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DEPARTEMENT OF DEVELOPMENT ECONOMICS

A THESIS PAPER SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIRMENT FOR DEGREE OF MASTER OF SCIENCE IN DEVELOPMENT ECONMOMICS (MSc)

THE IMPACT OF TAX REVENUE ON ECONOMIC GROWTH IN ETHIOPIA

BY: MOHAMMED KADER ID NO: GSE/7638/10

ADVISORS: Dr. ZELALEM GUTU

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Declaration

I, Mohammed Kedir, hereby declare that this research paper entitled, The Impact of Tax Revenue on GDP per Capita in Ethiopia, prepared by me to the Addis Ababa University School of Commerce for the MSc in Developmental Economics, is original work and that all sources of material used for the thesis are strictly recognized.

Declared by:

Mohammed kedir	…….	…….……
Name	Signature	Date

Confirmed by advisor:

Dr. Zelalam Gutu	…..……	……..
Name	Signature	Date

Statement of Certifications

I, Mohammed Kedir, hereby certify that this research paper entitled, The Impact of Tax Revenue on economic growth in Ethiopia, prepared by me to the Addis Ababa University School of Commerce for the MSc degree in Developmental Economics is original work and that all sources of material used for the thesis are strictly recognized.

Approved by:

Internal Examiner:

Dr. Mulugeta G.Mariam	……	……
Name	Signature	Date

External Examiner

Dr. Atnafu Gebremeskel	……...……	……..……
Name	Signature	Date

Advisor:

Dr. Zelalam Gutu	…..……	……..
Name	Signature	Date

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List of Acronyms and Abbreviations

AIC	Akaike Information Criterion
ARDL	Autoregressive Distributed Difference Lag
OLS	Ordinary Least Squares
ECM	Error Correction Methods
GDP	Gross Domestic Products
LNGDPPCT	Natural Logarithm of GDP per Capita at time t
LNTRT	Natural Logarithm of Tax Revenue at time t
LNGET	Natural Logarithm of Government Expenditure at time t
LNGCFT	Natural Logarithm of gross capital formation at time t
LNLFT	Natural Logarithm of Labor Force at time t
MOR	Ministry of Ethiopia
ECC	Ethiopian Custom Commission
MOFEC	Ministry of Finance and Economic Cooperation
CUSUM	Cumulative Sum of Recursive Residuals
EC	Error Correction Term
MPRA	Munich Personal Repec Archive
ADF	Augmented dickey fuller
IJOE	International Journal of Economics
JOPE	Journal of political economy
JOBE	Journal of business and economics

Abstract

The main objectives of the study is to examine the long run and short run impact of tax revenue on economic growth in Ethiopia using GDP per capita, as a proxy for economic growth over the period 1990/91to 2019/20. The trends of tax revenue and GDP per capita growth rate of Ethiopia is fluctuating during specified time of period. ARDL and ECM methods are used for the study. The results of the Bound test suggests that there is long term correlation with GDP per capita, tax revenue, trade deficit, and real effective exchange rate.

The result of ARDL models indicates that estimated coefficients, tax revenue, is significant effect on economic growth and their signs are consistent to the existing theories. The finding of this study concerning long run positive impact of tax revenue on economic growth is consistent with the endogenous growth models. In short-run, the estimated short-run model indicates that tax revenue is significantly positive impact on GDP per capita at 5% significance level.

The findings of the research have an important policy implication. The result of trends of tax revenue and GDP per capita growth rate of Ethiopia during the study periods are fluctuating so it recommended that Ethiopian government should take appropriate measures that makes tax revenue and GDP per capita growth rate lower fluctuating trends. In order to increase economic growth, it is important to strengthen the taxation system. Firstly, Tax authority should build strong and stable tax institution and encourage volunteer taxpayers. Secondly, Policy makers should build a secure business atmosphere for taxpayers to raise tax revenue. Finally, government revenue and government expenditure must goes in parallel ways, so government establish strategies that encourage distortionary taxation and productive government expenditure.

There are several further research direction Firstly, the study did not consider some variables, like illegal trade, contraband trade, tax evasion and informal sectors activities. Secondly, macroeconomic variables such international trade, inflation rate, and remittance that directly affect economic growth but cannot included in the model so this can be an opportunity or further research directions.

Key Words: Ethiopia, Economic Growth, Tax Revenue, ARDL Method, Bound Test, ECM Model

CHAPTER ONE
INTRODUCTION

1.1. Background of the study

Government needs revenues resource in order to run both public and administrative activities. For these activities, different sources of finances are used under different condition. Taxation is one sources of finance and it is a compulsory contribution imposed by the state (Belay, Z. 2015).

Most factors that can boost the economic growth have attention of most economists and policy makers for a long time. It is a well-known fact that taxation affects the decisions of economic agents regarding to resource allocation such as working, saving and investing (Singapore economic review, 2018). Tax revenue is vital for the growth and sustainability of the economy of both developed and developing countries (Bird, 2008 and Aliye, G. 2016).

Olashore, L. and orjih, M. (2001) cited in African capacity building foundation (2015) states that taxation is useful in raising revenue, controlling the consumption of certain commodities, controlling monopoly, reducing income inequalities, Improving the balance of payments as well as securing sectors for infants.

The tax revenue of Ethiopia in 2017 and 2018 fiscal year amount was 210.1359 billion birr and 235.23 billion birr respectively growing up by 10.67% (MOR, 2018). In other ways the gross domestic product (GDP) of Ethiopia by 2018 year was 7.13% that is higher relative to 2016 years (MOFEC, 2018).

In Ethiopia, the government collects a mix tax including both direct and indirect taxes. Direct taxes comprise of personal income tax, rental income tax and other incomes tax at federal and regional levels. In addition to this indirect taxes are comprised of domestic taxes and foreign trade taxes, including customs duties, excise tax, value added tax, surtax, and withholding tax (Haile, K. 2015).

The goal of this research is to examine the effect of tax revenue on economic growth (GDP per Capita) in Ethiopia by considering GDP per capita measured as dependent variable and tax

revenue, government expenditure, gross capital formation and labor force as independent variables by using the year 1990/91 to 2019/20.

1.2. Statement of the problem

Theoretically, there are two arguments that tax impacts on economic growth. Firstly, Solow growth model show that fiscal policy, such as taxation, can have level effects but cannot affect the rate of economic growth in the long run (Solow, 1956). Secondly, endogenous growth models give that a role for policy, like taxation, to positively affect the growth rate of economy in the long-run, has been developed by (Barro, 1990; Barro and Sala-i Martin, 1992; King and Rebelo 1990; Lucas, 1990; Rebelo, 1991 and Romer, 1996).

Empirically, many different studies have showed the impact of taxation on economic growth in different ways. Among those Orcan, C. (2009) cited in MPRA (2018) investigated the impact of tax on economic growth in South Africa. The result indicated that tax revenue is positive relationship to economic growth. Babatundel, A., Ibukan, O. and oveyemi, G. (2017) makes investigation to assess the connection of taxation and economic growth in Africa from the period 2004 to 2013; the outcome of the study shows that tax revenue is positive relation to GDP and encourages economic growth in Africa. In addition to this; Ali, A. (2015) and Ali, Y. (2017) as cited in Saney, D. (2018) conducted study to examine the effect on economic growth of tax revenue in Kenya over the period 1991 to 2013. The result indicates that tax revenue collections have a major positive impact on Kenya's economic development (Saney, D. 2018).

Similarly Dladla, K. (2017) as cited in Hlalefang, D. (2018) conducted the study on impact of taxation on economic growth in South Africa for the period 1981-2016. The results suggest that, in the short and long run, it is negatively linked taxation and economic development. In other ways, some studies evidenced no relationship between taxation and economic growth for instance; Ojong, M., Anthony, O. and Arikop, F. (2016) investigate the effect of tax revenue on Nigerian GDP growth from the period 1986 to 2010. The finding reveals that there are no effect and the insignificance relationship between tax revenue and Economic growth (GDP).

Workineh, A. (2014) cited in international journal of business and economics (2016) study on the tax revenue determinants in Ethiopia from the period 1974 to 2013 using Johnson co-integration method and the result indicated the GDP, foreign assistance, industrial value added share of GDP and per capita income in the long-term a positive effect on tax revenue. In other ways,

Firehiywot, H. (2016) conducted study on the Nexuses between tax revenue, inflation, private final consumption and economic growth in Ethiopia for the period 1970 to 2015 using VECM methods. The result revealed that Real GDP has a negative and significant long term effect on real tax revenue where as in the long run the impact of the actual private final consumption is positive and negligible in the long term. Theoretical literature implicates an inverse relationship between taxation and economic growth, on the other side the finding of empirical studies shows positive, negative and no relationship between taxation and economic growth.

There are inconsistences and conflicting result of study which require further research to identify the effect of tax revenue in Ethiopia. The main focus of this research is to evaluate the effect of tax revenue on economic growth. In addition to this, previous studied research in Ethiopia did not clearly identify the effect of tax revenue on economic growth therefore, this research elaborates the previous similar study in Ethiopia by including tax revenue and government expenditure in Solow and Swan growth models.

1.3. Objectives of the study

This study has two objectives. Those are:

1.3.1. General objectives of the study

1.3.2. The main objective of this study's analysis is to evaluate the short and long-run effect of tax revenues on economic growth in Ethiopia over the period from 1990/91 to 2019/20**.**

1.3.3. Specific objectives of the study

Beside this,

i. To identify impact of tax revenue on GDP per capita in Ethiopia.

ii. To indicate policy implication **and/ or** recommendation.

1.4. Research question

i. What is the long-run and short-run impact of tax revenue on Economic growth in Ethiopia?

ii. What looks like the trends of tax revenue and GDP per capita growth rate of Ethiopia?

1.5. Statements of hypothesis

The following hypothesis confirmed by this study:

H0**:** Tax revenue has no significance impact on economic growth in Ethiopia

1.6. Significance of the study

Firstly, the findings of the study may be used by the Ethiopian ministry of revenue to serve as a reference in setting certain actions for improvement on tax revenue. Secondly, the policy makers can use the findings to come up with the policies that will be helpful in tax revenue. Finally, the study stands to benefit future researchers, scholars and academicians who may wish to study in tax revenue related issues.

1.7. Scope and/or Limitation of research papers

To analyze the effect of tax revenue on economic growth, the analysis is limited to four independent variables. The analysis uses tax revenue, government expenditures, gross capital formation and labor force as independent variables and GDP per capita in terms of economic growth as dependent variables. The time period selected in the study covers time series data from 1990/91 to 2019/20.

1.8. Organization of the Study

This research has organized into five chapters. The current Chapter deals background of the study; statements of the problems, objectives of the study, research questions, statements of hypothesis, significance of the study and scope **and/or** limitations of the study. The rest of the paper is organized as follows. The next Chapter two deals the theoretical literature, empirical literature and conceptual frame works that pertaining to the relationship between tax revenue and economic growth; Chapter three presents about the research methodology; Chapter four presents descriptive and econometric analysis of the models and the interpretation of the results; the last Chapter provides a summary of main findings, conclusions, policy implication, limitation and direction for future research.

CHAPTER TWO
REVIEWS OF THEORATICAL AND EMPRICAL EVIDENCES

This chapter shows to review literature on taxation, tax revenues, economic growth and the conceptual framework for dependent and independent variables. The review has three main parts. Part 2.1 presents a review of the theoretical aspects related to the study. This is followed by the empirical literature review in part 2.2 and finally 2.3 conceptual frameworks.

2.1. THEORATICAL LITRATURE ON TAXATION

There are several researches that have been carried out to evaluate the relationship of economic growth with taxes. The outcomes of these studies, however, appear to yield contradictory results. Some studies have shown that taxes have improved the economy's efficiency, while other studies have shown that taxation decreases development and economic growth, while others have little evidence. The theoretical portions of the literature explain subjects such as the concept of taxation, Tax revenue and economic growth, and Exogenous and Endogenous growth model.

2.1.1. Taxation and Economic Growth

Tax revenue is the revenue received by government through taxation. Ola, F. (2001); Jhingan, D. (2004); Bhartia, K. (2009) cited by Bernard, J. (2015) states that Taxation is important to cover government expenditure and to redistribute wealth which transfers to development of a country.

Tax revenues are used to fund public services and products, such as infrastructure, education, health care, etc., on which innovators and companies benefit and rely on. Endogenous growth theories like, Romer, R.(1996) argues that taxation firstly, maintains economic growth and enhances global competitiveness, secondly, provides secure and predictable economic stability, thirdly eliminates long-term reliance on assistance, and finally, ensures good governance by enhancing government accountability.

Another view argues that taxation is an important determinant to investment and economic development, because taxation inhibits and deprives individuals or enterprises of ingenuity and rewards. Proponents of this view, such as Judd, Chamley, Barro, and King and Rebelo (1996), suggest that lower taxes inspire people to be innovative. Engen and Skinner (1996) argue that taxation can have a negative effect on economic growth in to five ways. Firstly, discourage the expenditure. Secondly affect the labor supply. Thirdly decrease the growth productivity, fourthly

diminishing the marginal productivity of resources. Finally reduce the efficient utilization of human capital.

Economic growth defined as changes in material production and increase in country's GDP during a relative short period of time, usually one year. Majority of literature proofs that gross domestic product per capita can be used as an efficient measure of economic growth. Gross domestic product per capita is defined as a total production of a country's output divided by its population.

2.1.2. Exogenous and Endogenous Growth model

Solow neoclassical growth theory (1956) shows that population growth and technological progress results in improve long run growth rate. Distortionary taxation and productive government expenditure encourage investing on human or physical capital but in the long run affect transitional growth effect rather than growth effect. In other ways, Endogenous growth theories like Barros (1990) and king and Rebel (1990) cited by Canadian journals of economics indicate that Distortionary taxation and productive government expenditure will effect on the long run growth rate of economy.

2.3. Benefit theory and Taxations

The benefit theory of taxation fundamentally deals the connection between the taxpayers and the state in conceptual terms. Taxation is the price paid by taxpayers for benefit or service provided by the states. Therefore, taxation should be small or insignificance for those receives no benefit from the state and high taxation receives high benefit from the state (Graeme, S. 1994).

Samuelson, P. (2012) cited by Magus, F. (2013) states as taxation of benefit theory treats that tax level are determined because taxpayer pay taxation proportionately for the government benefit they receive. In other ways, the individuals or organization that benefits the most from public service pay the most taxes.

2.2. EMPIRICAL EVIDENCES

The empirical study shows on prior research conducted on impact of tax revenue on economic growth. Accordingly, some studied research from Ethiopia and other countries is selected as follows bellow to illustrate the results that are relevant to these studies.

2.2.1. Empirical studies on tax revenue in case of global Studies

The empirical studies conducted on impact of tax revenue on economic growth showed that positive, negative and no relationship among tax revenue and economic growth. The empirical study and the finding of the result are described as follow bellows:

Lulia, R. (2015) cited in MPRA paper (2018) studied on the effect on Romania's economic growth of government revenues and expenditures over the period 1998q1 to 2014q1 using auto regression methods and Wajahat, R., Raza, A. and Shazia, K. (2020) also make investigation on government revenue and economic growth of Pakistan a variables GDP growth, tax revenue, non-tax revenue and additional receipt by using ARDL method over a period 1979 to 2017. The result of both researchers study shows that tax revenue is positive relationship with economic growth. In addition to this, Dladla, K. (2018) conducted the study on impact of taxation on economic growth in South Africa for the period 1981-2016 using Auto regressive difference Lad methods. The result shows an inverse correlation relationship between taxation and economic growth.

Gashi, B., Asllani, G. and Boqolli, L. (2015) cited IJOE and Business Administration Volume VI on the impact of tax system and economic growth (GDP) on Kosovo by OLS methods using variables such as personal tax, vat, withholding tax and GDP. Tony, A. and Jorgen, L. (2006) asses the Determinants of Tax Revenue in Sub-Saharan Africa over the period 1980 to 2005 using OLS methods. Badreldin, M. and Ahmed, A. (2013) studied on Fiscal Policy and Economic Growth in Sudan using a variable GDP, government tax revenue and government expenditures over a period by OLS methods. Sanely, D., Ali, A. and Ali, Y. (2018) conducted study to evaluate the effect on economic growth and tax revenue on Kenya over the period 1991 to 2013 In addition to this, Babatundel, A., Ibukan, O. and oveyemi, G. (2017) carried out a study to look at the correlation between taxation and economic growth in Africa between 2004 and 2013. The researchers conclude that there is a positive effect on economic growth from tax revenue. On the other ways, Ojong, M., Anthony, O. and Arikop, F. (2016) investigated the effect of tax revenues on Nigerian economic growth using OLS methods over the period 1986 to 2010. The finding reveals that there are no effect and the insignificance relationship between tax revenue and Economic growth (GDP).

Seida, B. (2015) analyzed the effect of tax and government expenditure on the Ethiopia's economic growth for the period from 1980 to 2014.The result shows that the direct taxes and

current expenditure has a significant negative long-term effect on GDP growth and indirect tax and capital expenditures has positive significant impact on GDP growth in long run. In other ways, both government expenditures and direct taxes are not any significant effect on economic growth, whereas indirect taxes are positive significant impact on economic growth of Ethiopia in the short run. Orcan, C. (2009) cited in MPRA papers (2018) investigated the effect of tax on economic growth in South Africa using VAR method. The result indicated that tax revenue is positive relationship to economic growth.

2.2.2. Empirical studies on tax revenue in case of our countries

There are some researches that investigated on tax revenue issues in Ethiopia with various topic names, some of which are described below:

Teshome, A. (2018) makes study on government revenue and economic growth in Ethiopia using yearly time series data from 1985-2016. The researcher follow VECM to analysis the finding of the study by using the variables such as Real GDP, total labor force, tax revenue, investment and grant and the result indicate that tax revenues are positively affect economic growth in Ethiopia. In other side, Firehiywot, H. (2016) conducted study on the Nexuses between tax revenue, inflation, private final consumption and economic growth in Ethiopia for the period 1970 to 2015 using VECM methods. The result revealed that Real GDP has a negative and significant long term effect on real tax revenue where as in the long run the impact of the actual private final consumption is positive and negligible in the long term.

Dasalegn, M. (2014) studied on Taxation Contributions on Ethiopia's economic growth using yearly data from 1993 to 2012 using multiple ordinary least square methods .It uses a variables tax revenue, non-tax revenue and foreign revenue as dependent variables and Gross domestic product (GDP) as dependent variables and the result shows that positive and significant correlation between taxation and economic growth. In addition to this, Workineh A. (2016) study on the tax revenue determinants in Ethiopia from the period 1974 to 2013 using Johnson co-integration method and the result indicated the GDP, foreign assistance, industrial value added share of GDP and per capita income in the long-term a positive effect on tax revenue.

Table 12: Summary of theoretical and empirical literature reviews

Author, and year of study	Titles of the thesis/study	Statistical method	Included variables in the models	Result of the findings
Exogenous growth model like (Solow, 1956)	Taxation and economic growth	Theoretical	Taxation and economic growth	Taxation has no effect on economic growth in the long run rather it has short run effect
Endogenous growth model like Lucas, 1990 and Romer,1996	Taxation and economic growth	Theoretical	Taxation and economic growth	Taxation can have long run or permanent effect on economic growth
Lulia Rosoiu (2015)	the effect on Romania's economic growth of government revenues and expenditures	ARDL methods	Economic growth(GDP), government revenue and expenditure	Government expenditure and revenue positively affect economic growth of Romanian economy.
Wajahat, R, Raza, A. and Shazia, K. (2020)	government revenue and economic growth of Pakistan	ARDL methods	GDP growth, tax revenue, non-tax revenue and additional receipt	Tax revenue is positive relationship with economic growth of Pakistan economy.
Dladla, K. (2018)	Impact of taxation on economic growth in South Africa	ARDL	GDP, Tax on income, profits, capital gains, investment and trade openness	An inverse correlation relationship between taxation and economic growth
Tony, A. and Jorgen, L. (2006)	The Determinants of Tax Revenue in	OLS methods	Economic growth(GDP), tax revenue	open and less agricultural based economies, in less populated and peaceful

	Sub-Saharan Africa			countries, the tax to GDP ratio is higher
Sanely, D., Ali, A., and Ali, Y. (2018)	Impact of tax revenue on economic growth in Kenya	OLS multiple regression	GDP, tax revenue and grant	Taxation has a direct positive impact on economic growth **and/or** development in Kenya.
Babatundel, A. and oveyem, G. (2017) and MPRA papers, (2018)	The correlation between taxes and GDP (economic growth) in Africa	OLS multiple regression	GDP, Direct Foreign Investment (DFI) and Inflation	Taxation is linked to GDP in a constructive way and stimulates economic development in Africa.
Ojong, M., Anthony, O. and Arikop, F. (2016)	Impact of tax revenue on economic growth in Nigeria	OLS multiple regression	GDP, VAT, Non-oil Revenue, and Tax revenue	No effect and the insignificance impact on tax revenue and Economic growth.
Dasalegn, M. (2014)	tax revenue for economic growth of Ethiopia	OLS Methods	GDP, revenues from taxation, non-tax revenue and international income	Positive and significant correlation between tax revenue and economic growth.
Orcan (2009)	Effect of tax on economic growth in South Africa	VAR method	GDP, tax revenue, real interest rate, CPI Gov.t expenditure.	Tax revenue is positively related to economic growth in south Africa.
Workineh, A. (2016)	tax revenue determinants in Ethiopia	Johnson co-integration Method/ma	Actual GDP per capita, assistance, and the share of	Economic growth positively and significantly affect tax

		ximum likelihood/VECM	GDP in industrial value added	revenue
Teshome, A. (2018)	government revenue and economic growth in Ethiopia	Johnson test and VECM methods	Real GDP, total labor force, tax revenue, investment and grant	Positive relationship b/n tax revenue and economic growth.
Firehiywot, H. (2016)	The Nexus between Tax Revenue, Inflation, Consumption and Economic Growth in Ethiopia	VECM Methods	GDP, Tax Revenue, Inflation, Private Final Consumption	Negative relationship between taxes revenue and economic growth in the long run

Source: organized by the researcher, 2020

2.2.3. Evaluation and gaps of existing literature

The literatures that incorporated in studies are scholarly journal articles, books and theses. The existing literatures are evaluated based on basic criteria such as accuracy, authority, objectivity, and coverage. Identified variables in reviews of literature on impact of tax revenue on economic growth are capital stock, total labor force, government expenditure, tax revenue, and GDP per capita. Previously discussed under review of empirical literature parts; there are researches in some developing nations on effect of taxation on economic growth; in Ethiopia also there are some researches, for instance, Workeneh A. (2014) tax revenue determinants in Ethiopia which involving variables such as GDP growth, tax revenue, Foreign assistance, GDP per capita and the share of GDP in industrial value added. They exclude some policy variables such as government revenue (tax revenue), government expenditure, gross capital formation, labor force and GDP per capita. This research attempts to fill this gap in existing literature.

2.4. CONCEPTUAL FRAMEWORKS

The study uses Solow and Swan growth models of Cobb-Douglas production function as their conceptual framework by specifying economic growth a proxy of GDP per capita as dependent variable, while tax revenue, government expenditure, labor force and capital as independent variables. Takumah, W. (2014) is used Cobb-Douglas production function to investigate tax revenue and economic growth in Ghana.

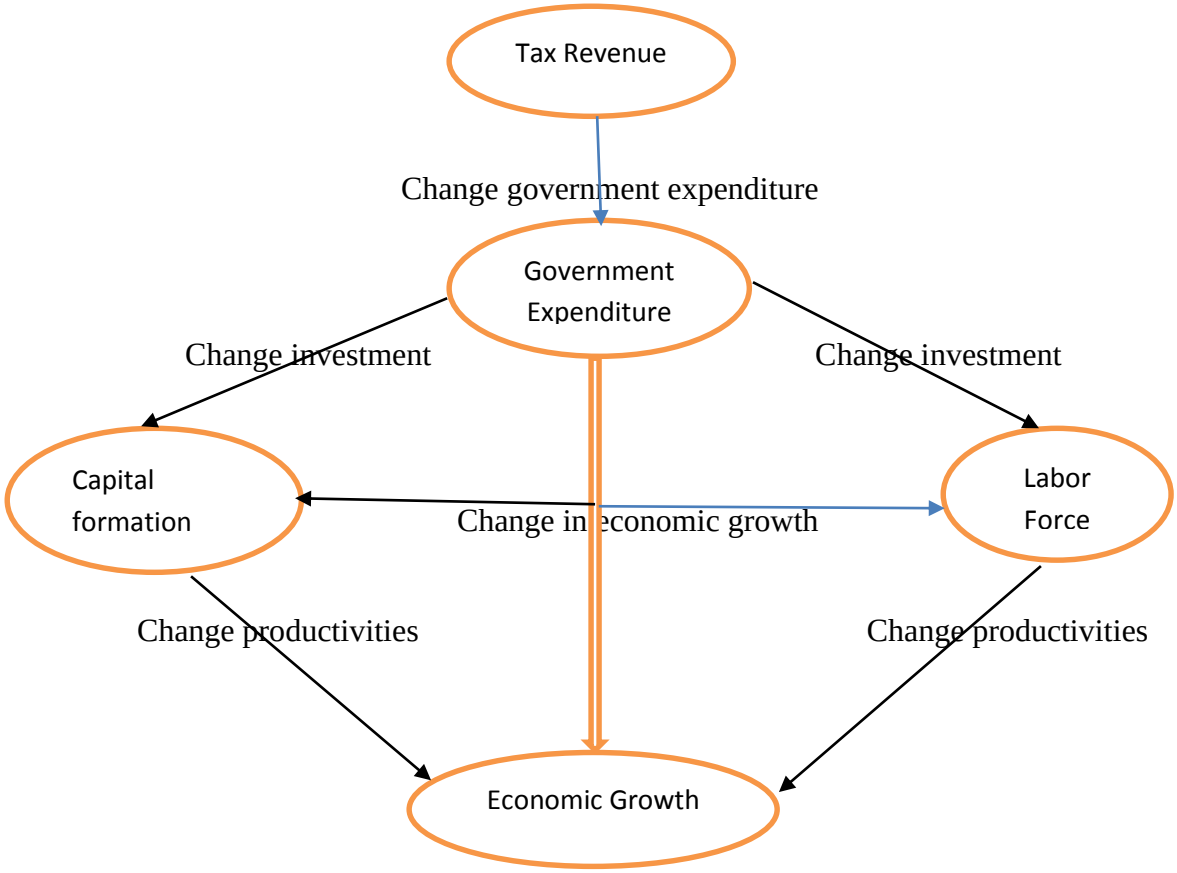


Figure 2.1 conceptual Framework

Source: Solow and Swan growth models of Cobb-Douglas production function

Relationship

CHAPTER THREE
RESEARCH METHODOLOGY

Topics that are discussed in this chapter are types and sources of data, description of variables, research design, and data analysis and model specification.

3.1. Types and Data Source of the study

The secondary data sources of the study are found from domestic source and World Bank. Domestic data sources are available from the Ministry of Revenue of Ethiopia, the Ethiopian Customs Commission, and the Ministry of Finance and Economic Cooperation. Data's that are not getting from domestic sources are taken from World Bank. After 1990/91 yearly data of labor force and GDP per capita is not easily obtained from domestic source and I get from Ethiopia's national bank after 2000 years, due to shift in base year fresh data is done by institution, this is not sufficient for needed yearly data, so I ought to use World Bank data source that is closest to domestic source of data.

Table 3.1 Types and Sources of Data

Variables	Proxy	Units	Expected Sign	Source of data
GDP per capita	GDPPCt	US Dollar	+	World bank
Tax revenue	TRt	million birr	+	MOR
Government Expenditure	GEXt	million birr	+	MOFED/MOFEC
Gross Capital Formation	GCFt	million birr	+	MOFED/MOFEC
Labor Force	LFt	In number	+	World bank

Source: organized by the researcher

3.2. Description of Variables

3.2.1. Dependent variable

i. GDP per Capita ($GDPPCt$)

GDP per capita is the total amount of the market values of all domestically produced final goods and service divided by total population during each fiscal year is taken as a proxy for economic growth.

3.2.2. Independent variables

i. Tax Revenue (TRt)

Tax revenue is the amount of money that has been collected by the Ethiopia government from people and organizations during each fiscal year. It is money collected by the government from domestic tax and foreign trade taxes. It excludes other source of finance such as grant and so on. Tax revenue is direct source of finance for government expenditure and indirect positive effect on economic growth so it is expected to positive sign (Romero, 1992).

ii. Government expenditure (GEt)

Government expenditures are total expense of goods and service by government during each fiscal years. Economic growth can be rise when an increase in government expenditure, particularly on productive activities such as infrastructure, water facilities, road Construction, and provision of electricity (Bergh and Karlsson, 2010). Keynesian models propose government expenditure is expected to increase economic growth.

iii. Gross capital formation ($GCFt$)

Gross capital formation is used a proxy for capital in Solow swan growth models. It is total investment on capital (human and physical). The expected sign of GCF coefficient is positive because investment in capital accumulation is support economic growth by increasing production of goods and services Barro (1995) and Sala-I-Martin (2004).

iv. Labor Force (LFt)

Labor force is selected instead growth of population because it include the total population aged between 15 to 65 years which is active productive people. In developing country like Ethiopia labor force is a power for labor intensive economic growth but less productive. According to Domar, (1946) and Solow-Swan, (1956) models labor force is good indicators of economic growth.

3.3. Research Design

In order to see the impact of tax revenue on economic growth in Ethiopia, the researcher adopts quantitative research approach because of the quantifiable and the numerical data that is used in the process. This research deals with the analysis of the empirical variables from time series data for the period 1990/91 to 2019/20.

3.4. Data Analysis Method

In order to achieve the study goals and assessing the data, both descriptive and inferential statistics are applied. In the descriptive analysis, the simple graph, mean, minimum, maximum

and so on will be employed to analyze the data. In addition to this, inferential statistics has been used and the study utilizes time series data analysis method involving autoregressive difference lags (ARDL) model for analyzing the impacts of tax revenue on economic growth in Ethiopia. Hence, the final data analyzed by using eview software version 10.

3.5. Model Specification

3.5.1. Theoretical Model Specification

Econometric model is used for the study, which runs a multiple regression analysis between GDP per capita (dependent variable) and the variables that affect economic growth such as Tax Revenue, government expenditure, Gross capital formation and labor force (independent variables).

Solow and Swan (1956) neoclassical growth model identifies the relationship between tax revenue and economic growth. Solow-Swan model explains the total output in an economy as a product of capital and labor.

$Yt = f\ (Kt, Lt)$ ……...……3.1

Where total output is Yt, Kt is capital and Lt is labor, and t is time

$Yt = f\ (Kt, Lt, At)$……..……3.2

Where, total factor productivity (TFP) is At

We assume that the functional Cobb-Douglas form production function, then we get

$Yt = AtKt^{\alpha}Lt^{\beta}$…….……3.3

Where α and β are shares of capital and labor

At is not constant but varies over time

3.5.2. Empirical Model Specification

The study uses the neoclassical Solow growth model by including technology At to over time.

Following studies such as Mansouri (2005), Fosu and Magnus (2006), we derived

Let $At = f\ (TRt,GEt) = TRt^{B1}GEt^{B2}$, then substitute

$Yt = \partial Kt^{\alpha}Lt^{\beta 1}\ TRt^{B2}GEt^{B3}$ ……..…….3.4

TRt is Tax Revenue, GEt is Government expenditure

Bi are share of inputs in the total output

By taking the natural logarithm, we arrive at the following specification

$Yt = ln\partial + \alpha lnKt + B1lnLt + B2TRt + B3GEt + Ut$……..……3.**5**

Let ln∂= B0

$Yt = B0 + \alpha lnKt + B1lnLt + B2TRt + B3GEt + Ut$……..……..3.6

The following ARDL model is specified to determine the long-run co-integration relationship between dependent and independent variables.

$\Delta LnGDPPC_t = \beta_0 + B1LnGDPPCt - 1 + B2LnTRt - 1 + B3LnGEt - 1 + B4LnGCFt - 1 +$
$B5LnLF_{t-1} + \sum_{i=1}^{n} B6\,\Delta\, lnGDPPC_{t-i} + \sum_{i=0}^{n} B7\Delta\, lnTR_{t-i} + \sum_{i=0}^{n} B8\,\Delta\, lnGE_{t-i} + \sum_{i=0}^{n} B9\,\Delta lnGCF_{t-i} +$
$\sum_{i=0}^{n} \Delta LnLFt - i$ + B11Trend + Ut …….....3.7

WHERE,

Logarithm of GDP per Capita at T, LNGDPPCT

Logarithm of Tax Revenue at T, LNTRT

Logarithm of Government expenditure at T, LNGET

Logarithm of Gross capital formation at T, LNGCFT

Logarithm of Labor force at T, LNLFT

It is intercept i.e. β_0

B6, B7, B8, B9 and B10; are coefficient that measures short-run relationships

Ut is an error term and n denotes lag length of autoregressive process

T is the time trend of the models

If the variables have a long-run equilibrium relationship; co-integration boundary tests are carried out. The hypotheses are described as shown below:

No long-run co-relationship between the variables exist Ho: β1=β2=B3=β4=B5=B6=0

The following long-run model is calculated after assessing the presence of long-run relationships between the variables:

$LnGDPPC_t = \beta_0 + B1lnGDPPC_{t-1} + B2lnTR_{t-1} + B3lnGE_{t-1} + B4lnGCF_{t-1} +$
$B5LnLF_{t-1}$ + B_{10}Trend + Ut……3.8

The next step is to estimate the model of VET that displays the dynamic short run parameter.

The calculation of the basic EC is as follows:

$\Delta LnGDPPC_t = \beta_0 + \sum_{i=1}^{n} B6\,\Delta lnGDPPC_{t-i} + \sum_{i=0}^{n} B7\,\Delta lnTR_{t-i} + \sum_{i=0}^{n} B8\,\Delta lnGE_{t-i} +$
$\sum_{i=0}^{n} B9\Delta GCFt - i + \sum_{i=0}^{n} B10LnLFt - i$ + B_{11}Trend + αECTt-1 + μt …… 3.9

Where:
B6, B7, B8, B9 and B10 are the short run model's coefficients

ETt-1 is error term lags by one period.

μt is vector error terms

α is error correction parameter

ECT is calculated from the long-run model, the coefficients of which are obtained by normalization of equations. In order to verify the robustness of the model in the long-term and short-term, normality test; serial correlation test, heteroscedasticity test and recursive coefficient test for model stability are estimated.

CHAPTER FOUR
RESULT AND DISCUSSION

In this chapter data are analyzed through descriptive statistics and estimation of multiple regression method of econometric models.

4.1. Descriptive Statics

The first process analysis in this part is descriptive analysis. It is used to define relevant aspects of variables' phenomena and provide comprehensive information on each relevant variable. This displays the mean, standard deviation, minimum and maximum values of the various variables that help to provide an image about the variables. The mean, standard deviation, minimum and maximum values of these variables are used as a descriptive description of these variables. The study are 30 observations from 1990/91 to 2019/20, as shown in table 4.1 below. There is one GDP per capita growth dependent variable ($LNGDPPCT$) and three independent variables ($LNTRT$, $LNGET$, $LNGCFT$ and $LNLFT$).

Table 4.1: Results of descriptive statistics

	LNGDPPCT	LNTRT	LNGEXT	LNGCFT	LNLFT
Mean	5.531935	2.810015	3.069889	4.585318	3.524463
Median	5.407644	2.448418	2.669236	4.328613	3.528157
Maximum	6.754604	5.535364	5.396714	6.506830	4.007151
Minimum	4.718499	0.104360	1.172482	2.818398	3.030617
Std. Dev.	0.684855	1.679291	1.348658	1.105420	0.294281
Skewness	0.426764	0.239990	0.393548	0.485369	-0.023178
Kurtosis	1.749640	1.844196	1.950969	2.121939	1.830315
Jarque-Bera	2.864888	1.957829	2.149983	2.141653	1.712888
Probability	0.238725	0.375719	0.341301	0.342725	0.424669
Sum	165.9580	84.30044	92.09666	137.5595	105.7339
Sum Sq. Dev.	13.60177	81.78057	52.74751	35.43666	2.511436
Observations	30	30	30	30	30

Source: Own estimation using EVIEWS, version 10

Annual GDP per capita varies from 4.72 to 6.75 respectively that indicating minimum and maximum value in 2002/03 and 2019/20. The average percentage is 5.53 and the amount of 0.68 for each observation deviates from this average. Similarly, annual tax revenues vary from 0.10 to 5.54, reflecting minimum and maximum inflows for the years 1990/91 and 2019/20, respectively. The average TR is 2.81 and each observation deviates from this average by a value of 2.45. The Government expenditure varies from a minimum of 1.17 in 1991/92 to a maximum

of 5.39 in 2019/20. The average government expenditure is 3.07 and the deviation for each observation is 1.35.

The gross capital formation for the study period ranges from 2.81 (in 1991/92) to 6.50 (in 2019/20), representing the minimum and maximum exchange respectively. The mean value of the GCF is 4.58, with each observation deviating by 1.11 from the average value. In addition to this, Annual labor force varies from 3.03 to 4.01 respectively that indicating minimum and maximum value in 1993/94 and 2019/20. The average percentage is 3.52 and the amount of 0.29 for each observation deviates from this average

4.2. Trend of tax revenue and GDP per capita in Ethiopia

4.2.1. Trend of tax revenue in Ethiopia

Annual tax revenue collection of a country has been increasing from year to year but the amount of tax revenue is more than higher after 2008/2019 years (Figure 4.1). The amount of tax revenue collections in 1990/91are 2.05 billion birr and 35.71 billion birr in 2009/10 between this year's 94.26 percent increases the tax revenue collection income. As shown in below tax revenue has been continuously increased after 2009/10 due to the establishments of institutional reforms (UNDP, 2015).

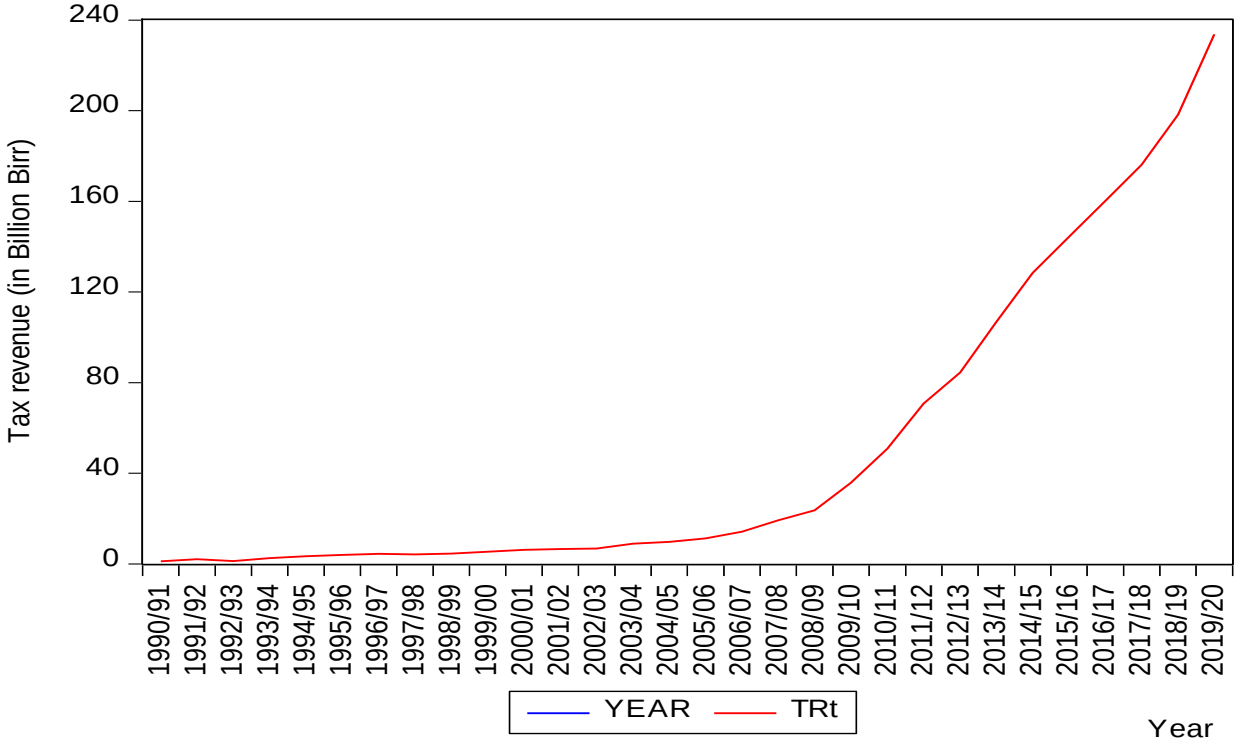


Figure 4.1: Trend of tax revenue (in billion birr)

Source: MOR statistical data own estimation using EVIEWS, version 10

4.2.2. Trends of GDP per capita in Ethiopia

As it indicated below figures the trends of Gross Domestic Product (GDP) per capita of Ethiopia is shows up and down. Teshome (2018) pointed out that the main reason for up and down direction of gross domestic product per capita is due to fluctuation of gross domestic product and increase in population of a country.

GDP per capita are sharply decrease up to 1995/96, and then starts to increase and decrease up to 2004/05, after 2005/06 up and down to 2019/20.

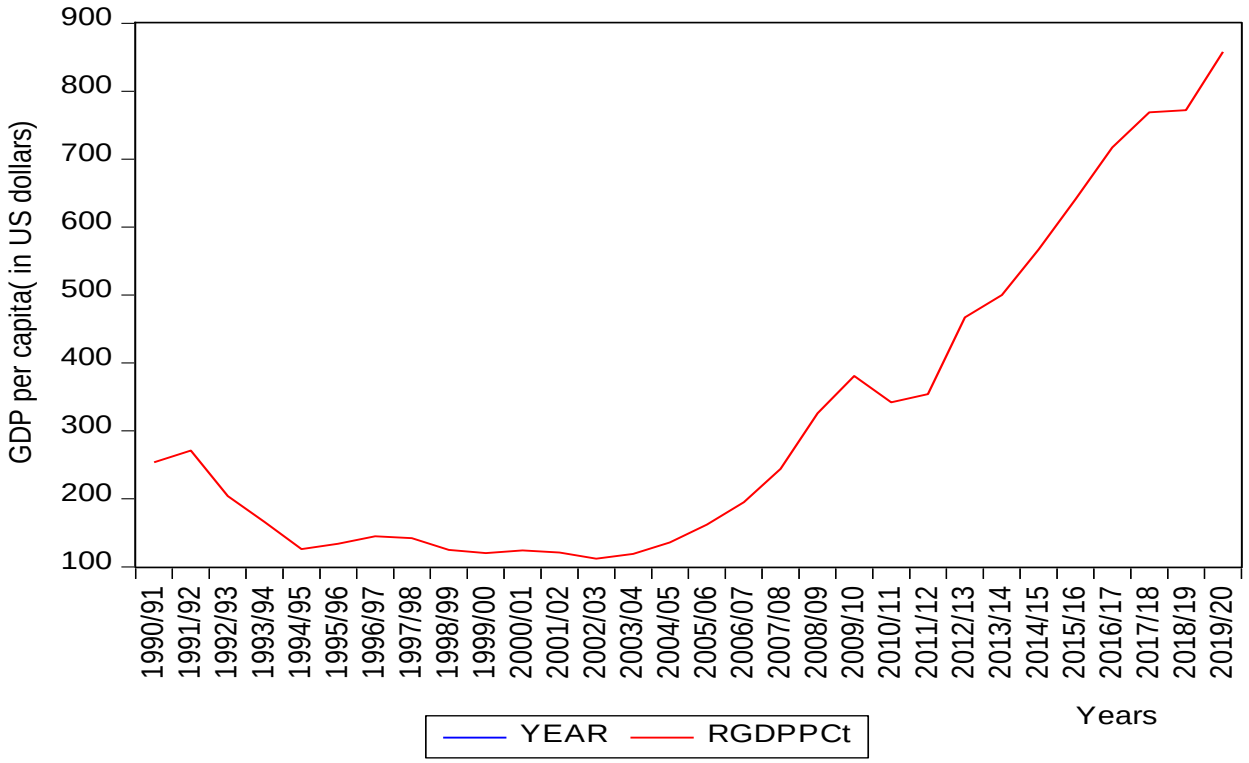


Figure 4.2: Trend of GDP per capita (in US dollar)

Source: World Bank statistical data Own estimation using EVIEWS, version 10

4.2.3. Trend of GDP per Capita and tax revenue growth rate in Ethiopia

Both tax revenue and GDP per capita growth rate are up and down trend. This shows that unstable trend of tax revenue and GDP per capita growth rate through specified time of periods. The trend is indicated as below figure 4.3.

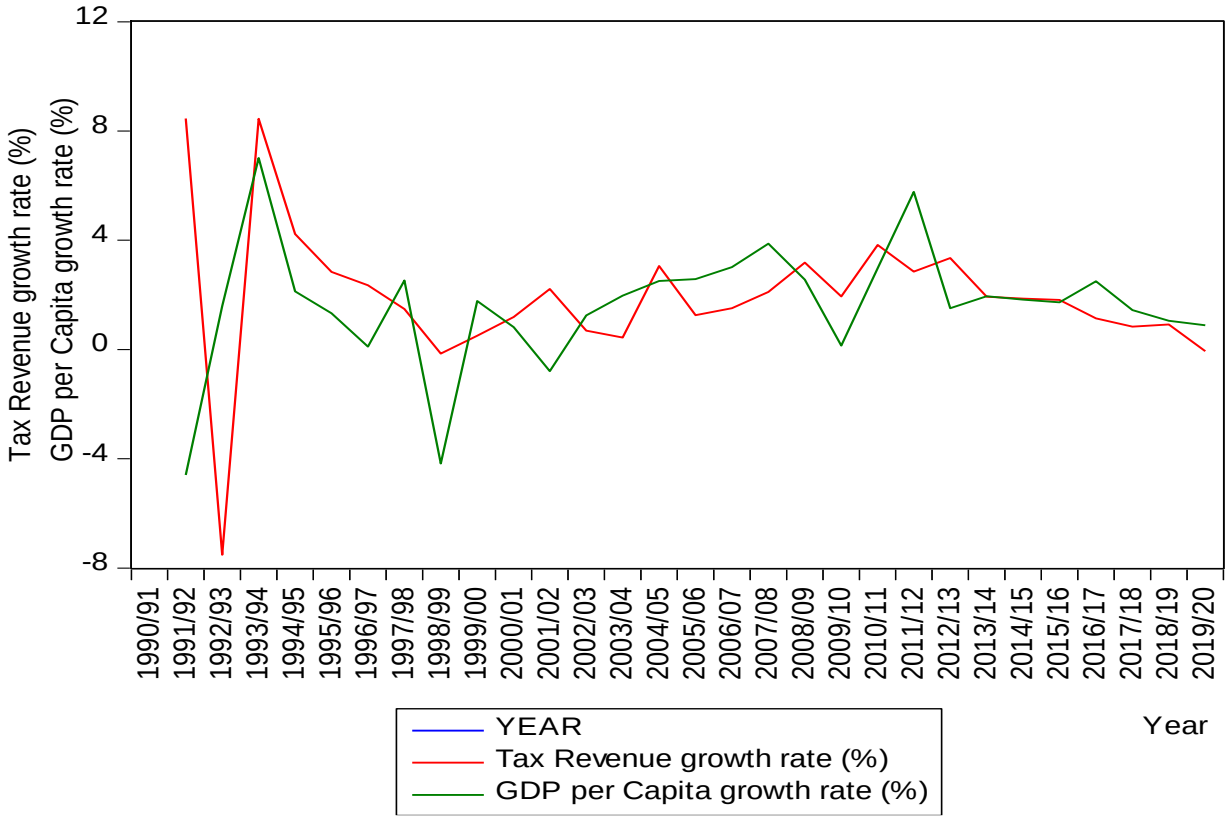


Figure 4.3: Trend of GDP per Capita and tax revenue growth rate (in %) in Ethiopia

Source: MOR and World Bank statistical data own estimation using EVIEWS, version 10

The average rates of growth in GDP per Capita for the period for 1990-1993 are 7 percent. In other ways, tax revenue growth rate has decreased by 7.5 percent. The reason for this is due to war and transition period for emerging government and military rule regimes. The growth rate of GDP per capita and Tax revenue of Ethiopia for the period 1994-2019 is unstable (Figure 4.3). It is up and down in different direction, so the reason for these phenomena is due to new policy, institutional structure change and increase in the population of the country.

4.3. Multiple regression estimation method

4.3.1. Augmented Dickey-Fuller Unit Root Test

A unit root test is performed using Augmented Dickey-Fuller unit root (ADF) test to evaluate the stationary variables. This test is performed to verify the order of integration of the variables. Only with intercept and trend at lag two is tested.

Table 5.1: ADF unit root test results

variables	Test Statstics	T-Statistic With C and T			Stationaries Level	Integration
		1%	5%	10%		
LNGDPPCT	-3.7652 (0.0341)	-4.3239***	-3.5806	-3.2253	Stationary	I(0)
D(LNGDPPCT)	-3.7179 (0.0377)	-4.3239	-3.5806**	-3.2253*	Stationary	
LNTRT	-2.0186 (0.5671)	-4.3098***	-3.5742**	-3.2217*	Not stationary	I(1)
D(LNTRT)	-8.1225 (0.0000)	-4.3239***	-3.5806**	-3.2253*	Stationary	
LNGET	-1.8652 (0.6463)	-4.3098***	-3.5742**	-3.2217*	Not stationary	I(1)
D(LNGET)	-4.4507 (0.0078)	-4.3393***	-3.5875	-3.2292*	Stationary	
LNGCFT	-1.7717 (0.6922)	-4.3239***	-3.5806**	-3.2253*	Not Stationary	I(1)
D(LNGCFT)	-6.2192 (0.0001)	-4.3239***	-3.5806**	-3.2253*	Stationary	
LNLFT	-2.8720 (0.01859)	-4.3239***	-3.5806**	-3.2253*	Stationary	I(0)
D(LNLFT)	-2.6155 (0.2767)	-4.3239***	-3.5806**	-3.2253*	Stationary	

Source: Own estimation using EVIEWS, version 10

NOTE. *** (1% critical), ** (5% critical) and * (10% critical) significance level.

The finding of this test shows that LNTRT, LNGET and LNGCFT have stationary at first difference and not stationary at levels with intercept and trend, LGDPPCT and LNLFT are stationary both at levels and first difference. Such types of test result are not allowing us to apply the Johansson co-integration methods rather allow to use bound test. This is one of the key

explanations for the use of Pesaran, shin, and smith (2001) ARDL approach (bound test method of co-integration).

4.3.2. Long run ARDL Bound Test to Co-integration

4.3.2.1. Optimal lag length

The first tasks in the co-integration of bound test method are to estimate lag length of the model. AIC* is taken as the main reference for this study and ARDL model, maximum lag order two is selected.

Table 5.2: Lag order selection criteria

Lag No	Log. L	L.R Error	F.P Criteria	A.I. Criteria	S.C Criteria	H.Q Criteria
0	156.5133	NA	1.96e-11	-10.46523	-9.989447	-10.31978
1	251.260	142.1213	1.42e-13	-15.44720	-13.78195*	-14.93812
2	**287.2375**	**41.11626***	**8.26e-14***	**-16.23125***	**-13.37653**	**-15.35854***

Source: own analysis using EVIEWS, version 10

4.3.2.2. Bound test for Co-integration analysis

The results for the ARDL bound test are revealed from Table 5.3 at all significant levels; F-statistics i.e. 5.59 is larger than the critical bound values. This indicates that the variables are co-integrated at levels of significance Therefore; this suggests that the overall results show there is co-integration among the variables. There is a long run relationship between tax Revenue, government expenditure, gross capital formation, labor forces and real GDP per capita in Ethiopia.

Table 5.3: Bound test for lower and upper bound critical value

TS	Value	Significance levels	Lower Bound I(0)	Upper Bound I(1)
FS	10.7974	10%	3.03	4.06
K	4	5%	3.47	4.57
		2.5%	3.89	5.07
		1%	4.40	5.72

Source: Eview 10 results

As it is showed in table 5.3 below, with an intercept and no trend, the F-statistics i.e. 10.7974 estimated is larger than I (1) at all levels of significance. This implies that the null hypothesis (H0) B1=B2=B3=B4=0 (there is no long run relationship) against its alternative (H1) B1≠B2≠B3≠B4=0 (there is long run relationship) is rejected based on the critical values at 5% level of significance.

Table 5.4: Bound test for Co-integration analysis

Description	Value
number of observation	30
optimal lag length of the model	2
calculated F-statistic	10.7974

Source: owns analysis based on Eview 10 softwares

4.3.3. Long-run model Estimation Method

The result indicates that the existence of long-run relationship among variables such as GDP per capita, tax revenue, government expenditure, gross capital formation and labor force. Once the existence of a long-run co-integration relationship between variables has been approved, estimated coefficients after normalizing (long-run level equation) on GDP per capita are revealed as showed in table 5.4

Table 5.5: Long-run estimated coefficients using ARDL Methods: LNGDPPCT

Models Variables	Parameters	Standard Error	Test Statistics	Probability
LNTRT	1.237119	0.224509	5.510333	0.0000***
LNGEXT	0.030284	0.214703	0.141053	0.8896
LNGCFT	-0.454847	0.216975	-2.096313	0.0523**
LNLFT	-62.81629	5.522765	-11.37407	0.0000***

EC=LNGDPPCT-(1.2371*LNTRT+0.0303*LNGET-0.4548*LNGCFT-62.8163*LNFT

Source: Researchers calculation based on Eview 10 softwares

Note: *** (1% critical), ** (5% critical) and * (10% critical) significance level.

The result of the above table and long-run level equation indicates that the estimated coefficient of tax revenue is statistically significant and their signs are match to the existing theories. If one percent increases tax revenue, then 1.24 percent changes (increases) in GDP per capita in the long run. The finding of this study concerning indirect long run positive impact of tax revenue on economic growth is fit with the endogenous growth models mainly developed by (Barro, 1990; Barro and Sala-i Martin, 1992; King and Rebelo 1990; Lucas, 1990; Rebelo, 1991 and Romer, 1996). The developers of the model show that taxation has positive impact on economic growth in the long run. When we see Empirical study made in Ethiopia and other area, many study are

done, the result of this research are similar to Teshome A. (2018), Orcan(2009, and Babtundel, Ibukan and Oveyems (2017) using VECM, VAR and OLS methods respectively.

Next to tax revenue, government expenditure has insignificant long run postive impact on GDP per capita. If one percent increases in government expenditure, then 0.03 percent increase in GDP per capita but insignificant at levels. On the other hand, gross capital formation and labor force have a significant negative impact to the Ethiopian economy (GDP per capita). When one percent increases in gross capital formation, then 0.45 percent decreases in GDP per capita. Whereas one percent increases labor force, GDP per capita decrease by 62.81percents.

LONG RUN EQUATION

EC=LNGDPPCT-(1.2731*LNTRT+0.0303*LNGET-0.4548*LNGCFt-62.8163*LNFT

This long-run equation shows that the relationship between GDP per capita as dependent variables and independent variables like, tax revenue (LNTRT), Government expenditure (LNGET), Gross capital formation (LNGCFT) and Labor force (LNLFT).

4.3.3.1. Test of Hypothesis

H0: Tax revenue has no significance impact on economic growth in Ethiopia

Table 5.4.1 Walid test

Test Statistics	Value	df	Probability
F-statistic	7.475714	(2, 16)	0.0051***
Chi-square	14.95143	2	0.0006***

Source: Researchers calculation based on Eview 10 softwares, 2021

Note: *** (1% critical), ** (5% critical) and * (10% critical) significance level.

If the probabilities of F-statistics of walid tests are less than 5 percent, it implies that the variables (tax revenue) jointly statistically significant at 5 percent level. Therefore, the null hypothesis is rejected rather the alternative hypothesis is accepted.

In the long run, the test result in table 5.4 shows that tax revenues have a positive and meaningful effect on the actual per capita domestic product. The LNGDPPCT (GDP per capita) means that a 1 percent rise in tax revenue results in a 1.23 percent increase in actual GDP per capita and the relationship is statistically significant at 1 percent significance level, keeping other things constant. Therefore, higher the tax revenue leads to a higher level of infrastructure and social activities improvement, which ultimately increase a GDP per capita of a country (endogenous growth models). This study therefore concludes that the null hypothesis that tax revenue has no significance impact on economic growth in Ethiopia from 1990/91 to 2019/20 is rejected and the alternative that there is

a strong and relevant relationship for the study period between real GDP per capita and tax revenue can be fail to rejected rather can be accepted. The result is match with theoretical study of endogenous growth models and empirically the findings of Teshome A. (2018), Orcan (2009, and Babtundel, Ibukan and Oveyems (2017).

4.3.4. Short run Error Correction Estimation Method

The short-run ECM model is estimated after the acceptance of long-run coefficients of the model. Table 5.6 indicates the error correction representation of the ARDL model. The estimated lagged error correction term (ECT-1) is negative and statistically significant at one percent levels. This result shows the co-integration among the variables included in the model. The coefficients of error correction term (-0.7165) implies that 71.65 percent of the disequilibrium is adjusted toward equilibrium annually.

Table 5.6: Error Correction representation of ARDL model: ARDL (1, 2, 1, 2, 0)

Dependent Variables: D (LNGDPPCT)

Models Variables	Parameters	Standard Error	Test Statistics	Probability
C	141.0158	17.17848	8.208865	0.0000***
@TREND	1.424921	0.172209	8.274351	0.0000***
D(LNTRT)	0.232593	0.080013	2.906929	0.0103**
D(LNTRT(-1))	-0.213856	0.074684	2.863502	0.0113**
D(LNGEXT)	-0.242634	0.097380	-2.491617	0.0241**
D(LNGCFT)	-0.178437	0.077970	-2.288541	0.0360**
D(LNGCFT(-1))	0.162952	0.096545	1.687824	0.1108
ECT(-1)*	-0.716470	0.087216	-8.214854	0.0000***

R-squared	0.864202	Mean dependent var	0.041160
Adjusted R-squared	0.816672	S.D. dependent var	0.147382
S.E. of regression	0.063104	Akaike info criterion	-2.453096
Sum squared resid	0.079643	Schwarz criterion	-2.072466
Log likelihood	42.34335	Hannan-Quinn criter.	-2.336734
F-statistic	18.18246	Durbin-Watson stat	1.961491
Prob(F-statistic)	0.000000		

Source: Researchers calculation based on Eview 10

Note: *** (1% critical), ** (5% critical) and * (10% critical) significance level.

Short-run Equation:

D (LNGDPPCT) = 141.01 + 1.42TREND + 0.2325 D(LNTRT) -0.2138 D(LNTRT (-1)) -2426 D(LNGET) – 1784 D(LNGCFT) +1629 D(LNGCF (-1)) - 0.7164 ECT (-1) + et

According to the above results, tax revenue D(LNTRT) GDP per Capita not only in the long run but also in short-run positively and significantly affect GDP per Capita. If one percent increases in tax revenue result in 0.2325 percent increase GDP per Capita. The finding of this study concerning short run positive impact of tax revenue on GDP per capita are match with exogenous growth model mainly developed by Robert Slow, 1956 and empirically the result is not similar with the work of Orcan (2009). On the other hand, if one percent increases in government expenditures (LNGET), then 0.2426 percent decreases GDP per Capita in the short run.

4.3.5. Diagnostic tests

To assess the degree of fit of the approximate model, a diagnostic test is performed. The diagnostic test indicates that the serial correlation, heteroskedasticity and the model's non-normality have been passed by the model.

4.3.5.1. Test for serial correlation

The Durbin-Watson Test and Breusch-Godfrey Serial Correlation LM Test are used to carry out serial correlation tests. The Breusch-Godfrey Serial Correlation LM Test has been used for this analysis and the result shows that there is no serial correlation. .Therefore, we do not dismiss the null residual hypothesis, but rather accept it because the F-statistic P-values surpass the 5% critical value.

F-statistic	2.953755	Prob. F(2,14)	0.0851
Obs*R-squared	8.308938	Prob. Chi-Square(2)	0.0157

Source: researcher calculations

4.3.5.2. Heteroskedasticity Test

The existence of heteroskedasticity in the model has been tested to ensure that the regular errors are correct. The error variance is said to be heteroskedastic if the variance of the residuals is non-constant. This research contains both the Breusch-Pagan test and the heteroskedasticity ARCH test. The rule of the decision states that if the p-value of the test is lower than any of the significance levels selected, i.e. 5 percent, it indicates a possible heteroskedasticity problem; while if the p-value of the test is higher than any of the significance levels selected, i.e. 5 percent does not indicate a possible heteroskedasticity problem The Breusch-Pagan-Godfrey Test in table below shows that the F- statistic and chi-square p-value are more than 5 percent, meaning

that, we do not reject the null-hypothesis that the residuals are homoskedastic at 5% significance level. Therefore, the residuals of the model have no problem of heteroskedasticity.

Breusch-Pagan-Godfrey Heteroskedasticity Test

F-statistic	1.016266	Prob. F(11,16)	0.4748
Obs*R-squared	11.51664	Prob. Chi-Square(11)	0.4010
Scaled explained SS	3.590266	Prob. Chi-Square(11)	0.9804

Source: Researcher Calculations

Furthermore, in the table below, the ARCH heteroskedastic test shows that both the F- statistic and chi-square p-value are more than 5 percent, which means that we do not reject the null hypothesis of no ARCHI effect. In other words, the null hypothesis that the residuals are not heteroskedastic, it is accepted, but rather heteroskedastic at the 5 percent significance stage. Hence, the model's residuals are considered to be homoscedastic.

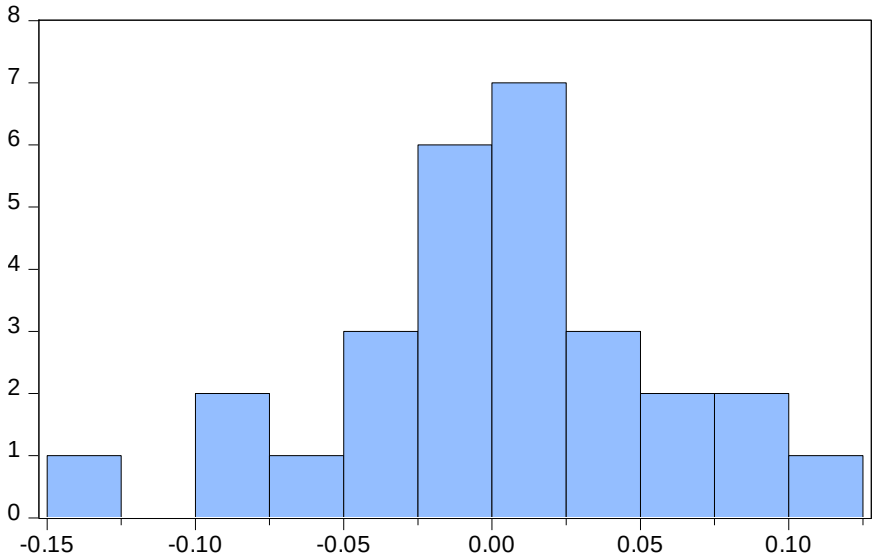
Heteroskedasticity Test : ARCH

F-statistic	2.436597	Prob. F(1,25)	0.1311
Obs*R-squared	2.397824	Prob. Chi-Square(1)	0.1215

Source: Researcher Calculations

4.3.5.3. Normality Test

The study checked whether the residuals are usually distributed or not, by using the Jarque-Bera normality test. If there are no problems with normality in the model, the residuals are usually distributed. This means that, in order not to reject the null hypothesis of normality at the 5 percent level, the p-value given at the bottom of the normality test screen should be greater than 5 percent. As shown in the figure below, since the histogram is bell-shaped and the Bera-Jarque statistic is not significant, this means that the p-value given in the normality histogram figure is greater than 0.05, at the 5 percent level, we do not reject the null normality hypothesis. As a result, in this study, we conclude that the error terms of the model specified are found to be normally distributed.



Source: Researchers plot based on Eview 10 softwares

The results reported in table 5.7 shows that there is no autocorrelations and hetroskedasticity, and the errors are normally distributed.

Table 5.7: Summary of Diagnostic tests

Test statistics	F statistics	Probability
Breusch-Godfry correlation LM test	2.9537	0.0851**
Breusch-Pagan-Godfry Hetroskedasticity test	1.0162	0.4748**
ARCH Heteroskedasticity Test	2.4365	0.1311**
Jarque-Bera Normality test	0.4349	0.8045**

Source: Researchers calculation based on Eview 10 software's

Note: The ** sign indicate the significance of the coefficients at 5% significance level.

4.3.5.4. Model Stability Test

In addition to the above-mentioned diagnostic tests, the stability of long-term estimates is assessed by applying the recursive coefficient test (RCT). For such tests, Pesaran (1999) and shin (2001) are suggested.

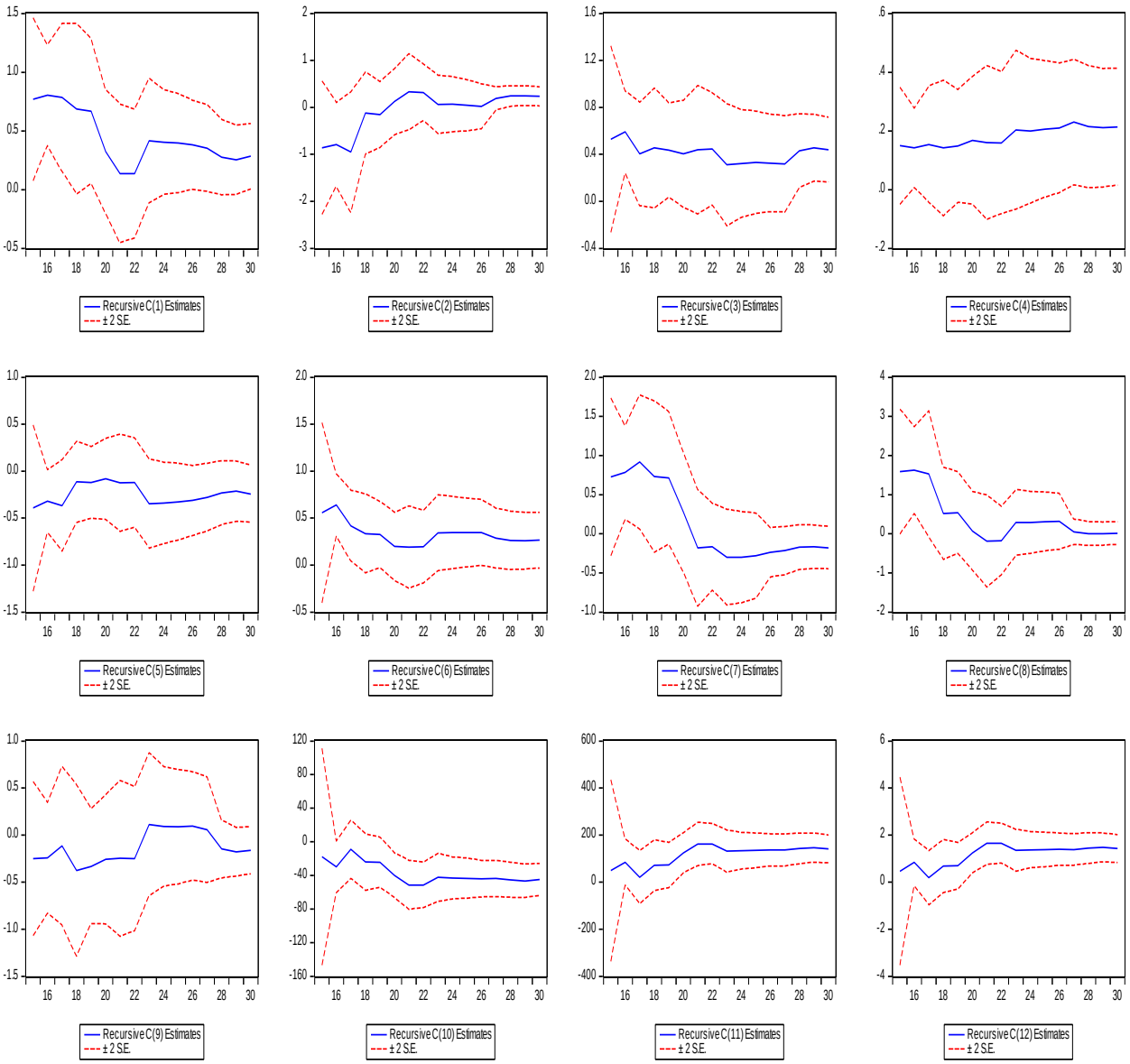


Figure 4.4 Plot of recursive coefficient stability test

Source: Researchers plot based on Eview 10 softwares

As can be seen from the above figure, the plot of recursive coefficient test did not cross the lower and the upper critical limits and there is no more high variation of coefficients of the variables. So we can conclude that long run and short run estimates are stable and the models are stable and efficient.

4.3.6. Granger-Causality test

If two variables are co-integrated in the long-run, one of the test, which is applied to determine the direction of causality, is Granger-Causality test. This is because the presence of co-integration leads to the existence of at least unidirectional causality between the variables.

Table 5.8: Granger Causality Checking Tests at lag two

Granger Causality Tests
Lag two

Null hypothesis	Observations	F- Statistics	Prob.
LNTRT does not Granger Cause LNGDPPCT LNGDPPCT does not Granger Cause LNTRT	28	9.05616 0.21723	0.0013*** 0.8064
LNGEXT does not Granger Cause LNGDPPCT LNGDPPCT does not Granger Cause LNGEXT	28	8.12013 1.72903	0.0021** 0.1997
LNGCF does not Granger Cause LNGDPPCT LNGDPPCT does not Granger Cause LNGCFT	28	8.83677 5.09600	0.0014*** 0.0147**
LNLFT does not Granger Cause LNGDPPCT LNGDPPCT does not Granger Cause LNLFT	28	11.1807 2.75049	0.0004*** 0.0849*
LNGEX does not Granger Cause LNTRT LNTRT does not Granger Cause LNGET	28	0.59024 10.5294	0.5624 0.0006***
LNGCFT does not Granger Cause LNTRT LNTRT does not Granger Cause LNGCFT	28	4.12408 5.78550	0.0295** 0.0092**
LNLFT does not Granger Cause LNTRT LNTRT does not Granger Cause LNLFT	28	3.83415 1.12156	0.0366** 0.3429
LNGCFT does not Granger Cause LNGEXT LNGEXT does not Granger Cause LNGCFT	28	3.83482 4.47216	0.0365** 0.0229**
LNLFT does not Granger Cause LNGEXT LNGEXT does not Granger Cause LNLFT	28	1.29557 0.37215	0.2930 0.6933
LNLFT does not Granger Cause LNGCFT LNGCFT does not Granger Cause LNLFT	28	1.41946 0.41946	0.2599 0.6623

Source: Researchers calculation based on Eview 10 software's

Note: *** (1% critical), ** (5% critical) and * (10% critical) significance level.

The Granger-Causality test are made to separate the direction of causality between the dependent variable GDP per capita and independent variable i.e. tax revenue. The outcome of Granger-Causality test indicates that, there is significant causality between GDP per capita and tax revenues. The results reported in table 5.8 show that, there is unidirectional causal relationship from tax revenue to GDP per capita so, we can reject the null hypothesis LNRGDPPCT does not granger cause of LNTRT rather we accept LNTRT does not Granger Cause LNGDPPCT that means tax revenue causes GDP per Capita. Therefore, it is important to determine the direction of causality between tax revenue and economic growth in Ethiopia for policy purpose.

Table 5.9: Granger Causality Checking Tests at lag Three
Granger Causality Tests
Lag Three

Null hypothesis	Observations	F- Statistics	Prob.
LNTRT does not Granger Cause LGDPPCT LNGDPPCT does not Granger Cause LNTRT	27	4.17643 4.32760	0.0189** 0.0166**
LNGEXT does not Granger Cause LNGDPPCT LNGDPPCT does not Granger Cause LNGEXT	27	1.81602 4.05652	0.1767 0.0210**
LNGCF does not Granger Cause LNGDPPCT LNGDPPCT does not Granger Cause LNGCFT	27	2.14739 0.96352	0.1262 0.4293
LNLFT does not Granger Cause LNGDPPCT LNGDPPCT does not Granger Cause LNLFT	27	3.17650 2.40897	0.0465** 0.0972*
LNGEX does not Granger Cause LNTRT LNTRT does not Granger Cause LNGET	27	0.12705 5.89135	0.9430 0.0047**
LNGCFT does not Granger Cause LNTRT LNTRT does not Granger Cause LNGCFT	27	2.78986 3.19802	0.0670* 0.0456**
LNLFT does not Granger Cause LNTRT LNTRT does not Granger Cause LNLFT	27	0.70887 2.06173	0.5580 0.1376
LNGCFT does not Granger Cause LNGEXT LNGEXT does not Granger Cause LNGCFT	27	2.44675 3.53839	0.0936* 0.0333**
LNLFT does not Granger Cause LNGEXT	27	0.73685	0.5423

LNGEXT does not Granger Cause LNLFT		0.23427	0.8714
LNLFT does not Granger Cause LNGCFT	27	1.41946	0.2599
LNGCFT does not Granger Cause LNLFT		0.41946	0.6623

Source: Researchers calculation based on Eview 10 software's

Note: *** (1% critical), ** (5% critical) and * (10% critical) significance level.

The result reported in table 5.8 and table 5.9 shows that at lag one, there is unidirectional significant causality between GDP per capita and tax revenue. At lag two there is bidirectional relationship between GDP per capita and tax revenue.

CHAPTER FIVE
CONCULUSION AND POLICY IMPLICATION

This chapter summarizes the key findings and result of the analysis. Furthermore, this chapter revealed the conclusion, policy recommendation, limitation and direction for future research.

5.1. Conclusion

This study aims to assess the long run and short run impact of tax revenue on economic growth in Ethiopia (using GDP per capita, as a proxy for economic growth) over the period 1990/91to 2019/20. Due to fluctuations tax revenue collection amount, GDP and increase of population of the countries, the trends of tax revenue and GDP per capita growth rate of Ethiopia is unstable (goes up and downs) during specified time of period. The ARDL Approach to Co-integration and Error Correction Model are applied in order to analysis the long-run and short run impact of tax revenue on Economic growth. The findings of the Bounds test shows that there is a stable long run relationship between GDP per capita, tax revenue, government expenditure, gross capital formation and labor force.

The result of ARDL models indicates that an estimated coefficient such as tax revenue is significant and their signs are consistent to the existing theories. If one percent increases in tax revenue, then 1.23 percent increases in GDP per capita. The finding of this study concerning indirect long run positive impact of tax revenue on economic growth is fit with the endogenous growth models mainly developed by (Barro, 1990; Barro and Sala-i Martin, 1992; King and Rebelo 1990; Lucas, 1990; Rebelo, 1991 and Romer, 1996) and empirically similar to the study of Teshome A. (2018), Orcan (2009), and Babtundel, Ibukan and Oveyems (2017) that are done using VECM, VAR and OLS methods respectively

Next to tax revenue, government expenditure has long run positive impact on GDP per capita but it is not significant at level. If one percent increases in trade deficit, then 0.030 percent increase in GDP per capita but insignificant at levels this is fit the theories of Keynesian that is government expenditures affect GDP calculation positively. On the other hand, gross capital formations and labor force rate have a significant negative impact to the Ethiopian economy (GDP per capita). If one percent increases in gross capital formation, then 0.45 percent decreases in GDP per capita in the long-run, while one percent increase in labor force, GDP per capita decrease by 62.81 percent this inconsistence to existing theories of exogenous and endogenous growth model.

In short-run, the coefficients of error correction term are -0.7165 suggesting about 71.65 percent annual adjustment toward long run equilibrium. The estimated short-run model indicates that tax revenue is significantly positive impact on GDP per capita. When tax revenue increases by one percent, then GDP per capita increased by 0.2320 percent. The results of short-run analysis revealed that positive effect of tax revenue on per capita GDP are fit with exogenous growth model developed primarily by Robert Solow in 1956. Similarly, when one percent increases government expenditures, GDP per capita decrease by 0.011 percent.

The models are checked the diagnostic test of serial correlation, test of heteroskedasticity, normality test and granger causality test. The test of result shows that the model is no problems of serial correlation, heteroskedasticity and the model is normality distributed. On the other hand, the test of granger causality test shows that there is unidirectional significant relationship between tax revenue and GDP per capita at lag one while bidirectional significant relationship between tax revenue and GDP per capita at lag two. This result indicated that there is strong relationship between tax revenue and economic growth in the long run.

5.2. Policy Implications

Both in the short-run and long-run, the study shows that tax revenue significantly affect economic growth. Therefore, Ethiopian ministry of revenue (MOR), Ethiopian custom commission (ECC), ministry of finance and economic cooperation (MOFEC) and policy makers may try to improve tax revenue in the following manner to affect economic growth.

i) The finding of trends of tax revenue and GDP per capita growth rate of Ethiopia during the study periods are fluctuating so it recommended that Ethiopian government should takes appropriate measures that makes tax revenue and GDP per capita growth rate stable and that make lower the gaps.

ii) Tax authorities (MOR and ECC) should be build strong and stable tax institution and transparent to tax payers. Such measure should increase uncollected tax revenue due to bureaucratic work process of tax authorities.

iii) Policy makers **and/or** the Government (MOFEC, MOR and ECC) should try to create comfortable trade environment for tax payers that increase tax revenue. Such measure should focus not only improve tax revenue but also increase tax revenue collection capacity of the country.

iv) Government (MOR, ECC) should also try to educate and build capacity of tax payers and stakeholders at all levels. Such measures may important to aware the society about taxation and increase volunteers tax payer

v) Government revenue and government expenditure must goes in parallel ways, so government and other responsible bodies establish strategies that encourage distortionary taxation and productive government expenditure. These measures should be important to increase GDP per capita of the countries.

5.3. Limitation

This study are faced a number of limitations. There are several limitations that can constrain my findings of the study as described below:

Firstly, illegal trade, contraband trade, tax evasion and informal sectors activities which may have some influence on economic growth and due to lack of data are not considered for the regression models for this study.

Secondly, another limitation that may constrain the findings of this study is easily unavailability of data particularly annual tax revenue data and GDP per capita beyond 1990/91. Therefore, this study considered time series annual data over the period 1990/91-2019/20 which limit only thirty years.

Lastly, another limitation that may constrain my finding is that well-structured domestic data cannot easily available in Ethiopia. This created to restrict my variables to only four.

5.4. Direction for future research

This study uses several variables to investigate the impact of tax revenue and economic growth; there are several opportunities or further research. In spite of this, this part shows some of these directions.

Firstly, impact of tax revenue on economic growth to be analyzed in the context of Ethiopia. Since this study did not consider some independent variables, like illegal trade (street trader), contraband trade, tax evasion and informal sectors activities, this can be an opportunity or further researchers to analyze the impact of such variables on tax revenue and economic growth which may give more robust results.

Secondly, this study considered four macroeconomic independent variables. However, there are several other macroeconomic indicators that affect economic growth (GDP per capita). Some of such variables are international trade (sum of import and export trade), inflation rate, and remittance and so on. The addition of these variables to the model may be an opportunity or further researchers to achieve more robust result.

Thirdly, this study covers the period 1990/91-2019/20. If possible, further research maybe analyzed on a period that is earlier than 1990/91to achieve more generalized result on the impact of tax revenue and economic growth. As such, this can be an opportunity or further research in this regard.

REFERENCES

ACBF, (2015). Taxation and economic growth in developing nations. African Capacity Building Foundation Working papers No. 09.

Ali, A. (2015) and Ali, Y. (2017). Effect of economic growth in tax revenue: journals of political Economy. 1(05) PP. 27-28

Aliyu, G. (2016). Factors influence tax revenue in Ethiopia. Master thesis papers: Addis Ababa University: Addis Ababa, Ethiopia PP. 27-29

Al-Qadi, M. (2019). Taxation and Economic Growth; Review articles of Journal of Global Economics volume no. 7 PP. 5-7

Babtundel, A., Ibukun, O., and Oveyemi, G. (2017). The connection of taxation and economic Growth. MPRA Papers 2(01) PP. 23-25.

Badreldin, M. and Ahmed, A. (2013). Fiscal Policy and Economic Growth in Sudan: MSc thesis Papers. Khartoum, Sudan.

Barro, R. (1990). Endogenous growth theories on government expenditures; political economy Journals 48(01) PP. 95-107

Barro, R. and Salai-martin, K. (1990). Economic growth models in public finance economy: Article reviews of political economy. 49(02), PP. 654-671.

Belay, Z. (2015).Tax Revenue Performance Determinants: FDRE, Master's Thesis, Addis Ababa University, Ethiopia, Addis Ababa.

Bird, R. (2008). Challenges of taxes on developing nations: international business institute 1(02), PP. 325-327

CJE, (2001). Canadian Journal of Economic: Testing endogenous growth models. Canada Vol.34 No. 1 PP. 36-57

Dasalegn M. (2014). Contributions of tax revenue for economic growth of Ethiopia, the paper work Prepared for MSC in Addis Ababa.

Dladla, K. (2018). Impact of taxation on economic growth in South Africa: journals of business and economics. 2(04), PP. 29-31.

Eric M. Engen, Jonathan S. (1996). Taxation and economic growth: NBER Cambridge Working paper no.5826 PP. 55-56

Firehiywot, H. (2016). The nexus between tax revenue, inflation, private final consumption and Economic growth; the paper prepared for MSC in Addis Ababa University Addis Ababa, Ethiopia.

Gareth, D. (2000). Taxation and Economic Growth: Institute for Fiscal studies. Exeter

Gashi, B, Asllani, G and Boqolli, L. (2015). Impact of tax system and economic growth on Kosovo: IJOE, 2(03), PP. 3-5

Graem, S. (1994). The benefit theory of taxation: Australia tax forum, Australia PP 493 University Vol. 21 no. 1 pp. 141-168.

Haile, K. (2015). Balance of payment to monetary approach and monetary policy implications. Journals of article review 5(1) PP. 10-12

Hlalefang, D. (2018). Impact of taxation on economic growth: Article reviews of political economy. 3(01), PP. 5-7.

Judd, Chamley, Barro, and King and Rebelo (1996). Taxation and Economic development views. International business and economics, 89(05), PP. 58-59.

King, R. and Rebela, S. (1990). Economic growth and public policy; improving neoclassical Theories, JOPE, 89 (06), PP. 136-145

Lucas, P. (1990). Mechanics of economic development; international monetary economy Journals 22(02) PP.5-12

Lulia, R. (2015) and MPRA (2018). Effect of economic growth on government expenditure and Government Revenue: working Papers MPRA 32(01), PP. 21-25.

Michael P.Todaro and Stephen C.Smith (2012).Economic Development.12 editions: The New York, George Washington University.

MOFEC, (2018). Ministry of finance and economic cooperation: Annual report records.

MOR, (2018). Ministry of revenue: Annual Report on Custom Duties and Taxes.

MPRA paper (2018). Impact of taxation on economic growth: Munich Personal Repec Archive MPRA paper No. 86291.

Ojong, M., Anthony, O. and Arikpo, F. (2016). Effect of tax revenue on economic growth in Nigeria JOPE: 7(01). PP. 35-37

Ola, F. (2001), Jhingan, D. (2004), Bhartia, K. (2009) and Bernard, J. (2015). Theory of taxation and economic growth: Article reviews of business and economics 48(01), PP. 21-23.

Olashor, L. and Orjih, M. (2001). African Capacity building Foundation. The working paper prepared in African Capacity building Foundation.

Orcan, K. (2009).The impact of taxation on economic growth: The case of South Africa; the working paper Prepared for MSc thesis in South Africa.

Romer, P. (1996). Long run growth and return to scales; Journals of Political economy 95(05) PP. 1002-1023

Rudolf, M. (2014). The impact of taxation on economic growth: Review of economic Perspectives 4(14) PP. 25-27.

Samuelson, P. (2012) and Magus, F. (2013). The relation between Government revenue and Economic growth; Kenya, University of Nairobi PP. 11-15.

Saney, D. (2018). Effect of economic growth in tax revenue: journals of political economy. 3(02) PP. 15-17

Seida, B. (2016). The effect of taxation and government expenditure on economic growth in Ethiopia: MSc thesis paper, Addis Ababa University.

Singapore economic reviews, (2018). Taxation and Growth in Singapore economy. International Business and economics. 4(02), PP. 31-32

Solow R (1956). Contributions of economic growth theory: International journal of economics PP. 55-96.

Swan, T. (1956). Capital accumulations of economic growth: Record of economics journal: PP. 194-2017

Takumah, W. (2014). Tax revenue and economic growth in Ghana: Munich Personal RePEc Archive (MPRA). MPRA Paper No. 58532 PP. 23-28

Teshome, A. (2018). Government revenue and economic growth in Ethiopia: MSc thesis papers, Ethiopia.

Tony, A, and Jorgen, L. (2016). Determinants of tax revenue in sub-Saharan Africa countries: Journals of political economy: 48(01), PP. 36-37.

UNDP (2015). Performance and Prospects of Tax Collection in Ethiopia: United nation Development programs: The working paper prepared in United Nations

Wajahat, R, Raza, A, Shazia, K. (2020). Government revenue and Economic growth of Pakistan: JOPE, 2(04), PP. 29-31.

Werkineha, A. (2016). Tax revenue determinants in Ethiopia: Journals of business and economics 7(01). PP. 17-19.

World Bank (2020). World development indicators; https://datatopics.worldbank.org/world-development-indicators/

APPENDIX 1: Original data used for analysis

Year	Real GDP per capita (US dollar)	Tax revenue (Billion birr)	Government Expenditure (Billion birr)	Gross capital formation (Billion birr)	Labor Force (In million)
1990/91	254	1.11	3.64	19.68	20.71
1991/92	271	2.05	3.23	16.75	21.44
1992/93	204	1.18	3.43	29.02	22.19
1993/94	166	2.21	4.39	31.46	22.97
1994/95	126	3.07	5.21	35.95	23.9
1995/96	134	3.87	5.58	40.85	24.76
1996/97	145	4.72	5.75	43.06	25.64
1997/98	142	5.35	7.19	42.82	26.54
1998/99	125	5.29	10.53	44.83	27.48
1999/00	120	5.23	13.67	44.19	28.47
2000/01	124	6.13	10.44	50.81	29.39
2001/02	121	7.45	10.55	57.78	30.37
2002/03	112	7.92	13.52	52.04	31.4
2003/04	119	8.24	11.96	70.59	32.46
2004/05	136	10.91	13.03	70.71	33.55
2005/06	162	12.27	15.23	83.15	34.58
2006/07	195	14.16	17.16	81.34	35.59
2007/08	244	17.35	22.79	91.08	36.71
2008/09	326	23.8	27.17	100.69	37.91
2009/10	381	28.99	32.01	123.11	39.2
2010/11	342	43.32	40.53	165.37	40.61
2011/12	354	58.98	51.44	207.60	42.1
2012/13	467	85.74	62.72	210.90	43.65
2013/14	500	107.01	78.08	259.17	45.17
2014/15	567	133.12	113.4	296.90	46.71
2015/16	641	165.31	131.9	585.66	48.24
2016/17	717	189.72	176.7	659.73	49.8
2017/18	769	210.14	210.5	625.31	51.41
2018/19	772	235.23	250.0	650.50	53.19
2019/20	858	253.5	290.0	669.70	54.99

APPENDIX 2: Original data Changed to natural logarithmic form

Year	LNGDPPCT	LNTRT	LNGEXT	LNGCFT	LNLFT
1990/91	5.537334	0.104360	1.291984	2.979603	3.030617
1991/92	5.602119	0.717840	1.172482	2.818398	3.065258
1992/93	5.318120	0.165514	1.232560	3.367985	3.099642
1993/94	5.111988	0.792993	1.479329	3.448717	3.134189
1994/95	4.836282	1.121678	1.650580	3.582129	3.173878
1995/96	4.897840	1.353255	1.719189	3.709907	3.209229
1996/97	4.976734	1.551809	1.749200	3.762594	3.244154
1997/98	4.955827	1.677097	1.972691	3.757005	3.278653
1998/99	4.828314	1.665818	2.354228	3.802878	3.313458
1999/00	4.787492	1.654411	2.615204	3.788498	3.348851
2000/01	4.820282	1.813195	2.345644	3.928093	3.380655
2001/02	4.795791	2.008214	2.356126	4.056643	3.413455
2002/03	4.718499	2.069391	2.604170	3.952013	3.446808
2003/04	4.779123	2.109000	2.481568	4.256888	3.480009
2004/05	4.912655	2.389680	2.567254	4.258587	3.513037
2005/06	5.087596	2.507157	2.723267	4.420646	3.543276
2006/07	5.273000	2.650421	2.842581	4.398638	3.572065
2007/08	5.497168	2.853592	3.126322	4.511738	3.603049
2008/09	5.786897	3.169686	3.302114	4.612047	3.635215
2009/10	5.942800	3.366951	3.466048	4.813078	3.668677
2010/11	5.834811	3.768615	3.702042	5.108185	3.704014
2011/12	5.869297	4.077199	3.940416	5.335613	3.740048
2012/13	6.146329	4.451320	4.13868	5.351384	3.776203
2013/14	6.214608	4.672922	4.357734	5.557484	3.810433
2014/15	6.340359	4.891251	4.730657	5.693396	3.843958
2015/16	6.463029	5.107822	4.882044	6.372739	3.876189
2016/17	6.575076	5.245549	5.174453	6.491831	3.908015
2017/18	6.645091	5.347774	5.349343	6.438248	3.939833
2018/19	6.648984	5.460564	5.372033	6.477741	3.973871
2019/20	6.754604	5.535364	5.396714	6.50683	4.007151

APPENDIX 3: Order of Lag Selection