETB

Year	Agricultural Recurrent Expenditure	Agricultural Capital Expenditure
1980/81	42.78	155.08
1981/82	50.15	257.35
1982/83	57.27	587.55
1983/84	61.62	304.02
1984/85	66.80	536.39
1985/86	69.30	654.50
1986/87	80.40	563.81
1987/88	107.10	596.76
1988/89	117.80	606.06
1989/90	129.40	548.18
1990/91	121.40	448.47
1991/92	135.10	394.16
1992/93	173.57	639.18
1993/94	250.17	721.17
1994/95	336.96	754.10
1995/96	378.57	781.68
1996/97	418.67	894.64
1997/98	447.35	769.55
1998/99	520.38	1,129.39
1999/00	542.83	903.44
2000/01	656.53	869.92
2001/02	707.16	1,284.72
2002/03	848.91	1,051.32
2003/04	988.28	1,551.91
2004/05	1,009.71	4,051.72
2005/06	1,391.57	4,728.95

2006/07	1,594.07	5,161.86
2007/08	2,076.57	6,178.62
2008/09	2,374.30	11,731.74
2009/10	2,810.77	13,492.78
2011/12	3,769.59	11,683.53
2011/12	5,335.78	18,361.09
2012/13	6,307.63	24,591.02
2013/14	7,224.77	29,224.66
2014/15	9,717.36	26,279.19
2015/16	13,392.58	31,938.52
2016/17	14,153.83	41,021.41
2017/18	16,553.39	34,526.84
2018/19	20,182.52	42,791.99

Educational, Health and Roads Construction Government Expenditure in million ETB

Year	EDUCATION	HEALTH	ROADS
1980/81	228.16	96.64	189.39
1981/82	282.06	109.48	183.79
1982/83	312.37	105.23	186.28
1983/84	333.79	110.55	168.59
1984/85	369.84	121.74	138.40
1985/86	386.10	125.66	176.89
1986/87	418.98	147.24	168.54
1987/88	447.35	154.64	173.37
1988/89	484.67	169.61	153.14
1989/90	495.57	174.42	115.88
1990/91	489.70	160.48	129.31
1991/92	528.48	188.89	131.76
1992/93	692.39	255.79	281.53

1993/94	996.86	349.52	555.70
1994/95	1,132.23	430.31	903.44
1995/96	1,382.87	479.50	831.51
1996/97	1,452.52	584.22	949.75
1997/98	1,516.63	641.32	1,039.31
1998/99	1,705.13	638.67	1,107.07
1999/00	1,638.41	577.53	1,099.16
2000/01	2,178.15	650.62	1,267.46
2001/02	2,714.32	797.67	1,848.61
2002/03	3,776.19	888.29	2,133.39
2003/04	4,456.89	837.04	2,387.87
2004/05	4,515.78	1,490.32	2,486.06
2005/06	6,220.93	1,506.83	3,297.70
2006/07	7,757.09	2,492.29	4,176.01
2007/08	9,932.68	4,049.64	6,827.85
2008/09	12,072.95	4,492.89	10,485.84
2009/10	15,422.59	6,809.78	15,400.67
2011/12	22,255.48	7,824.27	21,080.22
2011/12	29,789.59	10,345.51	29,276.10
2012/13	36,039.82	12,486.61	35,653.90
2013/14	39,647.04	15,870.49	42,028.36
2014/15	54,895.40	21,137.43	40,968.15
2015/16	66,314.48	23,451.26	38,144.45
2016/17	88,377.95	25,592.92	37,791.12
2017/18	88,660.54	31,829.24	41,083.90
2018/19	102,816.22	38,381.58	43,060.28

Agricultural value added as percentage of GDP and AOI

Year	Agriculture Value Added as % of GDP	AOI
1980/81	64.30	0.14
1981/82	62.22	0.19
1982/83	64.10	0.27
1983/84	60.64	0.19
1984/85	54.38	0.29
1985/86	57.38	0.31
1986/87	58.65	0.28
1987/88	57.62	0.26
1988/89	58.93	0.22
1989/90	59.51	0.22
1990/91	64.90	0.18
1991/92	65.92	0.19
1992/93	62.69	0.25
1993/94	60.21	0.23
1994/95	59.23	0.22
1995/96	60.86	0.21
1996/97	59.94	0.19
1997/98	55.54	0.20
1998/99	54.90	0.20
1999/00	54.38	0.15
2000/01	55.56	0.16
2001/02	54.32	0.21
2002/03	50.13	0.21
2003/04	52.13	0.23
2004/05	52.54	0.40
2005/06	52.23	0.36
2006/07	51.39	0.37

2007/08	49.87	0.35
2008/09	48.45	0.47
2009/10	47.54	0.43
2011/12	46.91	0.34
2011/12	45.03	0.39
2012/13	43.52	0.43
2013/14	41.47	0.46
2014/15	39.59	0.40
2015/16	37.17	0.43
2016/17	35.97	0.47
2017/18	34.55	0.42
2018/19	32.91	0.46

STATA Results

Co-integration with Bound Test

```
H0: no levels relationship              F =  15.473
                                        t = -8.402

Critical Values (0.1-0.01), F-statistic, Case 3

        |  [I_0]    [I_1]  |  [I_0]    [I_1]  |  [I_0]    [I_1]  |  [I_0]    [I_1]
        |    L_1      L_1  |    L_05     L_05 |   L_025   L_025  |    L_01     L_01
--------+--------------------+--------------------+--------------------+--------------------
  k_5   |   2.26     3.35  |   2.62     3.79  |   2.96     4.18  |   3.41     4.68
accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), t-statistic, Case 3

        |  [I_0]    [I_1]  |  [I_0]    [I_1]  |  [I_0]    [I_1]  |  [I_0]    [I_1]
        |    L_1      L_1  |    L_05     L_05 |   L_025   L_025  |    L_01     L_01
--------+--------------------+--------------------+--------------------+--------------------
  k_5   |  -2.57    -3.86  |  -2.86    -4.19  |  -3.13    -4.46  |  -3.43    -4.79
accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors
```

Short-Run Analysis

RlnAGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
RlnAGDP						
L1.	.1899314	.0964135	1.97	0.060	-.0086359	.3884987
lnARE	-.0157773	.0059144	-2.67	0.013	-.0279582	-.0035963
lnACE						
--.	-.0003622	.0055758	-0.06	0.949	-.0118458	.0111213
L1.	-.0109561	.0055895	-1.96	0.061	-.0224679	.0005557
lnEDU						
--.	-.0357812	.0079121	-4.52	0.000	-.0520764	-.0194859
L1.	.0455429	.0077332	5.89	0.000	.0296161	.0614698
lnHEALTH						
--.	-.017438	.0074462	-2.34	0.027	-.0327738	-.0021022
L1.	.0296579	.0071475	4.15	0.000	.0149373	.0443785
lnROADS						
--.	-.0031956	.0061191	-0.52	0.606	-.015798	.0094068
L1.	.011366	.0077796	1.46	0.156	-.0046563	.0273883
L2.	-.008634	.0049672	-1.74	0.094	-.0188643	.0015962
_cons	.0322837	.0119417	2.70	0.012	.0076893	.0568781

ECM

D.RlnAGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
RlnAGDP						
L1.	-.8100686	.0964135	-8.40	0.000	-1.008636	-.6115013
LR						
lnARE	-.0194765	.0069839	-2.79	0.010	-.0338602	-.0050928
lnACE	-.0139721	.0086739	-1.61	0.120	-.0318362	.0038921
lnEDU	.0120505	.0082578	1.46	0.157	-.0049568	.0290578
lnHEALTH	.015085	.0110409	1.37	0.184	-.0076542	.0378242
lnROADS	-.0005724	.004719	-0.12	0.904	-.0102913	.0091466
SR						
lnACE						
D1.	.0109561	.0055895	1.96	0.061	-.0005557	.0224679
lnEDU						
D1.	-.0455429	.0077332	-5.89	0.000	-.0614698	-.0296161
lnHEALTH						
D1.	-.0296579	.0071475	-4.15	0.000	-.0443785	-.0149373
lnROADS						
D1.	-.0027319	.0057221	-0.48	0.637	-.0145168	.009053
LD.	.008634	.0049672	1.74	0.094	-.0015962	.0188643
_cons	.0322837	.0119417	2.70	0.012	.0076893	.0568781