WOLKITE UNIVERSITY

SCHOOL OF POSTGRADUATE STUDIES

TAX REVENUE AND ECONOMIC GROWTH IN ETHIOPIA: A PANEL DATA APPROACH

BY

MULUGETA ENDALE

JUNE, 2019

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES DEPARTMENT OF ECONOMICS IN PARTIAL FULFILLMENT OF THE REQUIRMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN ECONOMICS (DEVELOPMENT ECONOMICS)

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Declaration

I hereby declare that this thesis entitled **"**Tax revenue and economic growth in Ethiopia: A panel data approach**",** is outcome of my own effort and study and that all sources of materials used for the study have been duly acknowledged.

To the best of my knowledge, this study has not been submitted for any degree in this University or any other University. It is offered for the partial fulfillment of the degree of Masters of Development Economics.

Name **----------**

Signature **----------**

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Advisors' approval Sheet

This is to certify that the thesis entitled entitled **"**Tax revenue and economic growth in Ethiopia: A panel data approach**"** submitted in partial fulfillment of the requirements for the degree of **Master's** with specialization in Development Economics, the Graduate Program of the school of graduate studies. To the best of my knowledge, is an original work and not submitted earlier for any degree either at this University or any other University.

Therefore we recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the department.

Getamesay Bekele(PhD)		17/09/2011
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Examiners approval sheet

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We, the undersigned, members of the Board of Examiners of the final open defense by Mulugeta Endale have read and evaluated his thesis entitled entitled **"**Tax revenue and economic growth in Ethiopia: A panel data approach**"**, and examined the candidate. This is, therefore, to certify that the thesis has been accepted in partial fulfillment of the requirements for the Degree of Master of Science in Developmental Economics.

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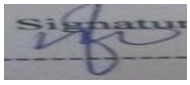
Bedassa W.(PhD)		_____
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Date _____

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Acronym and Abbreviations

A.A	Addis Ababa
BJ	Bera-Jarque
CLRM	Classical linear regression model
EAC	East Africa Country
EPRDF	Ethiopian Revolution Democratic Front
FDRE	Federal Democratic Republic of Ethiopia
FE	Fixed effects
GCE	Government recurrent expenditure
GDP	Gross domestic product
GRE	Government recurrent expenditure
GST	taxes on goods and services
IMF	International monetary fund
LF	Labor force
MOFEC	Ministry of finance and economic cooperation
OPEC	Organization of the Petroleum Exporting Countries
RE	Random effects
RGDP	Real gross domestic product
SNNPR	South Nation Nationality People Representative
SSA	Sub Saharan Africa
SSAc	Social structure of accumulation
TFP	Total factor productivity
TR	Tax revenue
VECM	Vector error correction model

Abstract

This study examines tax revenue and economic growth in some selected regional state of Ethiopia using annual panel data. Theoretically and empirically, it has been showed that taxes affect the allocation of resources. The main purpose of this study was to reveal the relationship between tax revenue and economic growth for the regional state of Ethiopia during the period 2005-2017. While, analyzing the effect of tax revenue on economic growth, the study applied panel long run and short run relationship between tax revenue and economic growth. The study applied fixed and random effect model, Johansen's co-integration test, VECM, and Granger causality test. The tax revenue with its component though affects economic growth significantly. The causal relationship with economic growth in the long run is not significant as expected. This implies there is independence between tax revenue and economic growth. In the short run the finding shows that there is no jointly causality between tax revenue and economic growth. Furthermore, the speed of adjustment is slow; however, to improve the speed of adjustment needs more controlling and monitoring system should be applied. The findings of the study major issues should the policymakers consider for effective taxation policy formulation and implementation of the economy.

Key words: Economic Growth, Government capital expenditure, Government recurrent expenditure, Labor force, Tax Revenue, Regional state of Ethiopia

Chapter one

Introduction

1.1 Background of the study

The political, economic and social development of any country depends on the amount of revenue generated for the provision of infrastructure in that given country. However, one means of generating the amount of revenue for providing the needed infrastructure is through a good structured tax system. Tax is a major player in every society of the world. The tax system is an opportunity for government to collect additional revenue needed in discharging its burning obligations. A tax system offers itself as one of the most effective means of mobilizing a nation's internal resources and it lends itself to creating an environment conducive to the promotion of economic growth (Azubike, 2009).

Similarly tax is a major source of government revenue for most countries in the world. The tax structure is commonly composed of direct and indirect taxes. Direct taxes are assumed to be paid by the factors that produce incomes whereas indirect taxes are assumed to be paid by the house hold that consume taxed(Obwona,2002).

Authorities in developing countries are faced with a very challenging set of circumstances when it comes to tax collection. Issues such as weak administration, low literacy levels, low population density and a large shadow economy necessitate that not only is overall revenue low but the tax structure is less reliant on income taxes, with a heavier weight placed upon trade taxes that are more easily collected. Trends in the data show that low and middle income countries have seen large changes in their tax structures since 1980, yet richer nations have had a relatively stable tax composition. The on-going trends of globalization and IMF support for a move towards consumption taxes have been instrumental in seeing low- and middle-income countries' reliance on trade taxes decrease. Yet questions remain over the impact of such structural shifts in taxation: revenue recovery following the changes in low-income countries has been poor; less still is known about the impacts on GDP growth(Baunsgaar et al,2010;Kyle et al,2014).

In sub-Saharan Africa, taxation is perceived as a brake on growth. Tax rules are insufficiently tailored to the taxpayer's specificity, and very often do not take into account the weak administrative capacity available in the countries of the region. Faced with this situation, countries in the region have embarked on reforms aimed at alleviating the burden of tax structures that are hampering economic growth. These reforms are generally aimed at creating a tax environment that encourages savings, investment, entrepreneurship and labor. They are not necessarily aimed at lowering the tax burden but seek to redefine the tax structure that would minimize the negative impact of taxes on growth while preserving fiscal revenues. In practice, these reforms have introduced tariff and tax rate reductions that have not always succeeded in widening the domestic tax base (Andre, 2017).

Overall domestic resource mobilization via taxation in the EAC partner states is still below its potential. For example, between 2003 and 2011, the respective tax-to-GDP ratios of the Sub-Saharan Africa Region (SSA) and the EAC sub-region were, on average, 16.6% and 14.2%, respectively. From 1992 to 2011, the ratio reduced from 20.5% to 15.9% in Kenya and 16.7% to 13.7% in Burundi, whereas it increased from 5.7% to 13% in Rwanda, 15.1% to 15.6% in Tanzania, and 7.6% to 16% in Uganda. From the 2008~2012 period, after the implementation of the Customs Union, the tax-to-GDP ratio remained static in Kenya (approximately 15.9%); fell in Uganda, Tanzania, and Burundi from 12.9% to 11%, 14.9% to 11.7%,and 16.5% to 14.2%, respectively; and increased in Rwanda from 12.2% to about 13.7% (Mayanja, 2016).

In the past decade of 2016, Ethiopia has made encouraging progress in mobilizing more revenues from domestic sources, particularly in tax revenue. Tax collection increased from Birr12.4 billion in 2005 to Birr 165.3 billion in 2015 indicating over thirteen fold increase in the decade. Similarly the share of domestic revenue in the total public revenue increased from 77 percent to 94 percent in the same period, and the share of tax revenue stands at 83 percent in 2015. However, there is a challenge increasing the tax revenue proportionate GDP; the tax to GDP ratio remained low at 13.4 percent in 2015 which is way below the Sub Saharan Average of about 18 percent, over 20 percent for emerging economies and above 30 percent for developed economies. In 2005 Ethiopia’s tax to

GDP ratio was 12.5 percent after a decade of robust and strong economic growth this ratio came to 13.4 percent posting very little progress. Although the economy has been growing at a remarkable rate averaging more than 10 percent, the slow growth in the tax to GDP ratio suggests the growth in tax collection is not commensurate with the economic growth perhaps indicating a huge untaxed potential (Kibret, 2016).

The instrument which the governments can use as a source of revenue is taxation. It can be said, therefore, that a major function of taxation is to marshal the necessary funds to finance the ever expanding level of public expenditures. As in all other countries, one of the purposes of taxation in Ethiopia is the raising of as much revenue as possible to meet the ever-expanding public expenditure for the supply of public goods and services which otherwise would not be available to the general public by the market. The central aim of the tax system in Ethiopia is to collect sufficient money to finance the administrative machinery of the government as well as to finance the fulfillment of basic infrastructures like roads, telecommunication, electricity and other basic social services like education, health and water supply facilities(Jira,2005)

This study focus on the relationship between tax revenue and economic growth on some regional state of Ethiopia by using panel data for the time period from 2005 up to 2017. The rich and the elites, deliberately has done gap the civic responsibility of paying tax and sometimes employ the service of tax specialists in order to pay less tax to the government. This study focus on how match affect tax revenue on economic growth on the selected regional state of Ethiopia. The different regional state with their constitutional law and also different ability in tax collection invite to do the research.

1.2 Statement of the problem

Taxes are important sources of public revenue. Public goods and services are normally subject to collective consumption, thus requiring that some of what earn into government hands. Public goods are normally supplied by public agencies due to their natures of non-rivalry and non-excludability. The nature of consumption of public goods is such that consumption by one does not reduce consumption for others. Besides, consumption of

public goods by an agent does not exclude others from doing same. Such nature of public goods therefore makes them impossible for private suppliers to avail them at market prices like other commodities. Government intervention in the supply of public goods is, therefore, inevitable and can only be done if the public pays taxes for the production and supply of such goods((Bogale, 2009).

In Ethiopia, the situation is not different and as such the Government has been changing tax structure where the existing one has not yielded the much targeted amounts of tax revenue. This ends up resulting into inequality or skewed income distribution. Further, there is no use of any analytical framework to design these tax changes hence making the revenue forecasting a guess work. As such, there is lack of an optimum taxation model or structure for the Government to rely upon when considering taxation policy changes. In view of this, it is not clear whether the relationship between taxation and GDP growth rate for regional state of Ethiopia.

Over the years, revenue from taxes has been well known to increase with growth in GDP. Some analysis have discovered that taxation impact positively on growth (Ilaboya 2012, Manitob 2014 and Onakoya 2016), while others found a negative relationship (Henrekson Gibato,2017). Some analysis paper have revealed that no long run relationship between tax and economic growth (Onakoya,2016, Henrekson Gibato,2017), while other founds no short run relationship between tax and economic growth(Gibato,2017)

In view of the above, neither economic theory nor empirical studies provides a clear indication of how taxation affects economic growth in a given economy. The debate on whether tax has positively or negatively effect on growth is still inconclusive. While many others agree on the fact that economic growth determines the tax structure, much has not been done to determine whether direct or indirect or both taxes are positively or negatively affect economic growth because when tax rate increase leads to increase saving amount of money in bank. This saving amount of money creates ability for investor to lend money in the bank. Contrary when tax rate decrease the investor response to lend money in bank is high but the opportunity to get money in bank is low.

For as long as this link is unknown to policy makers. Designing a tax structure which can enhance growth in the economy will always remain intangible (Masika, 2014). The result of the above unpredictable result makes neoclassical growth theories of Solow (1956) and Swan (1956) failed to establish any direct link between fiscal policy and economic growth

The behavior of tax revenue in the regional state of Ethiopia is not different from the country level. When the tax rate level is high, the relationship of tax revenue in economic growth most probability become negative contrary to this, the low rate of tax with creating job opportunity, the relationship of tax revenue in economic growth become positive. But this mentioned result is not always happen because it determines the nature of the project which is done in the country meaning, if the project more profitable, they could pay the tax otherwise the opposite happen.

The aim of this study is to see the tax revenue and economic growth. The Ethiopian tax collection system is divided in to three ways. The first one is a tax which is collected by the federal government only and the second one is collected by the regional state only. The third one is collected by together by the regional and federal government jointly. The regional state of Ethiopia authority to collect tax is limited meaning cannot collect all kinds of tax because in Ethiopian constitution article 98 says that the Federal government and state shall jointly levy and collect tax. For example shareholders, PLC, large scale mining, all petroleum and gas operations etc. The constitution of Ethiopia in article 97, the state can levy and collect tax revenue without the intervention of the Federal government. Therefore the state tax revenue is the sum of state collect and shares of jointly levy and collected tax revenue with the Federal government. The tax revenue which is collected by the state as described above individually and jointly on RGDP of the state of Ethiopia.

The problem of the regional State of Ethiopia, especially the rich and the elites, deliberately dodge the civic responsibility of paying tax and sometimes employ the service of tax specialists in order to pay less tax to the government. The first gap is the data of regional state not include all collected tax in the state because the Federal

government collect share did not included. Second most paper which has been done previously did not include capital and recurrent expenditure especially in panel data. These listed above problems and gap creates interest to study the relationship between tax revenue and economic growth. Those problems invited to do the research in regional state level of Ethiopia.

1.3 Research question

The research was guided by the following questions:-

- How does tax revenue affect economic growth on regional state of Ethiopia from 2005-2017?
- What is the impact of tax revenue on the long run and short run economic growth?
- How does tax revenue cause economic growth and vice versa both in the long run and short run?
- What is the trend of tax revenue in selected regional state of Ethiopia from 2005-2017?

1.4 **Objectives of the Study**

The broad objective of this study was to provide empirical evidence on the relationship between tax revenue and economic growth in Ethiopia. In selected sample regional state. The specific objectives include:

- To assess the trend of tax revenue in selected regional state of Ethiopia from 2005-2017.
- To examine the effect of tax revenue on the economy of selected regional state of Ethiopia.
- To examine the long and short run impact of tax revenue on economic growth.
- To determine the short and long run causality between the variable.

1.5 Significant of the study

Tax and country's output linkages do exist, and fiscal authorities have relied on this to urge economic growth and development. Taxes have been used to realize this goal. Some proponents argue that an objective to raise sufficient tax revenue supports the much needed economic growth and development. Contrary to this, some argue that tax is a burden on their well-earned fortunes, while to others; tax is seen as a necessary evil, to support the state and its activities. Depending on the side one is, this all depends on the benefit one derives from the tax system that is the net of tax payments over the respective benefits earned from the taxes they pay (Josephine, 2014).

This study therefore attempts to provide, first, contribution of tax on RGDP to the government, tax collection agencies such as the Ethiopia Revenue Authority among other organizations. Secondly, policy makers will benefit in analyzing the nature of relationship between both taxes and economic growth. Thirdly, other researchers would build on the findings of this study to carry out further research in the same area to expound, improve, update or enrich the findings of this study. Finally, the study will also add to the much needed economic literature on taxation and its growth linkages.

1.6 Scope or Delimitations of the study

This study covers the period 2005 to 2017. The choice of this period is based on the available of data in some regional state of Ethiopia that means the time which regional start put regional RGDP and tax revenue data. All of the data contained in the study are obtained from BOFED and MoFEC. It is also cover the area of four regional states namely Tigray, Amhara, Oromiya and SNNPR and also one city administration Addis Ababa were selected based on the availability of the data required. The other state has no full data currently.

This study empirically examines in depth using panel data of the variables such as; real gross domestic product, tax revenue, government capital expenditure, labor force and

government recurrent expenditures. Therefore, econometric analysis is makes to find out this issue.

1.7 Limitation of the study

The first limitation of this study is that there is no opportunity to get the data of private capital in the regional state of Ethiopia.

The second limitation of this study was lack of the rest regional state data. This problem forced to use the availability data of the above mentioned regional state.

1.8 Organization of the paper

This paper is organized as follows. The first chapter assesses the issues to be investigated and the driving force behind making a study on the back ground of the study concern. Chapter two consists of review of the relevant theoretical and empirical literature findings or studies are discussed. Chapter three describe the historical description. chapter four is designed to provide some clue about the methodology and model specification used in this study. Chapter five analyzes the result of the research. Finally in chapter six explain the research conclusion and recommendation of the finding.

Chapter two

Literature review

2.1 Theoretical literature review

2.1.1 Definition and concept of tax

The definition of tax, According to Yohans et al (2009) Taxes are defined to be burdens, or charges, imposed by "the legislative power of a state upon persons or property," to "raise money for public purposes." It is a power inherent in sovereignty, and without which constitutional government cannot exist. It is vested in the Legislature by the general grant of the legislative power whether specially enumerated in the Constitution among the powers to be exercised by it or not. Coming particularly to the case of Ethiopia, the Constitution of the Federal Democratic Republic of Ethiopia, while enumerating the powers and duties of the Federal Government in Article 51 clearly states that the levying of taxes and the collection of duties on revenue sources is among the duties of the government. In addition to this, Article 52 goes on and enumerates the powers and functions of state governments, amongst which is the levying and collection of taxes and duties on revenue sources reserved to the States.

Taxation includes the processes of levying, collecting, and paying taxes. The primary purpose of taxation is to mobilize the revenue required to finance public spending on goods and services. It can be levied either on income or expenditure, or on a combination of the two. Since taxes play a major role to influence economic decision of both households and firms (like by affecting after tax price of goods and services for consumers and after tax profit of firms), the tax system should be designed in appropriate way to bring efficient and fair allocation of resource as much as possible. By doing so, the state can achieve appropriate level of revenue that helps to finance its expenditure. Thus, a well-designed tax system should be effective in raising revenue, efficient in its effects on economic decisions of households and businesses, and equitable in its impact on different groups in society (Clifford, 2010).

Taxes are important sources of public revenue. The existence of collective consumption of goods and services necessitates laying some of our income into government hands. Such public goods like roads, power, municipal services, and other public infrastructures have satisfactory results on many families, business enterprises, industries and the general Public goods are normally supplied by public agencies due to their natures of non-rivalry and non-excludability. The nature of intake of public goods is such that consumption by one does not reduce consumption for others. Besides, consumption of public goods by an agent does not exclude others from doing same. Such nature of public goods therefore makes them impossible for private suppliers to avail them at market prices like other commodities. Government intervention in the supply of public goods is therefore inevitable and can only be done if the public pays taxes for the production and supply of such goods (Jira, 2005) .

2.1.2 Underpinning theories of taxation

In Ancient Greece the cost of public activities was directly financed by the rich members of the community. A person was assigned a liturgy which was a public office or duty. It was a compulsory obligation and an honour. The holder of a liturgy was responsible not only for defraying the cost but also for organising the activity. There was no assessment for a specified payment. The assignment involved a specific task and it was up to the person to decide how much to spend. It was quite common to boast at public assemblies in Athens that one spent more than was needed. The liturgies, which originated in the financing of religious festivals, sports and theatrical entertainments, were later extended to the provision of ships, maintenance of roads, supply of corn for the army and billeting of soldiers(Dichenson,1996).

Roman emperors followed the Hellenic practice and increased the range of the liturgies. Holders of the various offices, for which there was competition, were expected to make donations and these in time became regular obligations. As the burden of the benefactions grew, the appeal of the honours associated with them diminished. The increased power of the state and the extension of its activities required regular and increasing revenue. This was obtained by compulsory levies from which a system of taxation developed.

One of the early forms of taxation on which the Greek city-states and the Roman republic relied were harbor taxes. These were a lucrative source of revenue because of the volume of foreign trade. Business ventures have always been risky. The wish to look into the future and the demand for forecasts is not a modern phenomenon, though the methods of prophesying have changed. Where there is a demand a tax is sure to follow. In antiquity it was the Oracle at Delphi that provided prophesies to the Greeks, and to the Romans when they acquired Delphi in 191 BC. Whoever wished to consult the Oracle had to pay a tax, the 'teleno', one of the earliest taxes on a service. By the time the Roman empire was established the bulk of the tax revenue came from land.

At the peak of its power the Byzantine Empire had a sophisticated system of taxation. It had been developed by a financial genius, John the Cappadocian (sixth century AD), the imperial treasurer to Emperor Justinian. Taxation was based on property. Taxes were paid per capita according to the wealth owned. Duties were collected at the ports of the empire and taxes were levied on food, meat, corn oil, horses and carriages. It was said that defaulting taxpayers left the treasury naked or dead. The vast revenue was required to wage wars, build magnificent churches and palaces and to provide for the administration of a great empire(Ibid).

The quest for the optimum taxation rate where tax revenues are maximised for social welfare and economic growth has been the essence of the various theories. Adam Smith regarded taxation as a means of sustaining the government. Ricardo provided justification for capital tax which as part of factors of production (labour and capital) is required (in part) to fund government activities. In its regulatory function, taxation provides a mechanism to redistribute national income. In its catalytic role, taxation is applied to increase the value of effective demand, stimulate investment and engender economic development. There are quite a number of theories underlining the concept of taxation including the decentralization theorem which deals with the division of public sector functions and finances among different tiers of government (Ozo-Eson, 2005: Onakoya etal,2016).

The Benefit theory of taxation by Cooper (1994) suggests that the taxes are to be imposed on individuals according to the benefit conferred on them. In effect, the more benefits a person derives from the activities of the State, the more he should pay to the government, thus a "quid pro quo" is expected to subsist. However, it is impossible to implement precisely due to the difficulty of determining the amount of government benefits, including diffuse benefits such as military protection received by each resident and non-resident tax payer.

The contra theory to the benefit theory is the Cost of service‟ theory of taxation which provides that the government should tax the citizens according to the cost of service rendered by it. The tax, an individual should bear, must be equal to the cost of benefit receives that is, cost-benefit postulation. Yet a complimentary theory, Ability to pay "theory by Pigou (1920)" suggests that every citizen should pay taxes according to his ability to pay, to meet the cost of Government expenditure. The Ability to pay theory of taxation is synonymous with the principle of equity or justice in taxation. People with higher incomes should pay more taxes than people with lower incomes, thus „no quid pro quo' subsist. It appears more reasonable and just that taxes should be levied on the basis of the taxable capacity of an individual. The major drawback inherent in this theory is the definition of one‟s ability to pay.

The sacrifice theory by Makinya (2000) attempts to determine the burden that rests upon an individual in virtue of his payment of taxes and how much of his or her income remains for purpose of his own subsistence. According to this theory payment of tax is a sacrifice that an individual makes towards the support of the government.

The Ibn Khaldun‟s theory on taxation as espoused by Islahi (2006) identifies two different effects: the arithmetic and the economic effect which the tax rates have on revenues. The two effects have opposite results on revenue in case the rates are increased or decreased. According to the arithmetic effect, if tax rates are lowered, tax revenues will be lowered by the amount of the decrease in the rate and vice versa. The economic effect however proposed that lower tax rate positively impact on work, output and employment. The Ibn Khaldun‟s proposition is validated by the optimum tax theory

propounded by Mirrlees (1971). This theory seeks to stipulate a given rate of the tax at which a given amount of government revenue can be raised, with minimum distortion in an economy. This is important in order to achieve social efficiency through a desired adequate income distribution or an improvement of welfare. These theories incorporate the various subsisting interconnection between taxation and economic growth, and development.

2.1.3 Taxation and tax policy

Tax policy affects economic growth by discouraging new investment and entrepreneurial incentives, distorting investment decisions and discouraging work effort and workers' acquisition of skills (Solow, 1956). Typically, the output of an economy is measured by GDP and determined by its economic resources the size and skill of its workforce, and the size and technological productivity of its capital stock(Tekumuh,2014).

Engen and Skinner (1992) describe five ways through which taxes might affect economic growth. First, higher taxes can discourage the investment rate (net growth in the capital stock) through high statutory tax rates on corporate and individual income, high effective capital gains tax rates, and low depreciation allowances. Second, taxes may reduce labor supply growth by discouraging labor force participation or hours of work, or by distorting occupational choice or the acquisition of education, skills, and training. Third, tax policy has the potential to discourage productivity growth by decreasing research and development (R&D) and the development of venture capital for "high-tech" industries, activities whose spillover effects can potentially enhance the productivity of existing labor and capital which may lead to increase in economic growth.

The neoclassical growth models of public policy (see, for example, Judd, 1985, Chamley, 1986) give fiscal policy the role of determining the level of output rather than the long-term rate of growth. The equilibrium growth rate is based on exogenous factors such as population growth and technological progress, whereas fiscal policy can only affect the process of transition to this state of equilibrium. On the other hand, models of endogenous public policy growth (see Barro and Sala-i-Martin 1992, Stokey and Rebelo, 1995, Mendoza et al, 1997) provide mechanisms by which fiscal policy can determine

both the level of Production and growth rate at equilibrium. These endogenous growth models suggest that taxation can have a negative effect and a positive effect on the growth rate. The positive effect is indirectly driven by tax-financed spending. If taxes are used to finance investments in public goods, especially goods generating positive externalities (infrastructure, education and public health), economic growth rate can be positively influenced by taxation. The negative effect of taxation on growth stems from the modification of individuals' decisions in the direction of suboptimality. Engen and Skinner (1996) suggest five possible mechanisms by which taxes can affect economic growth: (1) the rate of investment may be hindered by taxes such as corporate and personal income and capital gains taxes; (2) taxes can slow the growth of labor supply by distorting leisure and leisure choices; (3) tax policy can affect productivity growth through its discouraging effect on research and development (R & D) spending; (4) taxes may result in a flow of resources to other (less taxed) sectors likely to have lower productivity; and (5) high taxes on labor supply can distort the efficient use of human capital by discouraging workers from jobs with high tax burdens.

2.1.4 Classical growth theory and taxation

This theory was advanced by political economist such as A. Smith, D. Ricardo and R. Malthus. Smith (1776) premised the four general canons of taxation. Firstly, the principle of equity which means that the subjects of every nation should contribute towards government support in proportion of their protection they enjoy from the state. Secondly, the principle of certainty which advocates that each individual is bound to a certain tax with clear timelines, payment manner and the quantity to be paid. Thirdly, the principle of convenient in that every tax levied at the given time and manner should be convenient to the tax payer. Lastly, the principle of economic in that very tax should ensure that the tax payer is left with some money once the tax is paid to the state (Apollo, 2016).

Some of the classical theories include the Ability to Pay Theory and Benefits Received Theory. With regard to the latter theory, taxes are imposed on the ability of tax payer to make the payment. The ability to pay principle means that there is equal sacrifice for all the subjects of the state who are tax payers. This involves the one with heavy shoulders

being taxed more heavily than the poor and also losing a greater absolute amount of utility. This is the most progressive tax system leading to complete egalitarian distribution of after tax income. Variables such as assets, incomes and expenditure levels are considered as the best indicators of ability to pay. With regard to benefits received theory, the state should to levy taxes on tax payers according to the benefits they receive from it. That is, the more the benefits a taxpayer receives from the activities of the government, the more the person should pay taxes to the government.(Apollo, 2016)

2.1.5 Neo-classical growth theory and taxation

Economic growth can be traced back to the classical economists of the eighteenth century, whose works are briefly reviewed alongside the transition to neo classical growth theory. Neo-classical theory states that, at any point in time, the total output of the economy depends on the quality and quantity of physical capital employed, the quantity of labor employed and the average level of skills of the labor force. However, once the economy reaches the full equilibrium level, additional growth in the stock of capital per worker will only take place if productivity increases, either through enhanced capital stock or through improvements in the quality of the labor force(Solow, 1956)

The accumulation of productive factors and the existence of diminishing returns have found modern expression in neoclassical production theory in the form of a production function. The production function summarizes the amount of output that can be produced with various combinations of inputs. The most commonly used form of the production function theory output as depending on just two inputs-capital and labor, according to a particularly convenient mathematical form (the Cobb-Douglas production function). It is commonly assumed that the production function is "constant returns to scale". This means that a doubling of all inputs will lead to a doubling of output. However, decreasing returns to scale apply to an input if other inputs do not increase. For instance, if the amount of capital is increased without any increase in labor, each subsequent addition of capital will yield smaller and smaller increments to output(Maré, 2004).

The clear implication from this theory is that in the long run, growth stops. Moreover, growth gets slower as capital per worker approach K* from below. Not only does the

amount of investment failure, but the output generated by an additional dollar of investment also gets smaller. The neoclassical growth model so far is a model of no growth, at least in the long run(Maré, 2004).

Based on this growth model, high investment rate or saving rate is leads to high level technology and skilled human capital. However, low level of population growth rate and low rate of capital depreciation are the most determinants of economic growth in long run. The rate of investment and population growth determines the growth rate of per capita output and the rate of technological change which is exogenous and determines the growth rate of the economy. That means, independently of all other factors and technological progress is absent and whose prime role is to augment labor(Serven et al, 1996; (Amsalu, 2018).

Solow model assumption includes constant return to scale diminishing marginal productivity of capital exogenously determined technical progress and substitutability between capital and labor. The Solow model studies the growth path of economies by assuming a neoclassical production function which combines two factors to produce output capital and labor. Both factors are perfectly substitutable and exhibit diminishing returns to scale (Morrisseyand, 2001;Amsalu,2018).

The assumption of diminishing returns implies that each additional investment project produces a smaller return until the point where the next project is not profitable. When no profit exists there are no incentives to invest and no capital is accumulated, the neoclassical model describes how an economy will eventually converge to a steady state where the growth rate of per capita output is constant in the long run. The growth rate of the economy is determined by the growth of the labour force and the savings rate which are taken as exogenous(Ibid).

In the tax side, this model had not clearly established the tax-growth linkage but held that the source of long-term growth was exogenous technical change, and a fiscal policy had slight effect on economic growth rate. In the Solow-Swan model, fiscal policy could affect the rate of growth only during the transition steady state. Once an economy

reached a steady state, the growth rate would be determined by the exogenous rate of technical progress (Cushin, 1995; Kairanya, 2016)

The neoclassical growth models argued that income tax might influence aggregate levels of real variables in a steady state situation, but not of their growth rates (Manas-Anton, 1987;Kairanya, 2016). In this respect, countries that provide disincentives to capital accumulation and / or technological progress through high and progressive taxes would experience lower GDP growth rates.

2.1.6 Exogenous and endogenous growth models and taxation

In studying the impact of taxation on growth, the various determinants of growth are considered and in so doing, the evolution of the neoclassical growth models to new growth models therefore becomes a critical component of the research. Considering the nature of this study, it is important to refer to the benchmark theoretical growth theory framework presented by the Solow model. Using the work of Harrod-Domsar, Solow (1956) extended on the model to make valued contributions to growth theory that has been widely accepted as the base model for long-run economic growth. Within the realm of neoclassical economics, the Solow model based its foundations on the Cobb-Douglas production function that analysed the behaviour of a single representative agent. Solow (1956) explains long-run growth by capital accumulation, population growth (or otherwise referred to as labour) and productivity (referred to as technological progress). Several key assumptions underpin the Solow model: firstly, that capital accumulation is subject to diminishing marginal returns. In addition, that economic growth is influenced by technological progress that is determined exogenously. Hence the classification of the model as an exogenous growth model. Solow (1956) found that over the short run, growth was influenced by changes in capital, the labour force and the depreciation rate of capital. While long-run growth might only be achieved by the exogenously determined technological progress.

While exogenous growth models provided a simplified framework to explain long-run growth, the assumption that growth is purely explained by external forces posed some limitation to empirical evidence. As Turnovsky (1995) illustrates the biggest challenge

with these types of models was the implication that conventional macroeconomic policy would have no impact on long-run growth. In other words, exogenous growth models assumed that the only efficient type of policy is one that would either increase the population growth rate or improve labour force efficiency. As time evolved, and focus leaned more towards inflation and unemployment, there was a growing need to adjust the exogenous models to accommodate for economic shocks that were clearly evident over time. New growth models therefore provided an alternative way of thinking proposing that technological progress is endogenously determined through factors such as individual firms' decisions to invest in research and development (R&D) and individual workers' choice to enter the labour market. In essence, the move towards endogenous growth models was a response to the limitations of the neo-classical models to respond to data/empirics.

2.1.7 Structure of tax in Ethiopia

The fundamental authority to tax is derived from the Constitution of 1995, which, following the federal structure, shares tax powers between the Federal Government and the Regional States. The Ethiopian Constitution goes to greater lengths than other areas of power in allocating taxation powers between the Federal Government and the Regional States. The Constitution classifies taxation powers as "taxes exclusive to the Federal Government," "taxes exclusive to the Regional States," "taxes concurrent to both the Federal Government and the Regional States," and "taxes undesignated.(Taddese, 2010)

Suppose first that there is no horizontal tax competition between the states. Then it makes no substantive difference whether powers are given uniquely to the federal government (with transfers running from center to states) or uniquely to the states (with transfers running in the opposite direction). If all tax powers are given to the federal government. It will simply face the tax design problem of the unitary government. If instead they are given to the states, then the federal government so long as it is able to impose appropriate lump-sum taxes on the state governments can, by acting as leader, again induce the unitary outcome. If, however, interstate mobility of the tax base generates horizontal tax competition, then tax powers cannot be delegated entirely to the states without

jeopardizing efficiency: the federal government must retain enough instruments to correct any pressure toward inefficiently low state taxes.(Michael, 1998)

2.2 Empirical literature review

2.2.1 Introduction

Theoretically and empirically tax has been shown that taxes affect the allocation of resources; and often distort the underlying behavior of economic agents.

Unfortunately, it is not easy to directly determine the net benefits of taxation and, therefore, to determine whether or not taxes are generous. For example, if taxation pushes economic activity underground, the finding lowers economic growth when, in fact, it is merely shifting economic activity from the measured economy to the unmeasured economy, that is, the overstating of the negative effects of taxation on economic growth. On the other hand, if taxation pushes economic activity upward, we would find that it increase economic growth or vice versa. The tax revenue increase by increasing investor's participation on economy and also the reduction of tax rate create conducive environment for investor. In this empirical literature review, the researcher explains the finding of the research paper tax on the RGDP. The finding of literature review use to relate the finding of this research finding in the fixed effect model and also in the short run and long run causality and effect of tax revenue in the economic growth in result and discusion. Therefore the literature review used to check tax revenue in economic growth with the reality of the other country situation.

Gupta (2007) studied the causes of tax revenue efforts in developing countries by use of panel data set that covered 105 developing countries for over a period of over 25 years. The results of the study finding was that countries that relied on taxation of goods and services as their main source of tax revenue had relatively poor tax yield performance. On the other hand, countries that relied more on direct taxes such as income taxes and profit taxes performed much better(Gupta, 2007).

The Statistical evidence from Panel Groups Data Granger causality test suggesting that the total tax revenue to GDP ratio is higher in the high income countries compared with the low and middle countries. The for all the variables that involves for all 120 countries,

in which it involved four groups of country, have causal relationship with the annual change in GDP. It is based on the value of F-test that significant at 0.01, 0.05, and 0.01 levels. This results shows that the components of tax revenue that involve in this study were significant to relate it with the economic growth and other economic indicators. The potential variable, inflation rate also has causal relationship with the taxes such as tax on goods and service (GST)(Bugang,2012).

In the case of the relationship between tax and economic growth it appears that explained as exploiting within-country variation by means of panel regressions. This research finding says as when the rich country sample is extended to non-OECD countries both government expenditure and taxation are found to be negatively associated with economic growth. This findings are robust even according to the stringent extreme bounds criterion(Stefan et al;Henrekson,2001).

The study of dynamic panel data for 47 developing countries by mobilizing the period 2000–2012 and using the system GMM estimator to address endogeneity issues. The lagged GDP per capita growth variable has a positive and significant coefficient at the 1 per cent level. Interestingly, the level of the taxes revenue is positive and statistically significant at the 1 per cent significance level Interestingly. Unlike many previous studies author permit for taxes having a non-linear effect on economic growth. The reason for this is that higher rates could be more distortionary and hence impact growth negatively while lower rates may generate revenues that are spent in productive ways. He find empirical support for a non-linear relationship form the econometric results which yield two important findings. First, there is a non-linear relationship between taxes revenue and economic growth. Specifically, the taxes revenue rise economic growth at short run. This effect then increases over time as these taxes increase. Second, there is a non-linear (Ushaped) relationship between taxes on income, profits and capital gains, taxes on international trade and economic growth at short run. These effects then diminish over time as these taxes increase(Nantob, 2014).

Ordinary Least Square (OLS) method has been employed in analyzing time series data captured over the period under study. Granger casualty test was then used to test causality

relationship between direct tax and economic growth. The coefficient of short run equation shows that, Labor Force is statistically insignificant and exhibited the expected positive sign. The speed of adjustment of the short run model to the long run equilibrium was 88% indicating adjustment to the equilibrium every year. There is a causal relationship between direct taxes and economic growth in Kenya. An increase in population as proxied for labour force shows a negative contribution to economic growth. Benefits of increased population such as ready market for produced goods and services; availability of cheap labour among others has a negative significant contribution to economic growth (Masika, 2014).

According to Mehrara et al (2014), looking at the effect of fiscal policy on economic growth find that using the PVAR approach a shock in tax revenues in the short term Long-term economic growth has no effect on growth. They also find that indirect taxes have more effect than other types of taxes at the macroeconomic level. Their analysis is based on a sample of 14 developing countries over the period 1990-2011.

The applied panel data estimation under the fixed effect assumptions deployed by Ugwunta et al (2015) they find that tax on capital gains and labor have a negative and insignificant effect. On the other hand, indirect taxes have a positive and insignificant effect on the economic growth of sub-Saharan African countries. N‟Yilimon(2014) finding is similar to this finding.

The Statistical evidence from time series data models is estimated using Johansen cointegration test, VAR, VECM and grange causality test were used . In the long run, improving tax revenue is important for economic growth in Ethiopia. There is no long run causal relationship between components of tax revenue growth with economic growth. In an empirical sense, it implies 27% of the disturbance in the short run is corrected each year or it adjusts any disequilibrium towards long run equilibrium state (Biruk, 2015).

In panel data the main estimation tests conducted were the OLS, fixed effect regression and random effect GLS. The results of the OLS estimation reveal that tax revenue has

significant and positive influence on the GDP. The Pedroni co-integration test result conclusion is tax revenue is related with GDP in the long run(Onakoya, 2016).

According to Saida (2016), by using VAR model is applied to identify the effect of tax on economic growth. The result from the long run models of the RGDP estimation indicates that capital expenditure, indirect taxes, labor forces have positive and significant effect on the Ethiopian RGDP in the long run. On the other hand current expenditure and direct taxes have negative and significant effect on the real GDP of the Ethiopian economy. The result from the short run estimation indicates that the level of RGDP in the previous period has positive and significant effect in the current RGDP of the Ethiopian economy. The t-statistics result of the model indicates that the effect of lagged difference indirect taxes has positive and significant effect in the short run RGDP also. There is bidirectional relationship between real GDP and government current expenditure, indirect taxes and government capital expenditure. RGDP cause to labor force (Seida, 2016).

Money research use labor force in their growth model because of its impact. It has been proven empirically that labor force is a good measure of economic growth. Using panel estimation technique and quality adjusted updated data, after taking care of the endogeneity problem; estimates for physical labor enter with significant consensus signs (Zaman, 2012). The impact of labor force on economic growth in Ethiopia, secondary data for 34 year annual data for the variables of interest which covered from 1981 to 2014, was used. In the long run Labor force brought a significant positive impact on GDP per capita. This result supports the theory that an expansion and utilization of labor force is important in production(Aweke,2016).

The study examines the long and short run relationship between public expenditure and economic growth in Nigeria over the period of 1986-2014, using Johansen cointegration and error correction approach. The outcome of recurrent expenditure is the major motorist of economic growth in Nigeria. Controlling for the influence of non-oil revenue, this study shows a negative and significant long run relationship between economic growth (RGDP) and recurrent expenditure coexists with a positive short run relationship, stress the dual effects of recurrent expenditure on economic growth in Nigeria. For the

capital expenditure, this study documents negative and significant long run effect of capital expenditure on economic growth in Nigeria (Iheanacho, 2016).

Easterly et al (1993):Llama et al (2017)summaries the statistical relationship between the level of development, rate of growth and the level of development using panel data for 28 countries between the 1970 and 1988 period. One of the findings in this study is that while there is a negative relationship between the GDP growth and the tax-revenue-to-GDP ratio for OECD countries, this negative relationship diminishes when one controls for the initial level of income once again, suggesting that an economy's level of development is important.

The panel data comprises 32 sub Saharan Africa countries and cover the period from 1980 to 2010. The long-term coefficients of tax variables are negative but not significant. This implies that there is not a long-term relationship between growth and tax revenues. The short-term coefficients of tax variables are negative with the exception of total revenue. But only the coefficient of revenue from indirect taxes is significant. This means that indirect taxes lead to a significant decline in short-term growth. Similarly the estimated coefficient of capital is positive and highly significant short-term and long-term low. This suggests that there is a long term relationship between growth and capital(Gbato, 2017).

The effect of fiscal policy on economic growth, the research find that using the PVAR approach a shock in tax revenues in the short term Long-term economic growth has no effect on growth. They also find that indirect taxes have more effect than other types of taxes at the macroeconomic level. Their analysis is based on a sample of 14 developing countries over the period 1990-2011(Mehrara et al, 2014; Gbato, 2017).

Study investigates the influence of disaggregated functional government capital expenditure on economic growth in Nigeria between the periods of 1970 to 2013, using error correction technique of approximation on the data of the economy. According to Falade (2016) find that the long run relationship exists between the components of government capital expenditure and economic growth. However, the results revealed that

disaggregated functional capital expenditure of government did not create the intending growth to real economic activities. More specifically, capital expenditure on economic service was actually negatively disturbing the growth of the economy. The government recurrent expenditure has positive effect on nominal and real income at level. While it has a significant effect at 5%t level of significance.

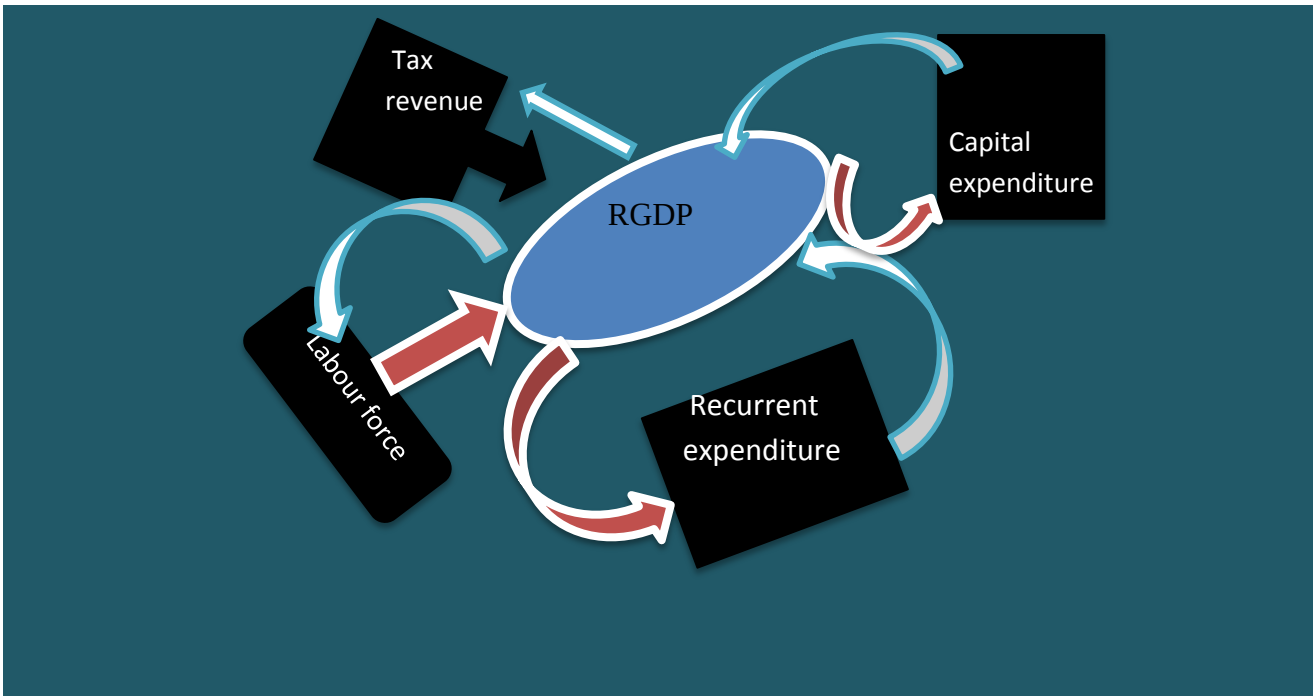
Thus any country generating revenue to provide the public infrastructure is through well-structured tax. The tax revenue is different from region to region and also from country to the country. In the empirical literature review, there are different finding on different researches. Some papers finding says economic growth and tax revenue has a positively correlated. One research finding in Developing country tax revenue was poor but tax collection focused in income and profit taxes are better. The ratio of Total tax revenue to GDP is high in the high income country and the other research paper finding says tax change only led to transitory change in growth.

Similarly some other research finding also told us higher taxes are strongly correlated with reduced economic growth. In few papers indirect tax are negatively correlated with economic growth in developing country. It is also in developed country positively correlated with economic growth. The other research also get indirect taxes have more effective than other types of tax at macroeconomic level. The other research get, that is no long term relationship between tax revenue and economic growth while the other paper say taxation has positive relation and is engine to economic growth. Those different researches find different finding based on the situation of the country. So, this research tries to know the relationship between tax revenue and economic growth in the regional state of Ethiopia.

2.2.2 Conceptual Frameworks

As discussed above about taxation and its impact in economic growth, the following conceptual framework will show the most explanatory variables on taxation. This conceptual framework is designed by the researcher by using the conceptual framework done by Karumba Apollo research paper as source to do this conceptual framework.

Figure 1:- Conceptual frame work



Source own design by using Karumba Apollo research paper as source (2018)

Chapter three

3.1 Overview economic growth of Ethiopia

The GDP growth rate of Ethiopia is rising with the average growth rate was more than 10% for the years of 2009-2017. The agriculture and service sector accounts a major contributor for the growth.

The 'Imperial Regime' refers to the reign of emperor Haile-Sellase I (1930-1974) in particular, and to its predecessors in general. The landed aristocracy and the majority of peasants (tenants) constitute the major socio-economic agents during this period. Land was the critical resource, the control of which was invaluable for any economic agent that aspires for power. In this period an attempt was made to modernize the country through the expansion of modern schools and health facilities, the promulgation of a constitution, the development of infrastructure, and the beginning of medium-term planning. The Imperial Regime pursued a market-based economic policy. GDP growth averaged 3 percent over the final phase (1960-1973) (Mohammed, 2014).

The Derg (meaning 'the committee' in Amharic) took the power after collapsing the imperial regime in the 1974 popular revolution. In terms of ideology and general policy, the Derg opted for a socialist economic system where market forces were deliberately repressed and socialization of the production and distribution process pursued vigorously. By all measures they adopted a "hard control" regime. Following the fall of imperial regime, there was a fundamental shift from market oriented structure towards of a tight command economic. Plenty of production and distribution systems were confiscated and nationalized by the state. Economic growth registered during derge period much less than that's of monarchy system. From 1974- 1991, the economy was growing at average 2% which was lower than the imperial era and also in 1984 the country had -10.4% economic growth which is the lowest record with in fourteen years and attributed to the persistence drought which killed thousands in northern part of the country. Various factors such as internal instability, war with Somalia, drought and inefficient and illogical policy can be cited as causes of this poor performance

This period begins following the accession to power of the Ethiopian People Revolutionarily Democratic Front (EPRDF) in May 1991/90, following the downfall of the Derg. The EPRDF adopted the typical structural adjustment policies of market liberalization, with the support of the Bretton Woods institutions.

The growth performance of post Derg regimes seems logical and it has shown a profound improvement through time. The real GDP has grown 7% per year and shows a significant upward trend till now. The adopted economic policy and a relative existence peace and security in the country have accredited the economic growth(Ibid).

3.1.1 History and overview of taxation in Ethiopia

The history of taxes reveals that their coercive nature is of comparatively recent development. The original idea of a tax was that payment was not obligatory upon the subject, but consisted rather as a voluntary contribution toward the expenses of government, as appears from the Medieval Latin term donum, and the English "benevolence." This conception of the relation between the subject and government was gradually transformed; payment becoming more and more obligatory, until finally coercive taxation resulted. At the present time payment of taxes is obligatory in all civilized nations; where the rate or imposition is at all dependent upon the taxpayer, the tax takes the form of a fee or payment for contractual services, Ethiopian Chamber of Commerce and Ethiopian Business Development Services Network (Zewude, 2015)

The first major change in Ethiopia's tax system was initiated in the post-Second World War period (between 1942-44), the years 1947-52 covering its second stage. These changes were generally discretionary, including amendments to property taxes (land and cattle). Broad-based taxes on goods and services were also introduced in the mid 1950s. Later in the decade and in the early 1960s, changes were also made in the rate and structure of taxes, especially on income. In the post-revolution period (1974-91), particularly during 1976-79, significant major changes on the rate and structure of all types of taxes were made. These involved widening the land taxbase, introducing capital

and surplus transfers from nationalized firms, as well as certain minor arrangements on other taxes (Wogene 1994; Abebe, 2005)

Resources were allocated among the various sectors of the economy differently in the imperial and revolutionary periods. Under the emperor, the government dedicated about 36 percent of the annual budget to national defense and maintenance of internal order. Toward the end of the imperial period, the budgets of the various ministries increased steadily while tax yields stagnated. With a majority of the population living at a subsistence level, there was limited opportunity to increase taxes on personal or agricultural income. Consequently, the imperial government relied on indirect taxes (customs, excise, and sales) to generate revenues. For instance, in the early l970s taxes on foreign trade accounted for close to two fifths of the tax revenues and about one-third of all government revenues, excluding foreign grants. At the same time, direct taxes accounted for less than one-third of tax revenues (Zewude, 2015).

The revolutionary government changed the tax structure in 1976, replacing taxes on agricultural income and rural land with a rural land-use fee and a new tax on income from agricultural activities. The government partially alleviated the tax collection problem that existed during the imperial period by delegating the responsibility for collecting the fee and tax on agriculture to peasant associations, which received a small percentage of revenues as payment. Whereas total revenue increased significantly, to about 24 percent of GDP in l988/89, tax revenues remained stagnant at around l5 percent of GDP. In l974/75, total revenue and tax revenue had been l3 and 11 percent of GDP, respectively. Despite the 1976 changes in the tax structure, the government believed that the agricultural income tax was being underpaid, largely because of under assessments by peasant associations Ethiopian Chamber of Commerce and Ethiopian Business Development Services Network (Zewude, 2015)

In 1991 the Ethiopian Revolution Democratic Front (EPRDF) toppled the old ‘socialist’ regime that had ruled the country for seventeen years. In contrast to the previous policy regime of hard control, EPRDF initiated a wide range of reforms that covered not only the tax system but also the exchange rate, interest rates, trade, domestic production and

distribution. Leaving aside this brief description of the evolution of the tax system before the 1991/2 reform, the subsequent taxing system in Ethiopia can be divided into three broad categories: (i) taxes on income and profits, (ii) taxes on goods and services and (iii) taxes on international trade. Most of these taxes have been reformed and amended in the last decade following the general 1992 liberalization (or reform) policy. Some institutional reforms aimed at enhancing the government's capacity to raise tax revenue have also been made(Abebe,2005)

3.1.2 The federal tax administration

For a long period of time, tax administration in Ethiopia was an appendage of ministries that did not have administrative specialization over the assessment and collection of taxes the Ministry of Trade and Industry before the Italian occupation (1936) and the Ministry of Finance after the Italian occupation (1941).Administrative units or departments within these Ministries were charged with tax administration. The preferred mode of organization was the organization of administrative units around the types of taxes rather than the functions of tax administration (Lencho, 2012).

One mode of organization that prevailed for a long time was an organization of tax administration units or departments for assessment and collection of taxes on international trade (customs duties, sales and excise taxes on imports and exports) and another one for domestic (internal) taxes or revenues (income taxes, sales and excise taxes, stamp duties on domestic transactions). The administrative units for assessment and collection of international trade taxes were organized under the "customs departments" or "customs authorities" while those for the administration of domestic taxes were organized under "inland revenue departments" or "inland revenue authorities." There were also times when specific taxes had their own tax administration units or departments within the Ministries (e.g., income tax departments, excise tax departments). The separation of tax administration for domestic and international transactions had the effect of parallel tax administrations for those taxes that were levied on both domestic and international transactions. For example, customs departments or

administrations assessed and collected sales taxes on imports and Inland Revenue Departments assessed and collected sales taxes on domestic transactions(Ibid).

With the establishment of the Federal Government Revenue Board in 1995, Ethiopian Tax Administration was for the first time organized as a separate and autonomous government body. The Board was established to oversee and coordinate the operations of three federal revenue agencies at the time: the Inland Revenue Authority, the Ethiopian Customs Authority, and the National Lottery Administration. A reorganization of Ethiopian tax administration in 2001 elevated tax administration to a ministerial level, creating the Ministry of Revenues (MoR). Like its predecessor, the Federal Government Revenue Board, the Ministry of Revenues was established to coordinate and supervise the three revenue agencies of the Federal Government, namely, the Federal Inland Revenue Authority (FIRA), the Ethiopian Customs Authority (ECuA), and the National Lottery.

The most recent reorganization and restructuring of tax administration which occurred in 2008 merged the three revenue agencies of the Federal Government into one authority the Ethiopian Revenues and Customs Authority (ERCA). This reorganization of Federal Tax Administration has relegated the task of tax administration from ministerial level to an authority but in substance, the reorganization has in fact strengthened the powers of the Tax Authority. Recent tax administration reforms have introduced a number of changes to Ethiopian tax administration, only some of which are mentioned here under for their instructive value(Ibid).

Chapter four

Methodology and data description

4.1 Description of the Study Area

By the constitution of 21 Aug 1995, Ethiopia was reorganized into nine ethnically-based regional states (*kilil*): Afar, Amhara, Benishangul-Gumaz, Gambela Peoples, Harari Peoples, Oromia, Somali, Southern Nations Nationalities and Peoples, Tigray; with two separate self-governing administrations in: Addis Ababa capital city, and from 2004, the Dire Dawa chartered city (Cahoon, 2018). The detail of regional state is described as:-

Tigray:- The capital city of the State of Tigray is Mekele. Its location is at the northern tip of the country. It shares the common borders with Eritrea in the north, the State of Afar in the east, the State of Amhara in the south, and the Republic of the Sudan in the west. It has an estimated area of 80,000 square kilometres. Major economic activities are about 83% of the population are farmers. Teff, wheat, and barely are the main crops.

Amhara:- The capital city of the State of Amhara is Bahir-Dar. It located in the north western and north central part of Ethiopia. The State shares common borders with the state of Tigray in the north, Afar in the east, Oromiya in the south, Benishangul/Gumuz in the south west, and the Republic of Sudan in the west. It covers an estimated area of 170,752 square kilometers. Major economic activities about 85% of the people are engaged in agriculture. The State is one of the major Teff (staple food) producing areas in the country. Barely, wheat, oil seeds, sorghum, maize, wheat, oats, beans and peas are major crops produced in large quantities(Ibid).

Oromia:- The capital city of the State of Oromiya is Finfine (Addis Ababa). The common borders with Afar, Amhara and the State of Benshangul/Gumuz in the north, Kenya in the south, The State of Somali in the east, the Republic of the Sudan and the

state of Benishangul/gumuz in the west, the State of Southern Nations, Nationalities and Peoples' and the state of Gambella in the south. Based on the political map (1994 Population and Housing Census Commission, CSA), the estimated area of the State of Oromia is about 353,690 Km2, and accounts for almost 32% of the country. According to the 1994 census:- The rural residents of the State accounts for 89.5% of the total

SNNP:- The State of Southern Nations, Nationalities and Peoples' comprises 10% of the total area of the country. The capital city of the State is Awassa. The State lies in the southern part of the country. It has common borders with Kenya in the south, the Republic of the Sudan in the South west, the State of Gambella Peoples' in the North West, and the State of Oromiya in the North and East. According to the CSA (Central Statistics Authority) annual statistical report, the State has an estimated area of about 112,323.19 sq. kms. According to the 1994 census report, the rural population of the State accounts for 93.2% of the total population. North Omo, Sidama, and Guragie are the three zones with the highest number of population. According to the 1994 census result, the predominantly spoken languages include, Sidamigna 18%, Gruagigna 14.72%, Wolayitagna 11.53%, Hadiyigna 8.53%, Keffigna 5.22%, and Kembatigna 4.35%. Other languages spoken in the State are, Gamoigna, Malo, Goffa, Gedeo and many others.

Addis Ababa:- Addis Ababa is the diplomatic capital of Africa. More than 92 embassies and consular representatives cluster in the city where the Organization of African Unity and the UN Economic Commission for Africa have their headquarters. Addis Ababa is located in the heart of the country surrounded by Oromia. Addis Ababa covers about 540 Km2 of which 18.2 Km2 are rural. According to the 1994 census, as capital of the country, Addis Ababa is a city where, despite differences in number, almost all-ethnic groups live in. However, the major ethnic groups are, Amharas 48.3%, Oromos 19.2%, Guragies 17.5%, Tigrains 7.6%, and others all together 7.4%(Ibid).

4.2 Data Source and description

This study discusses tax revenue and economic growth of selected regional state of Ethiopia. In order to achieve the above objectives, the types of data that has been used for

the study are quantitative secondary data; yearly data has been collected. Those annul panel data has been taken from Ministry of Finance and Economic cooperative(MoFEC), Central Statistical Agency of Ethiopia (CSA) , world data bank and plan commission of Ethiopia including regional state of Ethiopia. The sample used in this research out of 9 regional state and 2 city administration selected purposively select 4 regional state one city administration in Ethiopia for tha available of full data similarly. The study covers annual observations for some regional state of Ethiopia over the period 2005-2017. The intention is to focus on the tax revenue and economic growth in Ethiopia empirical evidence in regional state. Panel data approach will be chosen because it has many advantages over the other conventional methods such as cross sectional and time series data.

To investigate the relationship between tax revenue and economic growth in selected regional state of Ethiopia. This study used both descriptive statistics and empirical econometrics analysis by using STATA and EVIEWS software's for data presentation and analysis. The dependent variable is RGDP and the independent variables are tax revenue, Labour force, government recurrent expenditure and government capital expenditure. Instruments used in the OLS model.

4.3 model specification

The theoretical view about economic growth model can be the neo-classical (Solow) growth model. The neoclassical growth model allows for factor input substitution and diminishing marginal returns in the production process. Technology is considered as exogenous, whose prime role is to augment labor. The model further assumes that the rate of investment and population growth determines the growth rate of per capita output. Nevertheless, growth continues only in the transition to a new steady state. The policy measures do not affect long run growth rate (Mankiw, David, & and David, 1992) (Mankiw et al, 1992).

The production function is given as:

$$y_{it} = F(k_{it}, L_{it,} A_{it}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.1)$$

The researcher based this study on the neoclassical growth model since it acknowledges the long run relationship of policy measures.

Therefore a Cobb-Douglas production function with constant returns to scale is used as an initial point to build my model.

$$y_{it} = \left(Ak_{it}^{\alpha}L_{it}^{\beta}\right) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (3.2)$$

Since the researcher's major objective is to discover the relationship of various components of taxation on economic growth, these variable should be added to the model.

Barro (1990) Suggested the role of public service as an input for private sectors production activity. According to him such role of public sector on the activities of the private sector creates strong linkage between public sector and economic growth. Therefore in this study tax(x) is used as a proxy of the public sector and helps us to measure the size of the government in the regional state of Ethiopian economy.

$$y_{it} = (k_{it}, L_{it}, x_{it}) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . (3.3)$$

In the Solow cob-Douglas production function K denotes physical capital, so the change in this physical capital can be represented as investment. Since a nation's investment can come from both private and public sector, separating this variable into private and public investment is an important input to the model. In this study government capital expenditure and government recurrent expenditure can be used as a public investment but the private investment data in the regional state level did not get. However, based on the different theoretical views of the effects of government capital and recurrent expenditure on influencing the efficiency of productive factors, which could be negative or positive or the expenditure can be thus decomposed into productive and unproductive. Government current expenditure is represented as the unproductive component of government expenditure, whereas government capital expenditure is as the productive component of government expenditure.

L denotes labor force and x represents the tax revenue. Tax revenue is the sum of direct and indirect tax revenue.

In general, the variables included in the models are: RGDP, tax revenue, labor force, government recurrent expenditure and government capital expenditure Therefore the models to be estimated in the study are specified as follows:

$$RGDP_{it} = (TR_{it}, LF_{it}, GCE_{it}, GRE_{it}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.4)$$

These can be written in a regression form as

$$RGDP_{it} = \beta_0 + \beta_1 TR_{it} + \beta_2 LF_{it} + \beta_3 GCE_{it} + \beta_4 GRE_{it} + Z_{it} + u_{it} \dots\dots\dots\dots\dots\dots (3.5)$$

To make the interpretation of the results of the variables easier and also to get the stationary of the variables in lower order of integration the researcher take the natural logarithmic form for the above equations. Therefore the letter ln represents logarithmic terms of the variables. The logarithmic form of the regressions and the final models to be estimated in the study are specified as follows:

$$lnRGDP_{it} = \beta_0 + \beta_1 lnTR_{it} + \beta_2 lnLF_{it} + \beta_3 lnGCE_{it} + \beta_4 lnGRE_{it} + Z_{it} + u_{it} \dots\dots (3.6)$$

Where

$RGDP_{it}: - Real\ Gross\ Domestic\ Product$

$TR_{it}: - Tax\ revenue$

$GCE_{it}: - Government\ Capital\ expenditure$

$LF_{it}: - Labour\ Force$

$GRE_{it}: - Government\ recurrent\ expenditure$

$u_{it} =$ Error term

The regional state of Ethiopia which mentioned above have the authority to collect tax as described in constitution of Ethiopia in article 96.

The β_0 is a constant term and β_1 to β_4 are estimate parameters in the model and "i*"* is a cross-section data for regional state referred to, and t is a time series data and u_{it} is an error term.

To achieve the objectives of the study, the researchers used fixed and random effect model, panel cointegration, panel causality and VECM used for study as the objective. The study used regression equation to investigate the identified objective.

4.4 Relevance of panel research as compare to time series and cross section

Panel data are very popular among applied researchers in many different fields from economics to sociology. A panel data set is one that follows a given sample of subjects over time, and thus provides multiple observations on each subject in the sample. Subjects may be workers, countries, firms, regions... while the multiple observations per subject usually refer to different moments in time (e.g. years, quarters, or months). Indeed, time series and cross-sectional data can be thought of as special cases of panel data that are in one dimension only (one panel subject for the former, one time point for the latter)(Paul, 2018).

Allowing for the presence of subject-specific unobserved heterogeneity represents one of the key advantages of using panel data. Having multiple observations per individual allows identifying a time invariant component that is unobserved to the econometrician and may be correlated with other observable characteristics in the data set. For instance, in cross-country studies of economic growth, unobserved heterogeneity at the country level may be associated with cultural differences or geographical characteristics across countries (see Islam, 1995; Paul, 2018). Moreover, in a regression of y on x, panel data can accommodate feedback effects from current y to future x, so that this particular form of reverse causality can easily be accounted for by using well-known panel data

techniques where the x repressors are said to be predetermined. Predetermined repressors are also labeled as weakly exogenous or sequentially exogenous in the literature (Wooldridge, 2010; Paul, 2018)

A panel data has also a number of advantages, instead of pure cross-section or pure time series data. The obvious benefit is in terms of obtaining a large sample, giving more degrees of freedom, more variability, more information and less multicollinearity among the variables. A panel has the advantage of having N cross-section and T time series observations, thus contributing a total of NT observations. Another advantage comes with a possibility of controlling for individual or time heterogeneity, which the pure cross-section or pure time series data cannot afford. Panel data also opens up a scope for dynamic analysis. The main advantage of panel data comes from its solution to the difficulties involved in interpreting the regression coefficients in the framework of a cross-section only or time series only regression, as we explain below (Vigayamohanan, 2016).

In panel data, individuals (persons, firms, cities, etc.) are observed at several points in time (days, years, etc.). This paper focuses on panels with relatively better time periods (large T) and few individuals (small N). The two basic models for the analysis of panel data, the fixed effects and the random effects model and present consistent estimators for these two models. Panel data are most useful when we suspect that the outcome variable depends on explanatory variables which are not observable but correlated with the observed explanatory variables. If such omitted variables are constant over time, panel data estimators allow to consistently estimate the effect of the observed explanatory variables.(Schmidheiny, 2016)

Description of Variables and Expected sign of Coefficients

Real Gross Domestic Product: - it is the measure of real production measured by removing the effects of price change on the GDP measurement, or it is the value of currently produced goods and services measured at constant price. Note that all variables are deflated on their respective year's deflation rate.

Government current expenditure:- it refers to the total government expenditure on consumption purpose. Since it does not contribute to capital formation, the expected relation to GDP is negative.

Government Capital Expenditure:- it refers to the total government expenditure on capital investment. Since it increases productivity the expected sign of its coefficient is positive.

Labor Force:- labor force includes group of people within the age from 15-64, who are actually employed and those who are without a job but are actively searching for a job. It measures as percentage of total population. Since it includes working people, expected sign of labor in relation to RGDP is positive.

Table 1:-Variables and expected sign

No	Variable	Expected sign	Measurement
1	Real Gross domestic product (RGDP)	Dependent Variable	Economic growth measure.
2	Tax Revenue	positive (+ve or -ve)	Get from the sum of indirect and direct tax revenue.
3	Government Capital expenditure	Positive(+ve)	All the government expenditure on investment
4	Labor force	Positive(+ve)	Group of people with in age 15-64
5	Government Recurrent expenditure	Negative(-ve)	The government expenditure for consumption purpose

4.5 Estimation technique

4.5.1 Panel unit root test

Panel unit root testing arises from the time series nature of the data and its unit root. The major difference between time series testing of unit roots and panel unit root tests is that we have to consider asymptotic behavior of the time-series dimension (T) and the cross-sectional dimension of individual observation (N).Using Statistical software we can implements a variety of tests for unit roots or stationary in panel datasets(Amsalu,2018). According to (Maddala,1992;Biruk,2015) Regression using non-stationary variables will only reflect a relationship that is not real, and accordingly such regression is termed as "spurious regression". In this case, as the sample size increases, the coefficient variance doesn't tend to be constant and the consistency property of OLS estimators breaks down. The sampling distribution of the estimators will be non-standard and the usual statistics (t and F) based on normal become invalid.

From different panel unit root tests, LLC and IPS are the most popular tests. However, LLC assumes homogeneity in the dynamics of the autoregressive coefficients for all panel members. In this approach we develop the null hypothesis for each time series rather than applying the test on the average of the variables. In addition to this approach is appropriate for small size of cross country and time series dimensions. Accordingly Levin, Lin and Chu test assumes cross-sectional independence of the variables. The null hypothesis is that each individual time series contains a unit root against the alternative that each time series is stationary (Ho**:** each time series contains a unit root and H1**:** each time series is stationary)(Amsal,2018).

The ways of transforming a non-stationary variable in to a stationary one, If a non-stationary variable turns in to a stationary one by differencing [once or more], it is called Differenced stationary process (DSP). If a non-stationary variable turns in to a stationary one by de trending or by removing its trend, it is called Trend stationary process (Gujarati, 2004). In this research the transformation of stationary is by differencing the variable method is used.

4.5.2 Fixed effects and random effects models

In panel data analysis the most commonly estimated models are the fixed effects (FE) and random effects (RE) models. The crucial distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regresses in the model or not. Fixed Effects explore the relationship between predictor and outcome variables within an entity (country, person, company). Fixed effect models control for, or partial out, the effects of time invariant variables with time-invariant effects. When there is many variables that rise over time, and when one is interested in analysing the impact of variables over time FE models are essential to capture the effect of these variables (Maziya et al, 2005; Amsalu,2018).Accordingly the fixed effect model equation becomes as:

$$Y_{it}=\alpha_i + \beta_i X_{it} + U_{it} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . \dots \dots \dots (3.5.2.1)$$

Where, α_i is the unknown intercept for each entity (i = 1, 2……n) i denotes individual nations. Y_{it} Denotes the dependant variable t denotes time. X_{it} refers to explanatory variables; $\boldsymbol{\beta}_i$ refers to the coefficient of independent variables included in the model, and u_{it} is the error term.

We will use random effect model when we assume variation across entities to be random and uncorrelated with explanatory variables included in the model. In other words if we find reasons that influence difference across entities affect the dependant variable. The equation of random effect model is given by:

$$Y_{it} = \beta_i X_{it} + \alpha_i + U_{it} + \in_{it} \text{ ……..………………………………………..}(3.5.2.2)$$

Where; Y_{it} is the dependent variable as usual; X_{it} represent the explanatory variables; $\boldsymbol{\beta_i}$ the corresponding coefficients of independent variables. α_i represents the group specific constant term; U_{it} is the error term which unobserved or due to specification problem individual entity specific is the error or idiosyncratic error or varies over time and entities while $\in_{it}$ is the usual error component which is assumed to be independent and identically distributed over individuals country and time with mean zero variance (Woodrage, 2005; Amsalu,2018).

The nature of the variables that have been omitted from the model can be if we think there are no omitted variables or if we believe that the omitted variables are uncorrelated with the explanatory variables that are in the model then a random effects model is probably best. It shall produce unbiased estimates of the coefficients, use all the data available, and produce the smallest standard errors. More likely, however, is that omitted variables should produce at least some bias in the estimates. Similarly If there are omitted variables, and these variables are correlated with the variables in the model, then fixed effects models may provide a means for controlling for omitted variable bias. In a fixed-effects model, subjects serve as their own controls. The idea is that whatever effects the omitted variables have on the subject at one time, they will also have the same effect at a later time; hence their effects will be constant, or “fixed.” However, in order for this to be

true, the omitted variables must have time-invariant values with time-invariant effects(Williams, 2018).

The Choosing between Fixed Effects (FE) and Random Effects (RE) has the following criteria. First, with large T and small N there is likely to be little difference, so FE is preferable as it is easier to compute. Second, with large N and small T, estimates can differ significantly. If the cross-sectional groups are a random sample of the population RE is preferable. If not the FE is preferable. Third, If the error component, vi, is correlated with x then RE is biased, but FE is not. Finally, For large N and small T and if the assumptions behind RE hold then RE is more efficient than FE. The Hausman test for the statistical significance of the difference between the coefficient estimates obtained by FE and by RE, under then null hypothesis that the RE estimates are efficient and consistent, and FE estimates are inefficient. The test has a Wald test form, and is usually reported in Chi2 form with k-1 degrees of freedom (k is the number of repressors). If W < critical value then random effects is the preferred estimator (Mishra, 2018). In this paper the fixed effect model equation is described as

$$lnRGDP_{it} = \beta_0 + \beta_1 lnTR_{it} + \beta_2 lnLF_{it} + \beta_3 lnGCE_{it} + \beta_4 lnGRE_{it} + Z_{it} + u_{it} \ldots . (3.7)$$

4.5.3 Panel autocorrelation and heterogeneous test

The diagnostic tests that will be conducted includes: test for autocorrelation, testing for Heterogeneous (to test whether the disturbances have the same variance), testing for serial correlation (to test whether the residuals are correlated across entities); and test for the overall goodness of fits (weather the explanatory variables included in the model well explain dependent or not) (Gujarati, 2004).

The covariance between the error terms over time (or cross-sectionally, for that type of data) is zero. In other words, it is assumed that the errors are uncorrelated with one another. If the errors are not uncorrelated with one another, it would be stated that they are autocorrelated‘ or that they are serially correlated(Gebi,2016).

The Im, Pesaran and Shin (2003) panel unit root test, which is commonly known as IPS is more general in the sense that it allows for heterogeneity in these dynamics. Therefore, it is described as a Heterogeneous Panel Unit Root Test. It is particularly reasonable to allow for such heterogeneity in choosing the lag length in ADF tests when imposing uniform lag length is not appropriate. In addition, slope heterogeneity is more reasonable in the case where regional state data is used. As a result, the test of vec residual hetroskedasticity tests to test the presence of heterogeneous or not is used. The testing mechanism is the H_0: no presence of heterogeneous: Alt H_1: Has the problem of heterogeneous. Autocorrelation is assumed that errors are uncorrelated with one another for the given data. If errors are not uncorrelated to each other, this problem will be regarded as autocorrelation. To test the presence or not use Pesaran CD tests, vec residual serial correlation lm test, vec portmanteau test for autocorrelation are used.

4.5.4 Normality test

The need to check for non-normal errors in regression models obeys to both methodological and conceptual reasons. From a strictly methodological point of view, lack of Gaussianity sometimes harms the reliability of simple estimation and testing procedures, and calls for either better methods under alternative distributional assumptions, or for robust alternatives whose gains do not depend on distributional features. Alternatively, whether errors should be more appropriately captured by skewed and/or leptokurtic distributions may be a statistical relevant question (Javier Alejo A. G., 2015).

For standard regression models, the classical BeraJarque test is a simple way that detects departures away from gaussianity in the form of skewness and excess kurtosis in the regression error term. A natural concern in the case of panel data models is to identify which error compoment (if not both) is the source of non normalities. The proposed tests allows researchers to explore skewness and excess kurtosis in each component separately or jointly. In this context, the proposed procedure can be seen as extending the famous Bera-Jarque tests for the case of simple panel data models(Javier,2015).

4.5.5 Optimal lag length

The vectorial autoregressive(VAR) model became a standard linear model used in empirical work. An important aspect of empirical research in the specification of the VAR models is the determination of the lag order of the autoregressive lag polynomial, since all inference in the VAR model depends on the correct model specification. In several contributions the effect of lag length selection has been established. Selecting higher order lag length than the true lag length causes an rise in the mean square forecast error of the VAR and that under fitting the lag length often generate auto correlated errors. The literature has shown how to choice an adequate lag order of a covariance stationary VAR model and an adequate lag order of a VAR model subject to co-integration restrictions. Among the classical processes, there are the information criteria such as AIC: Akaike information criterion SC: Schwarz information criterio HQ: Hannan-Quinn information criterion. To investigate the performance of information criteria in selecting the lag order of a VAR model when the data are generated from a true VAR with co-integration and weak-form restriction that is referred as the correct model (Castro, 2007).

4.5.6 Panel cointegration tests

If the panel variables are integrated of order one, i.e. I(1), then testing for the presence of cointegration can be undertaken. In conventional time series, the Engle and Granger cointegration test founded on an examination of the residuals of a regression is commonly performed using I(1) variables. If the variables are cointegrated, then the residuals would be I(0). In such cases, the same unit root tests can be applied for both raw data and residuals, with proper modifications to the critical values when applied to the latter (Engle, 1987).

Kao (1999) proposes the Dickey-Fuller test and the Augmented Dickey-Fuller (ADF). Let $\hat{e}_{it}$ be the estimated residual from the following regression:

$$y_{it} = \alpha_i + \beta x_{it} + e_{it} \qquad i = 1,..N, t = 1,...T \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.5.6.1)$$

The equation (3.5.6.1) is estimated using LSDV (least square dummy variable) estimator. The DF test is applied to the estimated residuals:

$$\hat{e}_{it} = \gamma \hat{e}_{it} + \hat{v}_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots. \dots. (3.5.6.2)$$

The null hypothesis of no cointegration, $H_0: \gamma = 1$ is tested against the alternative of cointegration for all i=1,....n (Homogenous hypothesis).

Kao (1999) proposed four DF-types tests:

$$DF_\gamma = \frac{\sqrt{N}\, T(\hat{\gamma} - 1)}{\sqrt{10.2}} \quad \sim\ N(0,1) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots... (3.5.6.3)$$

$$DF_t = \frac{\sqrt{}(1.25t\gamma\ )}{\sqrt{1.875N}} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.\dots.. (3.5.6.4)$$

$$DF_\gamma^* = ((\sqrt{NT})(\gamma - 1) + \frac{(\sqrt[3]{N})\hat{\delta}_v^2}{\hat{\delta}_{ov}^2})/(\sqrt{(3 + 36\hat{\delta}_v^4)}/5\hat{\delta}_{ov}^4) \dots\dots\dots..\dots. (3.5.6.5)$$

$$DF_t^* = \frac{t_r + (\sqrt{6N\hat{\delta}_v/2\hat{\delta}_{ov})}}{\sqrt{((\hat{\delta}_{ov}^2/2\hat{\delta}_v^2)} + (\frac{3\hat{\delta}_v^2}{10\hat{\delta}_{ov}^2}))} \quad \dots\dots\dots\dots\dots\dots\dots.\dots\dots\dots\dots\dots\dots\dots\dots\dots.. (3.5.6.6)$$

While DF_γ and DF_t are based on the assumption of strict exogeneity of the regressors with respect to the errors in the equation, DF_γ^* and DF_t^* are for cointegration with endogenous regressors.

The ADF regression estimated is:

$$\hat{e}_{it} = \gamma \hat{e}_{it-1} + \sum_{j=1}^{\rho} \emptyset_j \Delta \hat{e}_{it-j} + v_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..\dots (3.5.6.7)$$

The ADF test is applied to the estimated residual: where p is chosen so that the residual $v_{i,tp}$ are serially uncorrelated. The ADF test statistic is the usual t-statistic of the equation (3.5.6.7).

With the null hypothesis of no cointegration, the ADF test statistics can be constructed as:

$$ADF = \frac{t_{ADF} + (\sqrt{6N\hat{\delta}_v/2\hat{\delta}_{ov}}}{(\sqrt{(\hat{\delta}_{ov}^2/2\hat{\delta}_v^2)} + (10\hat{\delta}_{ov}^2)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5.6.8)$$

Where $\hat{\delta}_v^2 = \sum \mu\varepsilon - \sum \mu\varepsilon \sum_\varepsilon 1, \hat{\delta}_{ov}^2 = \Omega_{\mu\varepsilon} - \Omega_{\mu\varepsilon}\Omega_\varepsilon^1,$ Ω is the long-run covariance matrix and t_{ADF} is the t-statistic in the ADF regression. Kao shows that all DF and ADF test converges to a standard normal distribution N(0,1).

Homogeneity hypothesis (i.e. the variances are constant across the cross-section units.)

Kao and Chiang (2000) analyzed the asymptotic distributions for ordinary least square (OLS), fully modified OLS (FMOLS), and dynamic OLS (DOLS) estimators in cointegrated regression models in panel data. They show that the OLS, FOMLS, and DOLS estimators are all asymptotically normally distributed.

Kao and Chiang consider the following fixed-effect panel regression:

$$y_{it} = \alpha_i + x_{it}'\beta + u_{it} \qquad i = 1, \dots N \;\; t = 1, \dots . T \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5.6.9)$$

where $[y_{it}]$ are 1 × 1, β is a k × 1 vector of the slope parameters, $[\alpha_i]$ are the intercepts, and $[u_{it}]$ are the stationary disturbance terms.

Kao and Chiang also assumed that $\{x_{it}\}$ are K × 1 integrated processes of order one for all i, where

$$x_{it} = x_{it-1} + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5.6.10)$$

Under these specifications, the previous equation defines a system of cointegrated regressions, i.e. is cointegrated under the hypothesis that $\{y_{it}\}$ and x_{it} are independent across cross-sectional units.

The innovation vector is $w_{it} = (u_{it}, \varepsilon_{it})$. The long-run covariance matrix, **Ω**, of w_{it}, can be written as:

$$\Omega = \sum_{J=-\infty}^{\infty} E(w_{i.jw'_{i,o}}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5.6.11)$$

$$\Omega = \Sigma + \Gamma + \Gamma' \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5.6.12)$$

$$\Omega = \begin{bmatrix} \Omega_u & \Omega_{u\varepsilon} \\ \Omega_{\varepsilon u} & \Omega_\varepsilon \end{bmatrix} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5.6.13)$$

Where

$$\Gamma = \sum_{J=-\infty}^{\infty} E(w_{ij} w_{io}) = \begin{bmatrix} \Gamma_u & \Gamma_{u\varepsilon} \\ \Gamma_{\varepsilon u} & \Gamma_\varepsilon \end{bmatrix} \dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5.6.14$$

And

$$\Sigma = E(w_{ij} w_{io}) = \begin{bmatrix} \Sigma_u & \Sigma_{u\varepsilon} \\ \Sigma_{\varepsilon u} & \Sigma_\varepsilon \end{bmatrix} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5.6.15)$$

Are partitioned conformably with w_{it}.

The-sided long-run covariance is defined as:

$$\Delta = \Sigma + \Gamma \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5.6.16)$$

$$\Delta = \sum_{J=-\infty}^{\infty} E(w_{i,j} w'_{i,o}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5.6.17)$$

$$= \begin{bmatrix} \Omega_u & \Omega_{u\varepsilon} \\ \Omega_{\varepsilon u} & \Omega_\varepsilon \end{bmatrix} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5.6.18)$$

Kao and Chiang derived limiting distributions for the OLS, FMOLS and DOLS estimators in a cointegrated regression. The OLS estimator of β is

$$\hat{\beta}_{OLS} = \left[\sum_{i=1}^{N}\sum_{t=1}^{T}(x_{it} - \overline{x}_i)(x_{it} - \overline{x}_i)'\right]^{-1}\left[\sum_{i=1}^{N}\sum_{t=1}^{T}.(x_{it} - \overline{x}_i)(y_{it} - \overline{y}_i)\right] \ldots.. (3.5.6.19)$$

where $\overline{x}_i = \frac{1}{T}\sum^{Ti=1} x_{it}$ and $\overline{y}_i = \frac{1}{T}\sum_{i=1}^{T} y_{it}$ represent the individuals means.

Kao and Chiang (2000) showed that the asymptotic distributions of the OLS estimator is normal standard.

According to Pedroni (2004) showed that testing for cointegration in panel data is not as simple as the conventional Engle-Granger way unless the regressors are strictly exogenous and the pooled ordinary least square (OLS) slope is constrained to be homogeneous. He argued that proper adjustments should be made to the test statistics themselves if the alternative hypothesis is that the cointegrating relationship is not constrained to be homogeneous across members, and that the parameters' estimates are allowed to vary across individual members. If this is not done, then the null hypothesis of no cointegration will certainly be rejected, regardless of the true relationship, as the sample size grows large. Also, imposing homogeneity falsely across members when the true relationship is heterogeneous generates an integrated component in the residuals, making them non-stationary, thus leading to the conclusion that the variables are not cointegrated even if they really are.

Extending the Engle-Granger framework to tests that involve panel data, Pedroni proposes several tests for cointegration that allow for heterogeneous intercepts and trend coefficients across cross-sections. Consider the following regression:

$$y_{it} = \alpha_i + \delta_i t + \beta_{mi} x_{mit} + e_{it} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots .. \ldots \ldots (3.5.6.30)$$

for t = ,1, K ,T; i = ,1, K , N; m = ,1 K , M ; where y and x are assumed to be integrated of order one, I(1). The parameters α_i and δ_i are individual and trend effects respectively

that may be set to zero if desired. Under the null hypothesis of no cointegration, the residuals it e_{it} will be I(1).

Pedroni tests can be classified into two categories: the with in dimensions and the between dimensions. The former are based on estimators that effectively pool the autoregressive coefficient across different members for the unit root tests on the predictable residuals, while the latter are based on estimators that simply average the individually estimated coefficients for each member i. A consequence of this distinction arises in terms of the autoregressive coefficient, γ_i , of the estimated residuals under the alternative hypothesis of cointegration.

The Pedroni statistics are one-sided tests with a critical value of − 1.64 where Z < − 1.64 implies rejection of the null hypothesis of no cointegration; except the panel v-statistic that has a critical value of 1.64, so that z_v^w > 1.64 suggests rejection of the null of no cointegration (Pedroni, P, 1997). Each of the statistics has an asymptotic distribution in the form:

$$\frac{\boldsymbol{x_{N,T} - \mu(N)^{1/2}}}{\boldsymbol{(v)^{1/2}}} \quad \boldsymbol{N(1,0)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. \boldsymbol{(3.5.6.31)}$$

where X N ,T is the corresponding form of the test statistic, while μ and ν are the mean and variance of each test, respectively.

In a Monte Carlo experiment, Pedroni (1997) compared the performance of the seven statistics in terms of size, distortion and power. He concluded that concerning power and small samples, the group ADF generally performed best, followed by the panel ADF and the panel rho; hence these are more reliable.

In this research, both Kao and Pedroni residual cointegration test are applied. To see the long run relationship between the dependent and independent variable are tested. If the variable have long run relationship then can go to do VECM otherwise return to the VAR.

4.5.7 Causality tests: VECM and Granger causality

If co-integration can be identified between dependent and independent variables as presented in the results discussed in the last section, then it can be understood that there is at least a single aspect of causality (Granger, 1969). Causality refers to the ability of one variable to predict (and thus cause) the other. The Granger (1969) causality test for two variables x_t and y_t involves the following Vector Autoregressive (VAR) model to be estimated:

$$y_t = \alpha_1 + \sum_{i=1}^{n} \beta_i x_{t-i} + \sum_{j=1}^{m} \gamma_j y_{t-j} + e_{1t} \quad \text{(3.5.8.1)}$$

$$x_t = \alpha_2 + \sum_{i=1}^{n} \theta_i x_{t-i} + \sum_{j=1}^{m} \delta_j y_{t-j} + e_{2t} \quad \text{(3.5.8.2)}$$

where it is assumed that both ε_{yt} and ε_{xt} are uncorrelated white-noise error terms. Thus, x_t does not Granger cause y_t if $0 = \beta_1 = \beta_2 = \beta_i$, where the latter hypothesis is tested using the F test.

If no co-integration is found between variables, then the standard causality test (Granger, 1969) can be applied. If there is co-integration, then causality can be examined using the vector error-correction model (VECM) (Granger , 1988) as below:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta y_{t-1} + \sum_{i=n}^{n} \alpha_{2i} \Delta x_{t-1} + \sum_{i=1}^{n} \alpha_{3i} EC_{t-n} + \epsilon_i \quad \text{(3.5.8.3)}$$

The short-term causality of the VECM can be tested using the Wald test (x^2 test), and the long-term causality is tested by examining whether the error-correction coefficient α_{3i} in the model is significantly different from zero.

The same test will be used to test for causality in the panel data equations. If the panel co-integration tests are co-integrated, a modified version of equation (3.5.8.3) to account for the panel data will be used (Pedroni, 1997):

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i}\, \Delta y_{t-1} + \sum_{i=n}^{n} \alpha_{2i} \Delta x_{t-1} + \sum_{i=1}^{n} \alpha_{3i}\, \Delta z_{t-1} + \sum_{i=1}^{n} \alpha_{4i}\, EC_{t-n} + \epsilon_i \ldots (3.5.8.4)$$

WhereΔy_{t-1} and Δx_{t-1} are the endogenous variables from each equation while Δz_{t-1} are the exogenous (predetermined) variables in the equations.

The long run individual variable causality is done by granger causality and joint causality has done by using VECM. The speed of adjustment has been done also in the VECM. Therefore this model play great role in this research.

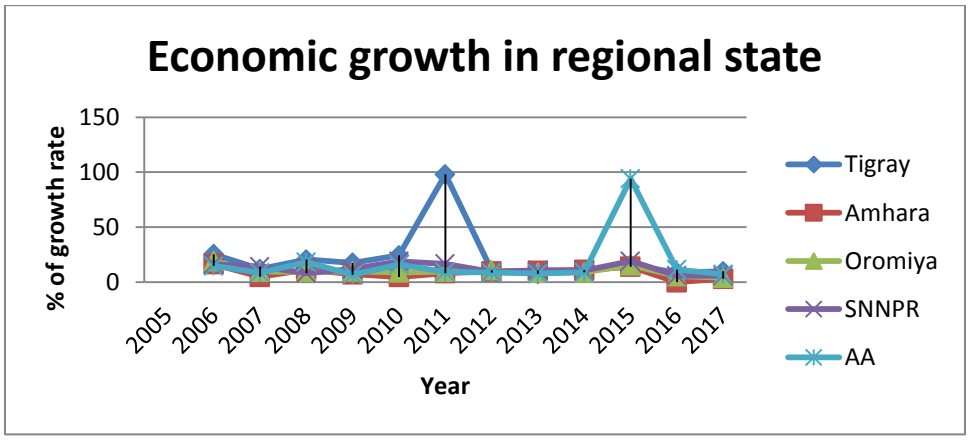
Chapter five

Estimation result and Discussion

5.1 Trends of tax revenue and economic growth

The regional state of Ethiopia economic growth rate covers from the year 2006 to 2017. The regional states of Tigray, Amhara and Oromia highest economic growth rate was 98%, 16.5% and 18.9% respectively happen in the year of 2011, 2006 and 2006 respectively The average growth rate for the year from 2006 to 2017 was 21.7%, 8.5% and 9.9% respectively. Similarly SNNPR and Addis Ababa the highest growth rate was 19.2% and 94% respectively in the year 2015 respectively. The average growth rate of SNNPR and Addis Ababa was 12.3% and 17.6% respectively. The Tigray RGDP growth rate is high in 2011 because in this year RGDP of Tigray was rebased and other new materials are included which was not were in 2000. Rebase means change the constant price adopted in 2000 in to 2011 price level. Addis Ababa recorded in 2015 was by the reason of change tax law. The tax payer were pay more as compare to the before year. This reason makes RGDP to rise in 2015. The regional state economic growth rate is shown in the following figure.

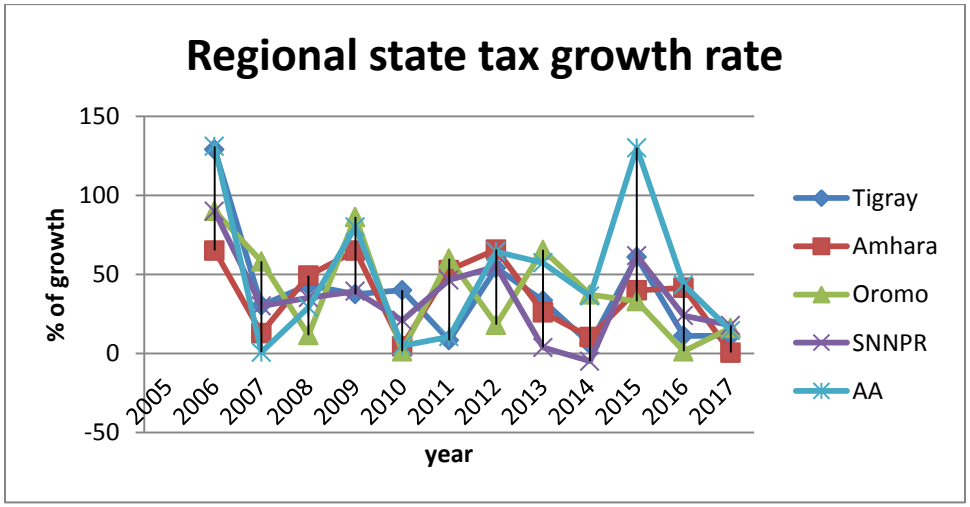
Figure 2*:- Regional State of Ethiopia economic growth rate*



Source own computation regional state RGDP of Ethiopia

The tax growth rate for regional state of Ethiopia covers from the year 2006 to 2017. The state of Tigray Amhara and Oromia tax which is the sum of direct and indirect tax highest growth rate was 129%, 65.7% and 90% respectively happen in the year of 2006. The average growth rate for the year from 2006 to 2017 was 39%, 36% and 39% respectively. Similarly SNNPR and Addis Ababa the highest growth rate was 61.7% and 130% respectively in the year 2015. The average growth rate is 35% and 50% respectively. This happen because in 2006 the government give more attention to response the question of the people because in 2005 political election give the leader to collect more tax. In 2015 the law of tax improved which means the paying amount in one person increase leads to increase the growth rate.

Figure 3*:- Tax growth rate in regional state of Ethiopia*



Source own computation

5.2 Descriptive Statistics of the variables

Descriptive statistics explain dependent variable RGDP and the four explanatory variables namely tax revenue, labour force, government capital expenditure and government recurrent expenditure in terms of central tendency mean and on measure of dispersion like standard deviation, range maximum and minimum observation value and also measure of normality like kurtosis(measure the degree of sharpness) and skewness(measure degree of symmetry) as shown below in table 2 below.

Table 2:- Discriptive stastics of the variable

Measurement	RGDP	TR	LF	GCE	GRE
Mean	81,500,000,000.00	7,010,000,000.00	973,473.00	41,400,000,000.00	9,410,000,000.00
Median	62,500,000,000.00	3,390,000,000.00	956,214.00	28,700,000,000.00	5,800,000,000.00
Maximum	281,000,000,000.00	50,100,000,000.00	2,370,124.00	162,000,000,000.00	38,200,000,000.00
Minimum	5,490,000,000.00	145,000,000.00	260,300.00	942,000,000.00	260,000,000.00
Std. Dev.	68,600,000,000.00	9,790,000,000.00	490,110.40	40,900,000,000.00	9,560,000,000.00
Skewness	1.137123	2.637401	0.550491	1.092737	1.231557
Kurtosis	3.734793	10.41829	2.997483	3.3437	3.53617
Jarque-Bera	15.47032	224.3976	3.282952	13.25574	17.20986
Probability	0.000437	0	0.193694	0.001323	0.000183
Sum	5.30E+12	4.56E+11	63275742	2.69E+12	6.11E+11
Sum Sq. Dev.	3.02E+23	6.13E+21	1.54E+13	1.07E+23	5.86E+21
Observations	65	65	65	65	65

Source: Descriptive statistics result from EView-9 run by the researcher

Mean is the average value of the sample. Similarly, maximum and minimum observation value, standard deviation, skewnes, kurtosis and jarque bera result of explanatory variables were depicted in the above table 2. Accordingly the mean value of tax revenue collected over the period 2005-2017 of 5 regional state of Ethiopia was 7,010,000,000 and also the maximum and minimum value were 50,100,000,000 and 145,000,000 respectively. Standard deviation measures how far observations are from the sample average. This data standard deviation of the sample data is 9,790,000,000 far from the mean of the data as shown on the table 2. This result of high standard deviation shows the variety of tax revenue from the region to the region in Ethiopia. Similarly the maximum and minimum result shows high variation in tax.

When the researcher comes to skewness measures the degree of asymmetry of the series. The tax data on table 2 result shows positive skewed. The positive result of skewness is normally happen because the mean of the data is greater than the median as shown in table 2. Similarly RGDP, GCE, LF and GRE become also positively skewed. In the kurtosis side, Kurtosis measures the peachiness or flatness of the distribution of the series. The result of kurtosis RGDP, TR, LF, GCE and GRE are 3.73, 10.42, 3, 3.34 and 3.54 respectively. The kurtosis result except LF all variable show pletykurtic because all

are more than the normal value 3. The LF kurtosis result shows mesokurtic. The measure of normality is measured by kurtosis and skewness. The different level measure of Kurtosis are Mesokurtic, Leptokurtic and Pletykurtic. In eview for mesokurtic(normal distribution) equal to the value 3, for leptokurtic(Positive kurtosis) greater than 3 and for platykurtic(Negative kurtosis) less than 3.

5.3 Choosing fixed effect versus random effect model

The tax revenue and economic growth in regional state of Ethiopia is specified and the model is formulated based on Economic theory as stated in chapter three. The organized data are estimated based on the panel model, which includes cross sectional and time series dimensions for some regional state of Ethiopia over the period 2005 to 2017. Fixed effects and random effects models are commonly used models for the panel data. In order to choose fixed or random effect model a formal test so called hausman test has used which was based on the null hypothesis in favor of random effect model estimator or the hypothesis states as: Ho: Random effect model is appropriate and H_1:Random effect model is not appropriate or FE model is appropriate. The decision rule is when the prob>chi2 or the P- value is greater than the given level of significant (usually 5%), then we fail to reject the null hypothesis (Ho), thus random effect model is appropriate. On the other hand, if the P- value is less than a given level of significant or 5% we reject the null or the fixed effect model is appropriate (Woodridge, 2006).

5.4 Panel unit root test

The use of non-stationary data can lead to spurious regressions. If two stationary variables are generated as independent random series, when one of those variables is regressed on the other, the *t*-ratio on the slope coefficient would be expected not to be significantly different from zero, and the value of R^2 would be expected to be very low. This seems obvious, for the variables are not related to one another. However, if two variables are trending over time, a regression of one on the other could have a high R^2 even if the two are totally unrelated. So, if standard regression techniques are applied to non-stationary data, the end result could be a regression that looks‘ good under standard

measures (significant coefficient estimates and a high R^2), but which is really valueless. Such a model would be termed a spurious regression(Brook,2008; Gebi,2016).

For the purpose of the analysis, a stationary series can be defined as one with a constant mean, constant variance and constant autocovariances for each given lag. While working with panel data, testing for stationary is needed. As it has been stated in previous paragraph, working with non-stationary leads to spurious output. This means, it indicate a relationship between variable which does not exist. To have reliable result, we have to transform non-stationary to stationary by making it differencing (Gebi, 2016).

There are a variety of tests for unit roots or stationary in panel datasets like the Levin–Lin–Chu(2002) and Breitung and Das (2005), Im,pesaran and shin W-stat, ADF-Fisher chi-square and PP-Fisher chi-square test. This study uses the Levin–Lin–Chu (2002), Im,pesaran and shin W-stat, ADF-Fisher chi-square and PP-Fisher chi-square test to analysis or investigates stationary of the Variables as a summary. The assorted tests make different asymptotic assumptions regarding the number of panels in the dataset and the number of time periods in each panel, thus this test assumes for balanced data sets. The main difference between panel and time series unit root test is that we have to consider asymptotic behavior of the time-series dimension T and the cross-sectional dimension N. If the calculated value is greater than the tabulated (P-value or critical) value at a given level, the given variable is stationary at the given order.

All methods [(1)Levin,Lin&Chu t* (2) Im,pesaran and shin W-stat (3) ADF-Fisher chi-square (4) PP-Fisher chi-square are telling that the variable TR, RGDP, LF, GCE and GRE are stationary at first difference. For all mentioned above methods Null; panel data has unit root(Non stationary) Alt; panel data has not unit root(Stationary).

As observed from the below table, the variable that was not stationary at level is stationary at first difference since their respective probability values were less than the 5% significance level. So, all variable became stationary and can be concluded that, there is no stationary problem as displayed for this study in table 3.

Table 3*:*- unit root test

Variable	Level of test	Levin-lin			Im,pesaran		
		Intercept	Inte and Trnd	None	Intercept	Inte and Trnd	None
lnRGDP	Level	-2.10577 (0.0176)**	1.45758 (0.9275)	4.85659 1.0000	1.16135 (0.8773)	1.08142 (0.8602)	-
	F.defference	-3.32505 (0.0004)	-4.66353 (0.0000)***	-2.26199 (0.0118)**	-3.17037 (0.0008)***	-2.29252 (0.0109)**	-
lnTR	Level	-3.15748 (0.0008)***	-3.94769 (0.0000)***	7.53006 (1.0000)	0.20391 (0.5808)	-1.70615 (0.0440)	
	F.defference	-4.72431 (0.0000)	-8.21814 (0.0000)	-4.84230 (0.0000)***	-7.03408 (0.0000)***	-7.14501 (0.0000)***	
Lnlf	Level	-0.67420 (0.2501)	-6.30450 (0.0000)***	7.08984 (1.0000)	1.96343 (0.9752)	-2.75611 (0.0013)	
	F.defference	-9.18024 (0.0000)***	-7.75750 (0.0000)	-7.73321 (0.0000)***	-7.31430 (0.0000)***	-5.04432 (0.0000)***	
lnGCE	Level	-2.22012 (0.0132)**	-1.08795 (0.1383)	5.37300 (1.0000)	0.66982 (0.7885)	0.64348 (0.7400)	
	F.defference	-8.16615 (0.0000)	-8.90822 (0.0000)***	-5.36366 (0.0000)***	-5.47835 (0.0000)***	-5.08941 (0.0000)***	
lnGRE	Level	-1.96133 (0.0249)	-5.11427 (0.0000)***	6.44237 (1.0000)	0.03595 (0.5143)	-1.89744 (0.0289)**	
	F.defference	-7.92613 (0.0000)***	-7.35850 (0.0000)	-5.99587 (0.0000)***	-5.97189 (0.0000)***	-4.32593 (0.0000)	
		ADF fisher			PP-fisher		
		Intercept	Inte and Trend	None	Intercept	Inte and Trend	None
lnRGDP	Level	3.99243 (0.9477)	5.44922 (0.8592)	0.11347 (1.0000)	4.54507 (0.9194)	1.87739 (0.9972)	0.03122 (1.0000)
	F.defference	27.2170 (0.0024)***	20.9559 (0.0214)**	22.0731 (0.0147)**	20.6963 (0.0233)**	24.0776 (0.0074)***	21.6756 (0.0168)**
lnTR	Level	6.97117 (0.7282)	20.8195 (0.0225)**	0.01061 (1.0000)	15.8995 (0.1025)	40.8108 (0.0000)***	0.00168 (1.0000)
	F.defference	55.2954 (0.0000)***	52.4948 (0.0000)	34.5722 (0.0000)***	86.2283 (0.0000)***	78.3915 (0.0000)	42.6294 (0.0000)***
Lnlf	Level	2.35375 (0.9928)	25.3023 (0.0048)***	0.04003 (1.0000)	1.83891 (0.9974)	32.3135 (0.0004)	0.03370 (1.0000)
	F.defference	56.6293 (0.0000)***	39.3280 (0.0000)	60.2868 (0.0000)***	74.9186 (0.0000)***	64.1730 (0.0000)***	60.1964 (0.0000)***
lnGCE	Level	4.53723 (0.9199)	5.57311 (0.8498)	0.12896 (1.0000)	6.95312 (0.7299)	5.84920 (0.8278)	0.02224 (1.0000)
	F.defference	43.0917 (0.0000)***	37.5678 (0.0000)***	38.7754 (0.0000)***	41.7249 (0.0000)***	36.0908 (0.0001)***	48.4187 (0.0000)***
lnGRE	Level	10.3471 (0.4106)	18.7883 (0.0430)**	0.57450 (1.0000)	17.3021 (0.0679)	24.9671 (0.0054)***	0.16582 (1.0000)
	F.defference	47.5825 (0.0000)***	35.0448 (0.0001)	49.3461 (0.0000)***	85.3823 (0.0000)**	78.2890 (0.0000)	62.6104 (0.0000)***

Source: Authors computation using E-Views 8.0 (2019).

5.5 Optimal lag length selection

In order to determine the possibility of long run relationship among the series, the Panel Pedroni and Kao(Engle Granger based) co-integration test was conducted. This was deployed in the next section after determining the optimal lag length. The researcher can be Choose the number of lags for the test of Johanson co-integration as well as vector error correction model. The implication of the lag length selected explains the effect of the outcome of previous year on the current year. The selection of an optimal lag length was very essential before carrying out a Panel co-integration test and VECM, the result of which is presented in Table 5. The result in Table 5 portrays different lag length criterion (LR FPE AIK SC and HQ). The Schwarz information criteria and HQ is depicting lag order length of one and the rest LR FPE AIK depicting lag order length 2 for the model is selected. For this research the optimal lag length is three. The Co-integration and causality of this research done in the next section.

Table 4:- Optimal lag length selection criteria

VAR Lag Order Selection Criteria
Endogenous variables: LNRGDP LNTR LNLF LNCAPE LNRECUE
Exogenous variables: C

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-221.9234	NA	0.002638	8.251759	8.434244	8.322327
1	36.36483	460.2226	5.48e-07	-0.231448	0.863461*	0.191962*
2	64.02558	44.25720*	5.09e-07*	-0.328203*	1.679130	0.448049

Source: Authors computation using E-views 8.0 (2019 : * indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterio HQ: Hannan-Quinn information criterion

5.6 Effect of tax revenue in economic growth

As described in Woodridge(2006) fixed or random effect model test is called hausman test. The result of Hausman test shows the prob>chi2 or the P- value of hausman test is less than 5%, then we reject the null or the fixed effect model is appropriate.

Based on the table 4, the regression equation can be used to predict the value of the dependent variable based on a set of values for the explanatory variables. The fixed effect result mathematically described as

$$lnRGDP = c + 0.47lnTR + 0.05lnLF + 0.13lnGCE - 0.18lnGRE \ldots\ldots (5.1)$$

If all variables are held constant, an increase TR by 1% increase RGDP by 0.47% and also increase GRE by 1% decrease RGDP by 0.18% at 5% level of significance in fixed effect model. Tax revenue and recurrent expenditure have effect in the economic growth. The rest variables are not significant but positively related as expected. Similarly the tax revenue result is similar to the finding of Nantib(2014) and Onakoya(2016). Ugwunta et al(2015) found positive but insignificant tax on economic growth of sub Saharan country.

Table 5:- Fixed effect model result

Dependent Variable: LNRGDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTR	0.470965	0.115245	4.086645	0.0001
LNLF	0.053575	0.379090	0.141326	0.8881
LNGCE	0.131583	0.103274	1.274115	0.2079
LNGRE	-0.179471	0.068431	-2.622647	0.0112
C	15.36625	3.652870	4.206623	0.0001

Source in own competition in eview 8

The regression effect of fixed effect model is explained above. Next explain the long run relationship and causality. As describe above, the variables are stationary at first difference. Then the optimal lag length is selected as follows.

5.7 Johansen co-integration test

There is precondition for running panel co-integration that is the variable must be non-stationary at level. When we convert to the first difference then they become stationary. The Pedroni (Engle-Granger Based) co-integration method was conducted. Based on deterministic trend specification (1, individual intercept 2, individual intercept and

individual trend 3, no intercept or trend) out of this three the number one and two are shows good result as shown in table 6 below. Each deterministic trend specification has seven different statistical and four weighed statistics test result. The result is described in table 6 below. Among them, the panel pp-statistic and panel ADF-statistics (both as a static and weighted statistic) are significant in both cases and also Group pp-statistics and Group ADF-statistics are significant. The rest statistical and weighed results of Engle-Granger Pedroni tests are insignificant. As shown in the table below out of eleven tests which is described in both cases six for each are significant. Based on majority decision the independent variables are related with RGDP in the long run.

The Kao (Engle-Granger Based) co-integration method was also conducted. The test result shows the independent variables are related with RGDP in the long run. The Pedroni and Kao test result describes independent variable has long run relationship with the RGDP.

Table 6:- The Pedroni residual co-integration test

Measuring test tools	Individual intercept		Individual intercept and trend	
	statistcs	Weithted statistics	statistcs	Weithted statistics
Panel v-stastics	-0.046085 (0.5184)	0.258956 0.3978	-0.217613 (0.5861)	0.799324 (0.2121)
Panel roe-stastics	0.648873 (0.7418)	0.697029 (0.7571)	1.922643 (0.9728)	1.984039 (0.9764)
Panel pp-stastics	-2.534294 (0.0056)	-3.442028 (0.0003)	-1.948838 (0.0257)	-1.944990 (0.0259)
Panel ADF-stastics	-2.525115 (0.0058)	-2.849715 (0.0022)	-1.741154 (0.0408)	-1.877067 (0.0303)
Group rho-statistics	1.676429 (0.9532)		3.022660 (0.9987)	
Group pp-statistics	-4.510543 (0.0000)		-4.07097 (0.0000)	
Group ADF-statistics	-3.451238 (0.0003)		-4.299118 (0.0000)	

Source own computation in eview 9

5.8 The long run impact of variable on the economic growth

After identifying the level of co-integration rank order, in order to identify how the growth in tax revenue and other independent variable encourage or discourage economic growth in regional state of Ethiopia is estimated using OLS.

The parameter estimate of tax revenue and other independent variables on economic growth is presented in Table 7. In the model, growth in tax revenue whether it has an impact on economic growth is estimated. The normalized long run coefficient, standard error and t statistics are presented in table 7 from above to bottom described respectively. According to Torres (2007) t-value test the hypothesis that each coefficient is different from zero. To reject this, the t-value has to be higher than 1.96(for 95% confidence). If this is the case then you can say that the variables have a significant influence on dependent variables. Based on this rule the long run impact explained as follows:-

Table 7:- The long run coefficient and t value

ln RGDP	lnTR	LF	lnGCE	lnGRE	C
1.000000	1.320995	0.676875	-1.399412	1.45079	2.588303
	(0.41235)	(0.35661)	(0.43106)	(0.32812)	
	[-3.20361]	[-1.89810]	[3.24642]	[-1.45079]	

The johanson long run equation which is described above in table 7 put mathematically as;

$$lnRGDP = 2.59 + 1.32lnTR + 0.68lnLF - 1.39lnCape + 1.45lnRecu \ldots\ldots (5.2)$$

In the long run, whether the coefficient sign(negative or positive) matches with the reality or not. The result which obtained in the above equation is matches with TR and LF as expected. But for GRE and GCE is not matched with the reality. As described above the long run impact of independent variable on RGDP is explained as follows. A TR and government Capital expenditure are significant in the long run. A 1% increase TR leads to increase RGDP by 1.32% and also 1% increase GCE decrease RGDP by 1.39% in the long run. The other variables are not significant in the long run. Therefore tax revenue in the long run has effect. Masika,2014 said that there is a debate in the theory on impact of

tax revenue in economic growth could be both negative and positive depend on the data of tax revenue. For this paper, the long run impact shows positively related as described. Similar study finds that Nantob(2014) finds that tax revenue is positive and statically significant. Mahrara et al(2014) tax revenue in the long run economic growth has no effect on economic growth.

5.9 Pairwise Granger causality test for the model

The existence of a panel long-run co-integration relationship among RGDP, Tax revenue, GCE, labor force and GRE suggests that there must be causality in at least one direction. As the evidence of panel co-integration is found, Engle and Granger (1987) two step procedure is used. Results of Granger causality testing is presenting in Table 8 .

Table 8:- pairwise panel causality

Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
LNTR does not Granger Cause LNRGDP	60	3.00310	0.0885
LNRGDP does not Granger Cause LNTR		0.04306	0.8363

The Table 8 result shows that there is no causality between tax revenue and economic growth in regional state of Ethiopia. The test result null cannot be rejected since the p-value is not significant at 5% level of significance. Therefore in the long run the granger causality test between tax revenue and economic growth suggest independence, meaning the tax revenue and RGDP growth coefficients are not statistically significant in both cases.

This can be explained as, in the regional state of Ethiopia for the period under investigation growth decisions has been made in isolation with tax revenue. It implies that growth decisions are made in isolation from growth in government tax revenue. This might be the reason for the dampening budgets deficit due to misallocation of tax revenue to recurrent expenditure. The finding of Biruk(2015) is similar to this research finding.

Seada(2016) finds that indirect tax, direct tax have bidirectional causality(relationship) in the long run.

5.10 The short run vector error correction model (VECM)

The error correction term(C(1)) tells as the speed with which our model returns to equilibrium followers an exogenous shock. It should be negative signed, indicating a move back towards equilibrium. This means that the dependent variable will come back to the equilibrium point with speed of C(1) value. A positive signed indicates movement away from equilibrium. The coefficient should lie between 0 and -1, 0 suggesting no adjustment one time period letter, 1 indicates full adjustment (Seid, 2016).

The speed of adjustment or the error correction term which is described in the table 9 below is represented by c (1) and come up with the expected sign and level of significance. In an empirical sense, the speed of adjustment is 9.5% annually because the data is annually collected. That is the whole system of the long run equilibrium is at the speed of 9.5% annually.

The short run impact of components of tax revenue, i.e., tax revenue on RGDP growth has been done. In the estimation of the short-run model, a two period distributed lag as determined by the information criterion and imposed on all variables. Table 9[1] shows the parameters coefficient estimation of ECM.

[1] C(1) is error correction term. As the C(1) is negative but not significant, it means that there is no long run causality running from independent variables to dependent variable. It also fails to suggest the validity of long run relationship between variables. And the other C(2), C(3) etc… except constant all are short run coefficients. If C(1) is negative and significant, then there is a long-run causality running from independent to dependent variable and if the independent variable become dependent C(1) of this equation also negative and significant a long-run causality running from in the similar way. For more information see Meoschool of research east west north south education is for all website.

The result in the below table shows the short run impact of independent variable in economic growth in acceptable lag length.

The result from the table described below all the variables are used, only GCE(-1), GCE(-2) at 5% level of significance and TR(-2), LF(-1) and GRE(-1) are statistically significant at 10% level of significance; meaning in the short run the impact of TR(-2) result shows the opposite direction when two period lag tax revenue increase at 1% decline the current RGDP at 0.20%. Similar study like Hakim et al (2014), Gbato(2017) find similar to this research. But Nantob(2014) finds that tax revenue increase economic growth at short run. Mahrara et al(2014) tax revenue in the short run economic growth has no effect on growth.

When GCE(-1) and GCE(-2) both increase at 1% current RGDP increase at 18% and 15% respectively. A 1% increase LF(-1) decline current RGDP at 0.46%. This was also explained by Solow (1956), that the output of an economy is determined by its size and technological output of its capital supply but the labour Force effect in economic growth has gone in unexpected direction. The negative relationship between LF(-1) and RGDP result is similar to the finding of Masika (2014) that is an increase in population as proxy for labour force shows a negative contribution to economic growth. Benefits of increased population such as ready market for produced goods and services; availability of cheap labour among others has a negative significant contribution to economic growth. The GRE decrease by 1% increase RGDP by 9%. These variables are gained as expected in the model.

Table 9:- The short run result and long run causality

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.095340	0.029650	-3.215511	0.0015
C(2)	0.044083	0.142431	0.309506	0.7573
C(3)	0.000727	0.126993	0.005723	0.9954
C(4)	-0.041443	0.129328	-0.320452	0.7490
C(5)	-0.204412	0.120250	-1.699888	0.0908
C(6)	-0.464331	0.239329	-1.940137	0.0538
C(7)	-0.121612	0.266186	-0.456868	0.6483
C(8)	0.179090	0.073373	2.440803	0.0156
C(9)	0.149952	0.071546	2.095877	0.0374
C(10)	-0.088697	0.050761	-1.747337	0.0822
C(11)	0.077117	0.052362	1.472777	0.1425
C(12)	0.145846	0.064612	2.257264	0.0251
Determinant residual covariance		5.95E-08		

Equation: D(LNRGDP) = C(1)*(LNRGDP(-1) - 1.32099503022*LNTR(-1) - 0.676875366385*LNLF(-1) + 1.39941216294*LNGCE(-1) - 0.476037830875*LNGRE(-1) + 2.58830253311) + C(2) *D(LNRGDP(-1)) + C(3)*D(LNRGDP(-2)) + C(4)*D(LNTR(-1)) + C(5) *D(LNTR(-2)) + C(6)*D(LNLF(-1)) + C(7)*D(LNLF(-2)) + C(8) *D(LNGCE(-1)) + C(9)*D(LNGCE(-2)) + C(10)*D(LNGRE(-1)) + C(11)*D(LNGRE(-2)) + C(12)
Observations: 50

R-squared	0.459356	Mean dependent var	0.137433
Adjusted R-squared	0.302854	S.D. dependent var	0.186986
S.E. of regression	0.156125	Sum squared resid	0.926246
Durbin-Watson stat	2.326771		

The short runs jointly causality run from GRE and GCE to RGDP. But there is no joint short run causality running from TR and LF to RGDP. The result of two period lag result described in appendix

5.11 Diagnostic cheek

5.11.1 The disturbances are normally distributed

The normality assumption (Ut - N(0, σ2)) is required in order to conduct single or joint hypothesis tests about the model parameters.

Testing for departures from normality

One of the most commonly applied tests for normality is the Bera-Jarque (hereafter BJ) test. BJ uses the property of a normally distributed random variable that the entire distribution is characterized by the first two moments: the mean and the variance. The standardized third and fourth moments of a distribution are known as its skewness and kurtosis. If the residuals are normally distributed, the histogram should be bell-shaped and the Bera-Jarque statistic would not be significant. This means that the p-value given at the bottom of the normality test screen should be bigger than 0.05 to not reject the null of normality at the 5% level (Gebi, 2016).

As shown in the appendix there is no evidence for the violation of normality distribution for errors terms since p-value is greater than 0.05 which is amounted to 0.647046 and histogram also is definitely bell-shaped, and with skewness and kurtosis of -0.120151 and 2.486448 respectively. This means that the p-value given at the bottom of the normality test screen should be bigger than 0.05 to not reject the null of normality at 95% confidence interval. Therefore it is normaly distributed. The figure is attached in annex.

5.11.2 Hetroscedasticity

$$Var(u_t) = \sigma^2 < \infty$$

It has been assumed thus far that the variance of the errors is constant, σ^2 - this is known as the assumption of homoscedasticity. If the errors do not have a constant variance, they are said to be heteroscedastic. Its prevalence is tested using modified vec residual hetrosedasticity test. In this paper modified vec residual hetrosedasticity test has been adopted.

The result of p values for chi^2 is 0.1735 which can be conclusion that there is no evidence for the presence of heteroscedasticity. Since the p vaues is considerably in excess of 0.05 level which show the fact that no problem of hetroscedastic in this regard that is error is homoscedastic.

5.11.3 Autocorrelation

Testing for cross sectional dependence/contemporaneous correlation using Breusch pagan LM test of independence cross sectional dependence is a problem in macro panels with long time series(over 20-30 years). This is not match of a problem in micro panels(few years and large number of cases (Torres, 2007). But in this paper the autocorrelation test is done. If errors are correlated to each other, this problem will be regarded as autocorrelation. A test of this assumption is therefore required. To test for autocorrelation we have two methods. If the test is to compare this year error term to errors' of last year Pesaran CD, is applied. That is, these tests are whether consecutive errors are related to one another. In other words, these tests are for first order autocorrelation- i.e. the tests only for a relationship between an error and its immediately previous value. The tests result shows, there is no autocorrelation problem in the model testing for serial correlation.The vec residual serial correlation LM test is show similar to pesaran CD test. The result in put in appendix.

Chapter dix

Conclusion and Recommendation

Having carried out analysis of the data collected and discussion of empirical results, there is a need to conclude this thesis and also make recommendation. In this chapter; the conclusion of finding and possible recommendation for better policy and strategy formulations are presented.

6.1 conclusion

Based on the discussion and analysis made in chapter four, the researcher concluded the finding as follows. The results obtained suggest that the trend analysis show the rate of growth and also in the descriptive part shows the mean, median, skewness and kurtosis of the research data.

Econometric analysis, using Johansen test of co-integration declared that a long run relationship exists between the explanatory and explained variable in the long run.

In the long run, there is a link between economic growth and tax revenue as depicted by the study. The model estimation reveals that tax revenue encourages economic growth. Holding other things constant, a 1% increase TR leads to increase the real gross domestic product by 1.32%. The result of fixed effect model result shows similar positively significant. Therefore tax revenue has strong impact in the economic growth. Furthermore, the long run causality runs from independent variable to dependent variable (RGDP). There is no long run Granger causality between tax revenue and economic growth in both cases.

The long run GCE has gotten unexpected result that was negatively significant in economic growth. Implying that, the economy did not benefit from such spending. This development in the regional state economy violates the growth theories.

In the short run, only two period lag value of tax revenue got statically significant in influencing current economic growth. Causality jointly did not run from tax revenue to RGDP. The speed of adjustment is slow implying that it takes long time for growth in RGDP to move back to its equilibrium once it drifts away from its long run equilibrium value.

In the short run, the other supportive variable like LF(-1), GCE(-1), GCE(-2) and GRE(-1) have impact in current RGDP. Hear labor force in the short run has negatively significant at one period lag affect current RGDP. The other variables are got as expected. The short run causality runs jointly from capital expenditure and recurrent expenditure to RGDP only.

While looking, the relationship between tax revenue and economic growth in regional state of Ethiopia, the result supported by the variables statistical significance, in terms of the impact of tax revenue on economic growth. The speed of adjustment exhibits very great importance. Hence, the following policy recommendations are forwarded to improve the interconnection in tax revenue and economic growth for regional state of Ethiopia.

6.2 Recommendation

Since the intervention of the government has both positive and negative implication on the economic activities. Based on the result obtained in this study, the following policy implications are drawn.

First, tax revenue has effect in the economic growth. Therefore the government should strength the economy effectively by the expansion of tax base area and also modernizing the tax collection method. Similarly raise the awareness for the regional society the importance of economic growth on their life.

Second, the regional state government should increase fertility ground for investor. This can be possible when the government provide different fertility ground like road, energy, etc. are the target part in the government side.

Third, the government capital expenditure results revealed that did not generate the intending growth to real economic activities. More specifically, capital expenditure on economic service was actually negatively affecting the growth of the economy implying that the economy did not benefit from such spending. This development in regional state economy contravenes the growth theories. Therefore the researcher recommends that the regional state of Ethiopia should adequately monitor all her spending in the economy to achieve the purposes for which the funds are released. Again, all the government projects and allocations should be well supervised to reduce the costs overestimated by government officials and contractors. Effectively utilization of public funds on rightful projects rather, spending it on enormous projects that will not translate into meaningful growth of the economy.

Fourth, an increase in population as peroxide for labor force in the short run shows a negative contribution to economic growth. Benefits of increased population such as ready market for produced goods and services; availability of cheap labor among others has a negative significant contribution to economic growth. This pushes the government to channel productive resources that could be used in development projects to provision of

public goods and services. Therefore, policies aimed at population control that the government has continued to promote are recommended by this study.

6.3 Areas for Further Research

This paper use only 4 regional state and one city administration in Ethiopia. The rest regional state was not included in the research because they have not RGDP. Other variables that affect economic growth exist apart from those considered in the model specification such as the regional human capital and private investment, remittance among others. The study recommends other studies to build on the study findings by incorporating the omitted variables and regional states.

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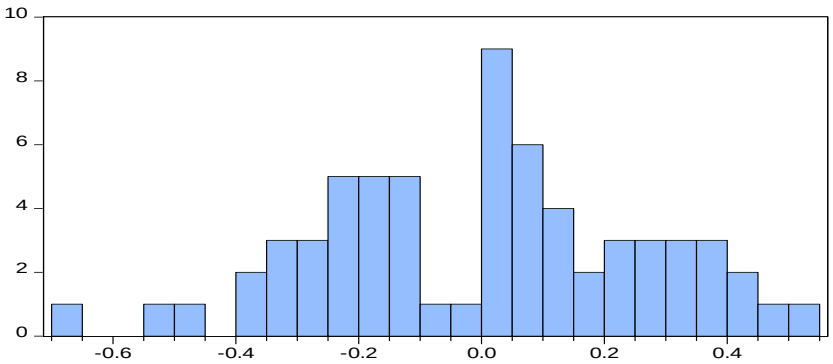
Appendix

1. The multivariate system diagnostic system

1.1 The test of normality



Series: Standardized Residuals
Sample 2005 2017
Observations 65

Mean	1.02e-17
Median	0.033364
Maximum	0.533664
Minimum	-0.665800
Std. Dev.	0.263305
Skewness	-0.120151
Kurtosis	2.486448
Jarque-Bera	0.870675
Probability	0.647046

1.2 Serial correlation test

1.2.1 Residual cross-section dependence test

Test	Statistic	d.f.	Prob.
Pesaran CD	-1.682478		0.0925

1.2.2 VEC residual serial correlation LM

Lags	LM-Stat	Prob
1	30.19323	0.2171

1.2.3 VEC Residual Portmanteau Tests for Autocorrelations

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	7.471169	NA*	7.623642	NA*	NA*
2	23.99378	NA*	24.83470	NA*	NA*
3	42.08042	0.5964	44.07580	0.5110	45

*The test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution

1.3 VEC residual heteroskedasticity tests

Chi-sq	df	Prob.
354.0553	330	0.1735

2. The fixed effect or random effect selection criteria

2.1 Fixed effect

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTR	0.470965	0.115245	4.086645	0.0001
LNLF	0.053575	0.379090	0.141326	0.8881
LNGCE	0.131583	0.103274	1.274115	0.2079
LNGRE	-0.179471	0.068431	-2.622647	0.0112
C	15.36625	3.652870	4.206623	0.0001

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.928791	Mean dependent var	24.71785
Adjusted R-squared	0.918618	S.D. dependent var	0.986717
S.E. of regression	0.281485	Akaike info criterion	0.430415
Sum squared resid	4.437105	Schwarz criterion	0.731484
Log likelihood	-4.988487	Hannan-Quinn criter.	0.549206
F-statistic	91.30220	Durbin-Watson stat	1.840941
Prob(F-statistic)	0.000000		

2.2 Random effect

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTR	-0.031530	0.082142	-0.383851	0.7024
LNLF	1.402383	0.088637	15.82170	0.0000
LNGCE	0.310043	0.090505	3.425717	0.0011
LNGRE	-0.271815	0.067417	-4.031846	0.0002
C	7.208562	1.104559	6.526190	0.0000

2.3 Hausman test

Correlated Random Effects - Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	151.983447	4	0.0000

3. Long run test

3.1 Kao Residual Cointegration Test

	t-Statistic	Prob.
ADF	-1.908624	0.0282

3.2 pairwise Granger causality tests

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LNTR does not Granger Cause LNRGDP	60	3.00310	0.0885
LNRGDP does not Granger Cause LNTR		0.04306	0.8363
LNLF does not Granger Cause LNRGDP	60	0.10866	0.7429
LNRGDP does not Granger Cause LNLF		2.02058	0.1606
LNGCE does not Granger Cause LNRGDP	60	0.90662	0.3450
LNRGDP does not Granger Cause LNGCE		1.55590	0.2174
LNGRE does not Granger Cause LNRGDP	60	0.11469	0.7361
LNRGDP does not Granger Cause LNGRE		3.70359	0.0593
LNLF does not Granger Cause LNTR	60	1.15071	0.2879
LNTR does not Granger Cause LNLF		0.01392	0.9065
LNGCE does not Granger Cause LNTR	60	0.72060	0.3995
LNTR does not Granger Cause LNGCE		3.10619	0.0834
LNGRE does not Granger Cause LNTR	60	0.03109	0.8607
LNTR does not Granger Cause LNGRE		2.37910	0.1285
LNGCE does not Granger Cause LNLF	60	0.39568	0.5318
LNLF does not Granger Cause LNGCE		0.79397	0.3766

LNGRE does not Granger Cause LNLF	60	0.11378	0.7371
LNLF does not Granger Cause LNGRE		4.78774	0.0328
LNGRE does not Granger Cause LNGCE	60	0.28380	0.5963
LNGCE does not Granger Cause LNGRE		5.03508	0.0287

4. Short run test

4.1 Short run jointly causality

Wald coefficient restriction	Variable	Stastics test(chi-squar	proba
C(2)=c(3)=0	RGDP	0.095820	0.9532
C(4)=c(5)=0	TR	3.163498	0.2056
C(6)=c(7)=0	LF	3.870202	0.1444
C(8)=c(9)=0	GCE	7.826615	0.0200
C(10)=C(11)=0	GRE	6.428970	0.0402

5. Map of Ethiopia with Eritrea

Source from the website of www.ethiopiantreasures.co.uk