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**THE IMPACT OF FISCAL DECENTRALIZATION ON
ECONOMIC GROWTH IN ETHIOPIA**

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ADDIS ABEBA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
SCHOOL OF COMMERCE
THE IMPACT OF FISCAL DECENTRALIZATION ON
ECONOMIC GROWTH IN ETHIOPIA

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**A Thesis Submitted to School of Graduate Studies of Addis Ababa University
in Partial Fulfillment of the Requirements for the Degree of Masters of
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ADDIS ABABA

DECLARATION

I, Abdurahman Hassen, declare that, this study, “*The Impact of Fiscal Decentralization on Economic Growth in Ethiopia*” is my own work. I have undertaken the research work independently with the guidance and support of the research supervisor. This study has not been submitted for any degree or diploma in this or any other institution. It is in partial fulfillment of the requirements for the Degree of Master of Science in Development Economics. All sources of material used for the research have been duly acknowledged.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dickey-Fuller
ARDL	Autoregressive Distributed Lag
CPI	Consumer Price Index
ECM	Error correction model
ER	Expenditure Ratio
ETB	Ethiopian Birr
FD	Fiscal Decentralization
GCF	Gross Capital Formation
GDP	Gross Domestic Product
MOF	Ministry of Finance
NBE	National Bank of Ethiopia
OECD	Organization for Economic Co-operation and Development
RR	Revenue Ratio
TGE	Transitional Government of Ethiopia

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ABSTRACT

Ethiopia embarked its journey of fiscal decentralization during the period of the Transitional Government of Ethiopia (TGE) and later, with the adoption of the 1995 Constitution of the Federal Democratic Republic of Ethiopia, fiscal decentralization was formalized. Two and a half decades after the 1995 Constitution, which set the path for fiscal decentralization in Ethiopia, no empirical evidence exists to prove whether fiscal decentralization has boosted economic growth or not. Thus, the main objective of this study is to investigate the impact of fiscal decentralization on economic growth in the Ethiopian context. The study used the Auto Regressive Distributed Lagged (ARDL) model to identify short and long run relationships between economic growth, fiscal decentralization, and chosen macroeconomic variables. The model was estimated using annual data of 25 years for the period ranging between 1996/97 to 2020/21. The model exhibits all of the characteristics of a good regression model. The model passed all serial correlation, normality, Heteroscedasticity, and Ramsey RESET tests. The Long-run estimation of the econometric analysis shows statistically significant and positive relationship between GDP per capita and fiscal decentralization in Ethiopian case. Similarly, the short-run ARDL estimate indicates that fiscal decentralization is positively related with GDP per capita and it is statistically significant. The study suggests that government can use fiscal decentralization as one tool to increase economic growth by devolving fiscal responsibilities to lower levels of government, strengthening local level institutions and enhancing competency of lower level officials.

Keywords:

Fiscal Decentralization, Economic Growth, ARDL Model, Fiscal Imbalance, Ethiopia

CHAPTER ONE

Introduction

1.1 Background of the Study

Since the 1970s, decentralization has increasingly become a dominant trend worldwide and the trend has been unstoppable with many countries becoming much more decentralized in the twenty-first century than before (Lago, 2021). Decentralization refers to the transfer of powers and responsibilities from the central government to the subnational level governments regarding political, administrative and fiscal matters. Decentralization covers three dimensions namely political decentralization, administrative decentralization and fiscal decentralization (OECD, 2019).

Fiscal decentralizations is defined as *“the ability of lower levels of government to make independent revenue and expenditure decisions regarding the provision of public goods and services within a geographic domain, without interference by the central government”* (Bodman and Ford, 2006, P4). It refers to the transfer of revenue collection and expenditure duties from the central/federal government to the sub-national governments.

The classical literatures about fiscal decentralization and public finance consider the three fundamental goals of the public sector are macroeconomic stability, income distribution and economic efficiency, with the central government being responsible for the first two and the sub-national governments handling efficiency especially with regards to public goods provision (Musgrave, 1959; Oates 1972)

In light of increasing the performance of the public sector and as a component of development strategy, many countries in both developed and developing world turned to fiscal decentralization, and fiscal decentralization was placed at the heart of institutional reforms in the last three decades (Lozano and Julio, 2016; Canavire-Bacarreza et al., 2019; Canare,2021). Acknowledging this widespread need for fiscal decentralization Oates (1999) described it as *‘fiscal decentralization is in vogue’* (Oates, 1999, p. 1120)

The increased interest in fiscal decentralization is based on the argument that fiscal decentralization contributes to economic growth through increasing the efficiency of public service delivery, boosting accountability and transparency in the provision of public goods, enhancing cooperation of tax-payers with local governments, increasing revenue mobilization, improving grassroots participation in development and fostering competition among sub-national governments which provides incentives for product innovation (Kimr, 2008; Sow and Razafimahefa, 2015; Bahl and Bird, 2018; Bojanic, 2018).

Contrary to the aforementioned argument, there are also counter-arguments that fiscal decentralization has pitfalls and may lead to economic inefficiency. The arguments include that, fiscal decentralization leads to lower level of production efficiency because of lack of necessary competency to deliver high quality public goods by lower level officials, makes macroeconomic stabilization (especially in times of crises) unachievable, results in inability of subnational governments to fully internalize cross-regional externalities, faces diseconomies of scale (as the central government has economies of scale allowing them to provide public goods at lower per unit cost), limits the national government's capacity to conduct fiscal policy and to implement redistributive programs. (Hankla, 2008; Yushkov, 2015; Sow and Razafimahefa, 2015; Bahl and Bird, 2018)

Many empirical studies have been sparked by the popularity of fiscal decentralization and the opposing arguments for and against it. Most of these literatures studied the relationship between fiscal decentralization and economic growth. The results are diverse and points in all direction (Lozano and Julio, 2016; Canare, 2021)

Coming to the Ethiopian context, Ethiopia embarked its journey of fiscal decentralization during the period of the Transitional Government of Ethiopia (TGE) from 1991-1994, which set out the expenditure responsibilities and the corresponding sources of revenue of the central government and the regional governments. Later, with the adoption of the 1995 Constitution of the Federal Democratic Republic of Ethiopia, fiscal decentralization was formalized with the devolution of fiscal power from the center to the regional states. Further, in 2002 the government introduced the second phase of fiscal decentralization which is termed as “district level decentralization” that devolved power from the regional government to the district level/Woreda (Degefe, 1994; Moges, 2003; Garcia and Rajkumar 2008)

One of the main reasons for the introduction and implementation of fiscal decentralization in Ethiopia is to accelerate economic growth through enhanced participation and improved efficiency. In the last two decades, decentralization has coincided with a remarkable economic growth in Ethiopia (Tesfay, 2015). This growth has been characterized by an average GDP annual growth of more than 10 percent, making the country one of the fastest growing economies in Africa. For ten of the past fifteen years, Ethiopia has sustained growth rates above 10%, with no year lower than 6.8 percent (World Bank, 2019). In this regard, this study will investigate the impact of fiscal decentralization on the economic growth in the Ethiopian context.

1.2 Statement of the Problem

Literatures concerning the relationship between fiscal decentralization and economic growth argue that the primary impact of fiscal decentralization on economic growth is through the channels of economic efficiency, redistribution and macroeconomic stability. Accordingly, the impact of change in fiscal decentralization on economic growth can be assessed by whether or not it results in changes in efficiency, macroeconomic stability and income redistribution (Oates 1972; Bodman and Ford, 2006)

Although theoretical works of fiscal decentralization offer arguments for its relationship with economic growth, the direction of the relationship have contrasting arguments. On the one hand, theory argued that fiscal decentralization is positively related with economic growth through consumer efficiency (improved supply of public goods by considering local preferences) and producer efficiency (enhanced inter-jurisdictional competition among sub-national governments which provides incentives to subnational innovations, cost reductions and productivity).

On the other hand, theory also argued that fiscal decentralization may negatively relate with economic growth. Fiscal decentralization might lead to inter-jurisdictional harmful competition, macroeconomic instability and higher regional disparities, unequal distribution of resources, and corruption that leads to undersupply of public goods. (Bodman and Ford, 2006; Udoh et al. 2015; Sow and Razafimahefa, 2015)

Empirically, there are numerous studies analyzing the effects of fiscal decentralization on economic growth, both across countries and in single country cases. The empirical justifications for the theoretical foundations are also ambiguous and points in all direction. Studies conducted

on the relationship between fiscal decentralization and economic growth, have revealed negative relationship (Davoodi & Zou, 1997; Zhang & Zou, 1998; Neyapti, 2010; Rodríguez-Pose and Ezcurra, 2010; Yushkov, 2015) positive relationships (Akai & Sakata, 2002; Iimi, 2005; Jin & Zou, 2005; Canavire-Bacarreza et al, 2019; Ginting et al, 2019; Hanif et al. 2020) or no significant connections (Herath, 2009; Baskaran & Feld, 2013; Jin and Rider, 2020, Atan and Esu, 2021);

Fiscal decentralization reforms have been taking place in Ethiopia amid impressive economic growth. Ethiopia has been among the fastest growing countries in the world, with GDP expanding at an average rate of 10.3 percent during 2004-2019. For the last decade Ethiopia registered an average growth rate of 9.4% a year from 2010/11 to 2019/20 (World Bank, 2021)

Even though international literatures regarding fiscal decentralization are abundant, empirical studies in Ethiopia are very limited. The first attempt to introduce fiscal decentralization on the academic front for empirical investigation was made by Chole (1993) entitled '*Opening Pandora's Box: Preliminary Notes on Fiscal Decentralization in Contemporary Ethiopia*'. Followed by contributions from Terfassa (1994), Degefe (1994), Seyoum (1994), Moges (1994) and Chole (1994), where their work primarily focused on the introduction of the concept of fiscal decentralization and analysis of its conceptual and legal frameworks.

Generally speaking, the Ethiopian literatures regarding fiscal decentralization analyzed the effects of fiscal decentralization on education and health sectors (Vander Naald, 2007; Weldemariam, 2010; Faguet, 2019), the practices and challenges of fiscal decentralization at country level (Mhreteab, 2000; Moges, 2003; Baraki, 2015; Assefa, 2015; Yesigat, 2016; Defere, 2018), at regional and local levels (Mulugeta, 2014; Mentta et al, 2014; Mekonne and Kassie, 2014; Ansaw, 2017; Legas, 2018; Alam and Debela, 2019), and the impact of fiscal decentralization on poverty and equitable development (Agegnehu and Dibu, 2016; Dera, 2021).

Nevertheless, two and a half decades after the 1995 Constitution, which set the path for fiscal decentralization in Ethiopia, no empirical evidence exists to prove whether fiscal decentralization has boosted economic growth or not. As described above, the most relevant empirical studies have focused on assessing its implementation and the challenges related to it and the impact of fiscal decentralization on different other indicators, but not directly on economic growth. This is

the gap this paper will try fill-in through empirically examining the impact of fiscal decentralization on economic growth in Ethiopia.

1.3 Objective of the Study

1.3.1 General Objective

The general objective of this study is to investigate the impact of fiscal decentralization on economic growth in the Ethiopian context.

1.3.2 Specific Objectives

The specific objectives of the study includes

- To assess the trend and features of fiscal decentralization in Ethiopia
- To determine the long term relationship and short run dynamics of fiscal decentralization and economic growth

1.4 Hypothesis of the Study

This study primarily focused on examining the effect of fiscal decentralization on the economic growth. In light of this fact, the study seeks to test empirically the governing hypothesis that fiscal decentralization affects economic growth significantly.

Based on the existing evidence and reviewing the available literatures on the subject matter the study developed the following testable hypothesis regarding the impact of fiscal decentralization on economic growth in Ethiopia.

H₀: fiscal decentralization affects economic growth directly and significantly

H₁: fiscal decentralization has no direct effects on economic growth

1.5 Significance of the Study

Until now, fiscal decentralization has attracted very little research in Ethiopia and lacks empirical evidence on the extent to which it has been contributing to the country's economic growth. This study shows the impact of fiscal decentralization on economic growth in the Ethiopian context. By doing so, it will add to the existing stock of knowledge on the impact of fiscal

decentralization on economic growth generally and aims to fill the knowledge gap in the Ethiopian context particularly.

This study will also give insights and information for other researchers for further in-depth study on the subject matter. Furthermore, the conclusions and policy recommendations of the study will help concerned bodies to understand fiscal decentralization and its impact in the economy.

1.6 Scope and Limitation of the study

This study analyzed the relationship between fiscal decentralization and economic growth in the Ethiopian context, post 1995 constitutional framework for fiscal decentralization. The study will employ time series data covering the years 1996/97-2020/21.

Preferably, fiscal decentralization should be examined by using the fiscal data of three tiers of government i.e. federal, regional and local governments (Woreda). But unfortunately, there is no sufficient and reliable data available for public finance at Woreda level. Therefore, the scope of this study is limited to the two tiers of government i.e. Federal and Regional governments, and thus have regional perspective. Nonetheless, the study assesses the impact of local (Woreda) level fiscal decentralization by incorporating it as dummy variable in the econometric model, considering its introduction period (i.e. 0 for pre-2002 and 1 for post 2002)

Furthermore, there was an intention to use panel data for analyzing impact of fiscal decentralization on economic growth. But due to lack of panel data particularly GDP data at regional level, the study is forced to use time series data for analysis.

1.7 Organization of the Study

This study is organized into five chapters. The first chapter deals with introduction part of the study. Following the introductory chapter, chapter two presents the review of theoretical and empirical literatures. In the following chapter, chapter three, methodology and model specification will be presented. Followed by chapter four, in which descriptive analysis and analysis of features of fiscal decentralization in Ethiopia will be discussed in detail and the results of the econometric model will be deliberated. Finally, chapter five will present the conclusions and policy recommendations of the study.

CHAPTER TWO

Literature Review

2.1 Concepts and Measurements of Fiscal Decentralization

2.1.1 Definition of Fiscal Decentralization

Yihua et al. (2015) defined fiscal decentralization as a process of financial decision-making decentralization in which governments at the subnational level play an increasingly important role in fiscal decision-making. The word "subnational" refers to all levels of government below the national/central government, including intermediate-level administrations (regions, states, provinces) and lower-level governments (municipalities, local governments). The concept of fiscal decentralization refers to the central government delegating financial responsibility (the ability to tax and spend) to subnational governments (Bahl, 2008). Fiscal decentralization is defined by Thiessen (2001) as the power of local governments to generate tax revenues and choose how to spend them on various initiatives while adhering to legal guidelines.

This study adopts the definition put forward by Bodman and Ford (2006, P4), in which it defined fiscal decentralization as *“the ability of lower levels of government to make independent revenue and expenditure decisions regarding the provision of public goods and services within a geographic domain, without interference by the central government”*.

The term "decentralization" can be interpreted in two ways: static and dynamic. It can refer to a state of decentralization (static) or the process of becoming decentralized (dynamic) (Treisman, 2002). On the one hand, fiscal decentralization refers to long-term disparities in subnational fiscal autonomy, either within or across nations. It is, in this sense, a static idea. In its dynamic sense, on the other hand, fiscal decentralization refers to a process of changing vertical fiscal structure a state (Baskaran and Hessami, 2012). For the purpose of this study, decentralization is used in the static manner in which duties are distributed among tiers of government, not in the dynamic sense of becoming decentralized.

It is also important to consider what fiscal decentralization isn't. It wouldn't count if a ministry's decision-making and service-delivery capabilities were decentralized. This is a strategy for deconcentration of management and administration, as well as possibly some decision-making.

Even when local leaders are invited to the discussion, higher-level government retains the dominant voice. This type of deconcentration by a ministry does not empower the local government so wouldn't be considered fiscal decentralization. Delegating service delivery powers to local interest groups or community development associations is not also decentralization. Despite the fact that these entities are established locally, they are not elected and are not accountable to the local community (Bahl, 2008).

2.1.2 Pillars of Fiscal Decentralization

Fiscal decentralization is conventionally divided into four elements or “pillars” namely (a) expenditure assignment, (b) revenue assignments, (c) inter-governmental fiscal transfers and (d) subnational debt/borrowing.

a) Expenditure assignment

Expenditure assignment refers to the level of autonomy afforded to subnational governments in deciding on the amount and mix of budgeted expenditures needed to fulfill their service delivery responsibilities. Expenditure assignment is the first step and is the cornerstone of an intergovernmental fiscal system (Bahl, 2008). The rationale for decentralized expenditure assignment is attaining efficiency. Apart from efficiency, additional economic and political justifications like accountability, autonomy, and manageability are also the justifications for expenditure assignment (Oates, 1972)

However, assigning some spending responsibilities to the lowest level of government may not result in a welfare increment. There are two main causes behind this; the first is the existence of externalities in service delivery. Local governments would underspend or overspend on such services since they would solely consider private benefits and costs when making budgetary choices. Social costs and gains from spillover effects would be overlooked, and society would not attain the same degree of welfare as if the service had been assigned to national level. The second reason is economies of scale in the delivery of service. In general, central governments have economies of scale advantage in case of huge fixed expenses and large-scale purchases (Bahl, 2008).

b) Revenue assignments

Revenue assignment refers to the division of taxing powers among different tiers of government. A well-structured revenue assignment system will make it clear which tiers of government are legitimate to levy specific taxes, as well as the degree of discretion each level will have in levying and managing the taxes (Bahl, 2008). To have complete fiscal autonomy over revenues, local governments must be able to adjust tax rates and tax bases in principle. Thus, Local governments have the ability and obligation to own and fund services in their areas (Ebel and Yilma, 2002).

According to Bahl (2008), since they may have a comparative advantage in some taxes, subnational governments can narrow the gap between aggregate tax collections and tax potential. There are three such advantages that might be mentioned. To begin with, local governments are often in charge of a wide range of licensing and regulating duties, as well as keeping track of property ownership and land-related transactions. As a result, they have plenty of opportunities to discover local enterprises and learn about their assets and scope of operation. Second, knowing the tax base may enable provincial and local governments to catch some of individuals who do not completely comply or who evade taxes entirely. Third, sub-national governments can also benefit from increased revenue from new taxation.

The centralization of taxing authority is frequently argued for the reasons such as central government has advantage of trained and skilled manpower, economies of scale and enforcement capacity.

c) Inter-governmental fiscal transfers

The third pillar of the fiscal decentralization is intergovernmental transfers. Fiscal decentralization usually entails the shift of financial resources from central to local government due to an imbalance of revenue-generating advantages at the central government level and certain expenditure advantages at the local government level. Local tax revenues are practically always insufficient to keep up with the needs assigned to localities. To address this imbalance, intergovernmental transfers are required (Boschmann, 2009).

When governments create their grant system, they take into account a number of underlying goals. To mention some of them

Vertical Balance: In developing countries, the primary rationale for intergovernmental transfers is to correct the imbalance between subnational governments' expenditure responsibilities and their revenue-raising powers.

Equalization: In developing countries, there are large variations in economic well-being among areas. Most countries do some equalization to fill the disparities among regions using intergovernmental transfers.

Externalities: If local governments are left to make their own choices without any incentives, they will underspend or overspend on services that have significant externalities. Intergovernmental transfers can be used as an incentive for local governments to spend more on tasks that provide external benefits.

Administrative and political justifications are also other reasons for intergovernmental transfers (Bahl, 2008).

d) Subnational debt/borrowing

Subnational governments can borrow through at least two different channels: through a public intermediary or directly from private capital markets. Subnational borrowing can be considered a viable option for subnational public finance for three key reasons:

Intergenerational equity: The benefits of certain investment projects, such as infrastructure and education, are spread across time, implying that not only current residents, but also future residents of a community will benefit from the projects' services. Consequently, future residents should likewise contribute to the investment cost and borrowing is a good tool for this purpose.

Economic Development: Delaying investments in infrastructure may have a negative influence on the performance of the subnational economy. Such a negative influence will have a direct impact on individuals' lives, resulting in fewer job prospects and lower earnings. Thus, subnational borrowing can be used to stimulate the local economy.

Synchronization of Expenditure and Revenue Streams: For a variety of reasons, expenditures and tax receipts may not be completely synchronized for a given year. Borrowing allows subnational governments to smooth out the imbalance and continue to offer services without interruption in this situation (Ebel and Yilma, 2002).

Regional states are constitutionally permitted to borrow, subject to certain restrictions: they can only borrow on the domestic market, and only with the supervision and permission of the federal state, which makes the final decision on the amount to be borrowed based on the region's financial capabilities. However, in practice, borrowing appears to be quite restricted and non-existing at the regional level in Ethiopia. In this regard, this study will only deal with the three pillars of fiscal decentralization (expenditure assignment, revenue assignment, and intergovernmental transfers) in Ethiopian case.

2.1.3 Measurements of Fiscal Decentralization

Fiscal decentralization is a multi-faceted system whereby the national government passes decision-making authority over public finances to the subnational governments, encompassing both the expenditure and revenue aspects of decentralization (Gu, 2012). As a result, studies on fiscal decentralization frequently employ expenditure and revenue aspects as proxies for determining the degree of decentralization. Nonetheless, determining how to quantify fiscal decentralization adequately is a vital topic in the study of fiscal decentralization (Wibowo, 2016). The following section discusses the major fiscal decentralization measures employed in empirical researches.

i. Expenditure Ratio (ER) and Revenue Ratio (RR)

Several attempts to measure fiscal decentralization have been made, most of which rely on budget revenue and expenditure items, measured by the proportion of subnational governments' expenditure or revenue compared to the whole government's expenditure or revenue.

$$ER = \frac{\text{Subnational governments expenditure}}{\text{General Government expenditure}} \quad \text{-----} (2.1)$$

$$RR = \frac{\text{Subnational governments own revenue}}{\text{General Government revenue}}$$

----- (2.2)

Economists commonly use the percentage share of subnational governments' expenditure (revenue) in total government expenditure (revenue) as a representative of fiscal decentralization (Oates (1972), Davoodi and Zou (1998), Zhang and Zou (1998), Akai and Sakata (2002)).

Despite its widespread use in empirical investigations, this measurement has numerous drawbacks, as detailed by Ebel and Yilma (2002), expenditure and revenue indicators doesn't ascertain the degree of local expenditure autonomy, intergovernmental transfers/grants and whether transfers are allocated based on objective criteria or on a conditional basis. Stegarescu (2005) further argued that share of sub-national governments to total government expenditures or revenues is flawed because it ignores the local governments' true autonomy in selecting how to allocate, utilize, and collect finances. Despite the fact that the spending and revenue-generating responsibilities are nominally given to the subnational levels, it is likely that the local government does not have complete control over these funds since transfers from central government may include conditionality.

Due to aforementioned constraints, ER and RR are problematically inadequate in measuring the precision of fiscal decentralization and end up as an overestimate of fiscal decentralization (Liu, 2012). In cross-country empirical research, two nations may have the same sub-national share of expenditure/revenue, but the number of participating sub-national governments may differ significantly. In these conditions, the country with the most sub-national governments should be more decentralized than the country with the fewest. Given the apparent shortcomings in the data, it is impossible to determine the genuine differences between these two nations (Bahl & Nath, 1986)

As a result of these limitations, it is difficult to determine the true link between fiscal decentralization and economic growth using share of subnational governments' expenditure (revenue) in total government expenditure (revenue) as a representative of fiscal decentralization.

ii. *Revenue Autonomy(RAI)*

To overcome abovementioned limitations of ER and RR measurements and recognizing the multiple facets of fiscal decentralization, the OECD (2002) set out to provide more specific definitions of sub-national government revenue. Despite the fact that the categories of sub-national revenue sources have been revised and fiscal autonomy has been taken into account, the OECD documentation lacks a cross-country, time-series dataset, making it impossible to undertake empirical analysis using OECD datasets.

Similarly, Stegarescu (2005) offered new fiscal decentralization measurement method based on revenue and tax classifications that better reflect local government autonomy. The local government's level of control over revenue sources was used to classify them.

$$RAI^1 = \frac{\text{Subnational governments own revenue}}{\text{Subnational governments' revenue}} \text{-----} (2.3)$$

Similarly, Martinez-Vazquez and Timofeev (2009) define the circumstance in which increased decentralization of expenditure leads to higher revenue autonomy. Only when the elasticity of revenue decentralization with respect to expenditure decentralization is larger than one is it an increasing function of expenditure decentralization. In other words, raising the degree of revenue autonomy is achievable when revenue decentralization is combined with expenditure decentralization. In other words this index is the ratio of RR and ER.

$$RAI^2 = \frac{\text{Subnational governments own revenue}}{\text{Subnational governments' expenditure}} \text{-----} (2.4)$$

The limitation with this measurement is that Revenue autonomy indicator has positive relation to the Revenue ratio and negative relation with Expenditure ratio. This potential that two components of the same decentralization process might proceed in different directions could help to explain some of the discrepancies in previous decentralization research' conclusions (Liu et al, 2013).

iii. **Average Ratio (AR)**

Akai and Sakata (2002) presented a decentralization measure that incorporates both revenue and expenditure shares. Average ratio is the arithmetic mean of ER and ER

$$AR = \frac{ER+RR}{2} \text{----- (2.5)}$$

Nevertheless, this measurement considers ER and RR as separate entities without showing the interaction and reinforcement between both.

iv. **Fiscal Decentralization Index (FDI)**

Vo (2008) used an alternative method, creating the Fiscal Decentralization Index (FDI), which includes Fiscal Autonomy (FA) and Fiscal Importance (FI). First, fiscal autonomy refers to the delegation of taxation authority and the assignment of responsibility for the provision of public goods and services. Fiscal autonomy is calculated as follows:

$$FA = \frac{\sum_{i=1}^p OSR_i}{\sum_{i=1}^p E_i} \text{----- (2.6)}$$

In which, OSR_i is the own-sourced revenue and E_i is the own-sourced expenditure of the province and i & p is the number of provinces. The expression suggests that the value of FA is in the range between 0 and 1. If FA corresponds 1, the province's budgetary revenue equals its budgetary spending, indicating a high degree of autonomy and independence from the national budget, allowing the province to be proactive and inventive in building its economy. If FA is near to zero, the province is almost totally reliant on the national budget since its own revenues are insufficient to fund its expenditures.

Secondly, fiscal importance refers to the relative importance of the province's fiscal operations compared to those of the national. Fiscal autonomy is calculated as follows:

$$FI = \frac{\sum_{i=1}^p E_i}{TE} \text{----- (2.7)}$$

Where, FI denotes the province's fiscal importance, TE is the total public sector spending across all levels of government in the country, and E_i denotes the regions's public expenditure. The value of FI falls between the ranges of 0 and 1. The closer FI comes to 1, the larger the percentage of the country's total fiscal spending covered for by the region's public spending, indicating the region's importance. If FI approaches zero, the region's public expenditure is relatively low in comparison to the rest of the country, signifying a limited role in national economic development.

Vo (2008) introduced the Fiscal Decentralization Index (FDI), which was created by combining the two aforementioned indicators, calculated as follows

$$FDI = \sqrt{FA \times FI} = \sqrt{\frac{\sum_1^p OSR_i}{\sum_1^p E_i} \times \frac{\sum_1^p E_i}{TE}} \quad \text{----- (2.8)}$$

The value of FDI also ranges from 0 to 1. The closer it's to one indicates high fiscal decentralization and the closer the value to zero indicate fiscal centralization. While Vo (2008) sought to link local revenue autonomy with the local share of public expenditure, the functional form chosen resulted in the elimination of the expenditure component, leaving a measure that is basically the same as the revenue share (Martinez-Vazquez and Timofeev, 2009)

v. **Composite Ratio (CR)**

Martinez-Vazquez and Timofeev (2009) developed updated decentralization ratio measures to incorporate both aspects of expenditure and revenue, named Composite Ratio (CR). Calculated as follows

$$CR = \frac{RR}{1-ER} \quad \text{----- (2.9)}$$

Because CR is rational function of the ER and RR indicators, it contains information on both revenues and expenditures. Unlike earlier efforts to combine the expenditure and revenue ratios, revenue decentralization and expenditure decentralization are mutually reinforcing in this measurement. Indeed, if the amount of expenditure decentralization is higher, the composite ratio

will be higher for the same level of income decentralization, and vice versa (Martinez-Vazquez and Timofeev, 2009).

While it is hard to represent a multi-dimensional feature of fiscal decentralization with a single indicator, CR assesses more than one component that is not just focused on revenue or spending. The CR indicator weights more heavily comprehensive decentralization than just the decentralization of administration (Liu et al, 2013). Thus, Following Martinez-Vazquez and Timofeev (2009) this study will employ Composite Ratio (CR) to measure fiscal decentralization in Ethiopia.

2.1.4 Fiscal Imbalance

Fiscal imbalance is the discrepancy between expenditures and revenues at various levels of government (Richard & Andrey, 2002). It takes place when there is an imbalance between governmental revenues and expenditures. Vertical and horizontal fiscal imbalances are the two types of fiscal imbalances.

- a) *Vertical Fiscal Imbalance (VFI)*:- When there is an imbalance between the fiscal resources available to each level of government and the expenditure duties given to them, it is referred to as a vertical fiscal imbalance (Boex, 2004). Vertical fiscal imbalance also defined as a discrepancy between the two tiers of government's authority to raise income and handle expenditures. Poor tax administration and collection have an impact on the lowest level of government's ability to increase its income. Accordingly, the lack of revenue autonomy at the subnational level, together with the belief of the central authorities that the majority of substantial taxes should be centrally administered, is the most frequent cause of vertical imbalance (Vazquez, 2004).
- b) *Horizontal Fiscal Imbalance (HFI)*: - A horizontal fiscal imbalance is characterized as a discrepancy between income and expenditures for various geographical areas of the nation. Horizontal fiscal imbalances are frequently used as a justification for equalization transfers or payments from the federal government to a state in order to balance out monetary disparities between various regions of the nation. When sub-national governments are unable to raise the equivalent amount of money from their tax bases to pay public services, there is a horizontal fiscal imbalance.

2.2 Theories and Determinants of Economic Growth

2.2.1 Meaning of Economic Growth and Its measurement

In economic theory, economic growth is defined as a yearly rise in the value of material output, or the rate of growth of GDP or national income. Economic growth is associated with the production of products and services, the creation of jobs, and the accumulation of wealth. It's usually calculated as a percentage rise in gross domestic product (GDP). As a result, GDP represents the entire market value or monetary worth of all final products and services produced inside a country's boundaries during a certain time period and is computed annually (Lequiller, F. and D. Blades, 2007)

Economic growth is the process of increasing the size of national economies, macroeconomic indicators, particularly GDP per capita, with positive effects on the economic-social sector, whereas development is the process of increasing the standard of living in a society (Haller, 2012).

A country's national accounts can be measured in a variety of ways. (1) Gross Domestic Product (GDP), (2) Gross national income (GNI): GDP plus primary income of citizens from the rest of the world minus primary income of non-residents from the economy. (3) Gross Domestic Product (GDP) minus depreciation is known as Net Domestic Product (NDP). (5) Net Disposable Income (NDI) is the difference between net national income and taxes at market prices. Most economies measure their national accounts using GDP (Mankiw, 2010).

The expenditures approach, the income approach, and the production value-added approach are the three ways for calculating GDP. The expenditures technique calculates GDP as the total of all expenses incurred in taking that entire product from the market, whereas the income approach calculates GDP as the total of all money received (wages, salaries and supplements, gross operating surpluses, gross mixed income and indirect taxes less subsidies). The production value-added technique varies from the other two approaches in that it calculates GDP by considering the contribution of each economic unit (value-add) by calculating the value of products and services after subtracting the value of inputs utilized in their production (Viet, 2009).

The expenditures approach, in which GDP is computed by adding consumer purchases of goods and services, gross investment spending by firms, government purchases of goods and services, and net exports in an open economy, is the most prevalent way of estimating GDP. International organizations employ a number of benchmarks to assess economic growth, with per capita GDP being one of them. It is determined by taking a current-price GDP measure and dividing it by the overall population.

Economic growth can be positive, zero, or negative in one sense or another. Positive economic growth is documented when the yearly average patterns of macro-indicators are greater than the average patterns of population increase. When the annual average rhythms of growth of macroeconomic indicators, notably GDP, equal those of population increase, we can talk about zero economic growth. Negative economic growth occurs when the patterns of population increase outpace the patterns of macroeconomic indicators (Haller, 2012).

Despite certain known flaws (GDP per capita, for example, offers no indication of how GDP is allocated among residents. GDP per capita may raise, but if income inequality rises, more individuals may suffer), GDP per capita is a key indication of economic growth and is widely employed as a broad measure of average living standards or economic well-being (Stiglitz, 2009).

2.2.2 Theories of Economic Growth

I. Classical Growth Theory

In his book *Wealth of Nations* (1776), Adam Smith stated that there are various variables that allow for improved economic growth. Smith emphasized the importance of the role of trade in enabling specialization, the role of market in determining supply and demand and labor productivity and increasing returns to scale to economic growth.

According to the Classical Growth Theory developed by Thomas Malthus, a country's economic growth will slow as its population grows and resources become scarce. This is an inference of classical growth theory economists' assumption that a temporary boost in real GDP per capita will ultimately lead to a population explosion, limiting a country's resources and, as a result, reducing real GDP. As a result, the economy of the country will begin to slow.

According to David Ricardo, a country's resources should be concentrated primarily in areas where it is most globally competitive, and it should trade with other nations to get items that are no longer produced domestically. Based on certain types of technical advancements, David Ricardo argues for the existence of natural market wages and assumes that the introduction of new technology leads to a decline in labor demand (Salvator, 1990).

II. Keynesian and Neo-Keynesian Growth Theories

Keynes' General Theory of Employment, Interest, and Money served as the foundation for all Keynesian growth theorists. The effective demand is a crucial component of the Keynesian model. As a result, increasing aggregate effective demand should help the economy grow. These ideas arose as a result of the critical analysis and development of Keynesian macroeconomic equilibrium. J. Keynes established a theory to explain fluctuations in the amount of economic activity based on economic values such as national income, consumption, savings, and investment.

Following the 1936 publication of Keynes' General Theory, several economists attempted to dynamize Keynes' static short-run theory in order to study the long-run dynamics of capitalist market economies. Evsey Domar and Roy Harrod separately developed the growth model that relates an economy's rate of growth to its capital stock, resulting in the Post Keynesian (Neo-Keynesian) theory of economic growth.

The Harrod–Domar model was originally developed to serve in the analysis of the business cycle, but it was later extended to explain economic growth. Its conclusions were that economic growth is determined by the amount of labor and capital available; greater investment leads to capital accumulation, which in turn leads to economic expansion. Economic growth, according to the model, is dependent on policies that enhance investment by raising savings and putting that investment to better use through technical advancements. The model indicates that full employment and steady growth rates do not occur "naturally" (Todaro & Smith, 2012).

III. Neoclassical Growth Theories and the Exogenous Theory of Robert Solow

The basic framework of the neoclassical growth model, which was developed by Robert Solow and Trevor Swan, states that the total output of an economy is determined by the quality and

quantity of physical capital employed, the quantity of labor employed, and the average level of skill of the labor force at any given time. However, after the economy has reached complete equilibrium, continued growth in the stock of capital per worker will occur only if productivity improves, either through increased capital stock or improved labor force quality.

According to the Neoclassical Growth Model, capital accumulations in an economy, as well as how individuals utilize it, are essential factors in determining economic growth. It also says that an economy's total production is determined by the interaction between capital and labor. Finally, the model argues that technology boosts labor productivity, resulting in higher overall production due to increased labor efficiency. As a result, the neoclassical growth model's production function is used to assess an economy's economic growth and equilibrium (Todaro & Smith, 2012).

IV. Theory of Endogenous Economic Growth

The endogenous character of the most important technological innovations has been hypothesized by Paul Romer and Robert Lucas based on investment in technological development and human capital through Research and Development, and most importantly, scientific and technical progress has been considered as an endogenous, growth factor generated by internal causes.

According to the Endogenous Growth Theory, economic growth is created internally in the economy, that is, through endogenous rather than exogenous factors. The hypothesis differs from the neoclassical growth model, which asserts that external factors such as technical advancement, among other things, are the primary drivers of economic growth.

The following are some of the most important policy implications of endogenous growth theory: Government measures that are aimed at imposing more market competition and stimulating product and process innovation can assist boost an economy's growth rate. Capital investment in education, health, and telecommunications yields increasing returns to scale. Investment in Research and development by the private sector is a critical source of technological advancement for the economy (Snowdon and Vane, 2005).

2.2.3 Determinants of Economic Growth

A wide range of researches have been conducted to study the elements that contribute to economic growth. Using distinct conceptual and methodological perspectives, these studies have focused on a varied set of explanatory variables and provided various insights into the drivers of economic development. However, there is still no agreement on the main determinants of growth, and no all-encompassing model that takes into account all of the variables has been developed (Boldeanu and Constantinescu, 2015). The following section discusses the major determinates of economic growth in Ethiopia from literatures.

a) Physical Capital Accumulation

Capital accumulation is one of the primary drivers of economic growth. The share of current income saved and invested in order to increase future production and income is referred to as capital formation. It is frequently the consequence of the purchase of a new factory, machinery, equipment, and all productive capital goods. One of the key elements affecting the amount of real output (GDP), is the pace of accumulation of physical capital. Senait (2014), using the annual data for the period 1960/61 to 2011/12 examined the contribution of different variables to economic growth of Ethiopia, the results showed that gross capital formation (as a proxy for physical capital formation) positively and significantly affected economic growth in the long run but not in the short run. On the other hand Rao and Leta (2017), found that gross domestic capital formation has negative significant impact on the economic growth of the country.

b) Human Capital formation

Human capital refers to a country's human resources' talents and capabilities, whereas human capital production refers to the process of obtaining and expanding the number of individuals who have the skills, good health, education, and experience required for economic success. As a result, investments in education and health are categorized as human capital development. Human capital is important in a variety of endogenous economic growth theories. Human capital, according to Romer (1990), is the principal input to the research sector, which provides the new ideas that underpin technological advancement. Mulugeta (2017) investigated the impact of government spending on human capital formation on economic growth in Ethiopia covering

the period 1981-2014. The study result showed that human capital formation had a significant and positive relationship with the long-run growth of real per capita.

c) Inflation

In an economy, inflation happens when the general price levels rises and demand for products and services rises, according to classical theory. According to Keynesian theory, inflation arises when demand exceeds the economy's potential output. Previously, inflation and growth were positively related in the short term and even in the long run, with higher inflation having a favorable influence on growth. When inflation is high, wealth is shifted from money to physical capital. However, new empirical research indicates a negative link between inflation and economic growth.

Abis (2013) using quarterly data from 1992 to 2010 investigated the relationship between inflation and economic growth in Ethiopia, the result showed that, there is a positive long-run relationship between inflation and economic growth. Similarly, Ashagrie (2015) empirically assessed the relationship between inflation and economic growth and found significant relationship both in long run and short run.

d) Trade openness

Several research articles have examined the relationship between openness and economic growth. A large number of studies have found that states with open economies have greater per capita GDP and expand significantly quicker (Romer, 1990; Barro, 2003). Trade openness may have a significant impact on economic growth through a variety of channels, including technological transfers, competitive advantage, and increased economies of scale (Chang et al. 2009). Khalid and Kenji (2016) investigated the source of Economic Growth in Ethiopia covering the period 1981-2014. The empirical result discovered that GDP growth has positive and significant long-run relationship with trade openness.

e) Labour force growth

The labor force encompasses all persons who work for a living, whether as employees, employers, or self-employed, as well as the unemployed who are looking for employment.

Particular attention is paid in the economic literature, both traditional and modern approaches, to the formation of labour force and the general balance in the economy (Jarmołowicz and Knapieńska). Labor forces significant and positively affect the GDP in long run (Feyisa and Feyera, 2020). Similarly, Mekonnen (2017) examined the major determinants of economic growth in Ethiopia covering the period 1974 to 2015. The study indicated that labour force have a positive significant impact on the growth of real GDP.

2.3 Fiscal Decentralization and Economic growth; Theoretical Perspective

This section explores different theoretical models of fiscal decentralization and how they relate to economic growth, consumer utility, and the provision of public services.

2.3.1 Economic dimension of fiscal decentralization

A public finance policy's standard economic elements are macroeconomic stability, equity, and efficiency (Musgrave, 1959). Fiscal decentralization can be discussed from these three elements as follows: -

i. Efficiency

The economists' primary endpoint for fiscal decentralization is the efficiency component of the economic dimension. Individual preferences for public goods vary, therefore in a fiscally decentralized system; people choose to live in a community that reflects their interests, maximizing social welfare in the process. The economic argument for efficiency arises from the idea that local governments are better equipped to accommodate residents' diverse opinions and interests and distribute resources more efficiently than a central authority because of their proximity to them (Bodman and Ford, 2006)

According to Musgrave (1959), subnational governments' policies should be allowed to diverge in order to represent the desires of their citizens. Oates (1972), building on Musgrave's argument, stated that each public service should be delivered by the authority having control over the minimal geographic region that would integrate benefits and costs of such delivery. This argument is known as the decentralization theorem. The decentralization theorem is founded on the premise that the national government can only deliver goods and services in a uniform

manner across regions. As a result, the argument goes; fiscal decentralization has the potential to improve efficiency.

Efficiency gains from decentralization can be efficient resource allocation and managerial. Because local governments have greater knowledge about their residents' demands than the central government, decentralization will boost efficiency resource allocation. In addition to that, local governments will compete for better use of public resources as a result of fiscal decentralization. Fiscal decentralization encourages cross-jurisdictional competition, which reduces governments' excessive taxation authority by acting as a curb on revenue-maximizing government conduct (Brennan and Buchanan, 1980).

ii. Stability

Compared to centralized fiscal systems, decentralized fiscal systems offer a larger potential for improved macroeconomic governance. As a result, it is critical to note that fiscal decentralization does not always imply macroeconomic instability. In reality, most nations chose to decentralize as a result of macroeconomic distress, with central governments increasingly depending on local governments to provide services in reaction to substantial central budget deficits. Decentralization is part of the central government's fiscal adjustment plan in certain nations, which involves moving expenditure obligations downward without building an intergovernmental financial system that distributes sources of revenue to subnational governments (Bodman and Ford, 2006).

iii. Equity

The redistribution of money to develop a socially inclusive outcome is a concern of the equity aspect of public finance policy. In its most basic form, redistribution entails transferring resources to low-income families in order to produce a more equitable distribution of income. The issue of redistribution has two dimensions in the context of decentralization: horizontal and within-locality equality. Horizontal equity refers to the extent to which subnational governments are capable of providing comparable services. Redistribution policies are aimed to transfer greater resources to poorer regions in order to solve horizontal disparities. In most fiscally decentralized systems, the equalization grant is the most widely utilized mechanism to adjust for horizontal imbalances (Bodman and Ford, 2006).

2.3.2 Fiscal decentralization and economic growth

Oates' (1972) key work on the 'Decentralization Theorem' established one of the early hypotheses on the benefits of decentralization. Decentralization, by adapting public good provision to the preferences of the local people, has the potential to be more welfare-enhancing than a centralized structure, in which the central government distributes public goods uniformly for the whole population.

Tiebout's (1956) 'voting with the feet' theory was another prominent early hypothesis on decentralization. It asserts that consumers can select the jurisdiction that provides their desired public goods, as long as the premise of perfect mobility is satisfied. According to Tiebout, various jurisdictions provide distinct public goods based on their objective purpose. After that, consumers self-select by migrating to their favorite jurisdiction. As a result of decentralization, various types and amounts of public goods that are more suited to local tastes might exist. When public goods are centrally planned and standardized throughout localities, they may be under-provided in some regions while being over-provided in others.

More subsequent models focused on determining the ideal amount of decentralization or the conditions under which decentralization is preferred from a utility-maximizing standpoint. The latter is shown by Faguet's (2004) model. The government optimizes the net benefit of public goods under this paradigm. It combines the local government's knowledge advantage on local needs and preferences with the central government's cost advantage in supplying public goods. Faguet's fundamental argument is that a decentralized government structure is preferable when the information advantage of sub-national governments outweighs the cost advantage of the central government.

Xie et al. (1999) and Davoodi and Zou (1998), on the other hand, developed models of ideal decentralization level for growth. The models entail the government optimizing the utility of a representative customer while restricting production. Production is a function of both private and public capital, the latter of which is separated into national, state, and local government capital. The challenge is solved by allocating money among these three levels of government in a way that optimizes growth. These models' key conclusion is that there is an optimal amount of

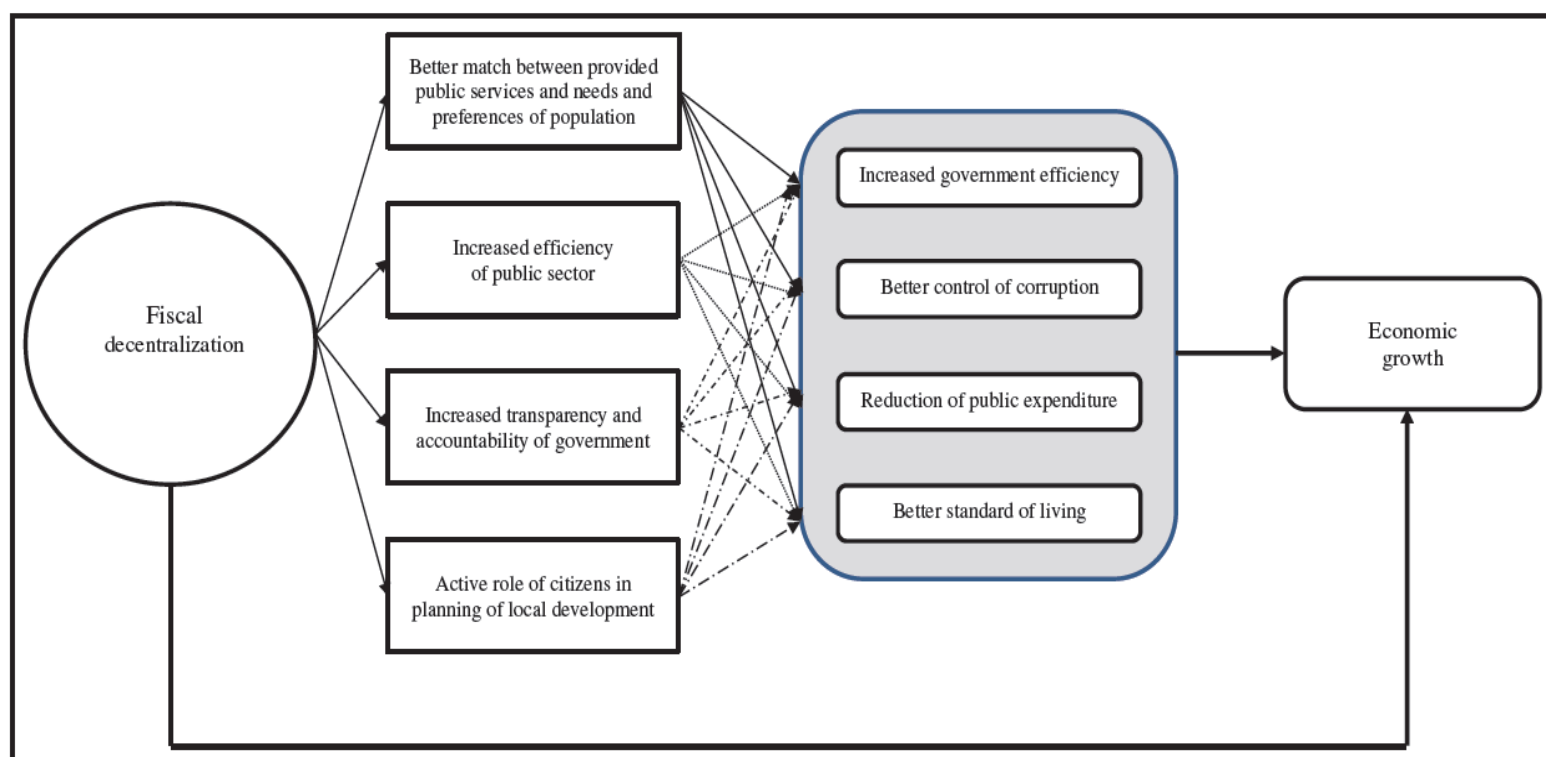
decentralization. Further decentralization boosts economic growth below this level. Above that, decentralization should be reduced to promote growth.

All of the theories covered in this section include one crucial assumption: that the government's goal is to maximize the utility of its citizens. This is a feature of what are known as first generation fiscal federalism models. Considering that many public officials are elected, and people can penalize them in the next election if they do not fulfill their job, this is a reasonable assumption (Oates, 2005). However, corruption and bribery persist, prompting a reconsideration of this assumption. A more recent body of work, known as second generation fiscal federalism models, implies that government employees have incentives that may not always line with the utility of consumers (Oates, 2005). As a result, maximizing their objective function may result in suboptimal social results.

In the Bardhan and Mookherjee (2006) model, for example, the local bureaucrat's dilemma is to select an optimal bribe level whilst also providing local public goods, whereas the national bureaucrat's problem is to solve for an optimal bribe schedule when allocating resources across different local governments. According to the concept, the fundamental drawback of centralized public goods supply is that it fosters monopolistic power and corruption in the uncontrolled central government, whereas the principal cost of decentralized provision is that local governments are vulnerable to local elite capture. The key consequence is that the impact of decentralization on the efficacy of public service provision is determined by the mechanism by which sub-national governments are funded.

The principal-agent analysis was employed in the Seabright (1996) and Tommasi and Weinschelbaum (2007) models, in which consumers are the principals while central and local governments are the agents in delivering public goods. As in many principal-agent situations, the utility of the consumers increases as the quantity of public goods increases; however, the utility of the government decreases as the quantity of public goods increases since more public services demand more work. They, like other decentralization models, have a trade-off: a decentralized structure has the advantage of more accountability, yet a centralized government has the virtue of coordinating in providing public goods, which is particularly important when there are inter-jurisdictional externalities.

The most common way to model fiscal decentralization and economic growth is to use a direct link between the two. The results of this link range from positive to negative or a hump-shaped association. The previously listed justifications for decentralization, such as greater public sector efficiency, higher quality public service delivery, and a higher standard of life, all have an influence on economic growth. As a result, the influence of decentralization on economic growth occurs through indirect transmission routes as well (Stojcic and Tolic, 2018).



Source: Stojcic and Tolic (2018)

Figure 2.1: Theoretical model of the direct and indirect effects of fiscal decentralization on economic growth

Baskaran et al. (2014) summarize past studies on the theoretical link between fiscal decentralization and economic growth, identifying four potential channels: heterogeneity of preferences, market preservation, structural change, and political innovation. Heterogeneity of preferences implies that diverse preferences jurisdictions for government activities are welfare-maximizing process. Market preservation indicates that fiscal decentralization boosts horizontal

fiscal competition, which reduces subnational governments' negative incentives, improves market development circumstances, and accelerates economic progress. During structural crises, structural transformation is linked to the possible good benefits of decentralization. Decentralization makes structural change simpler to achieve because risk-averse authorities in a centralized system may be more interested in providing excessive financial help to unproductive businesses, which prevents fundamental improvements. Fiscal decentralization establishes circumstances for utilizing regions as economic experimentation labs, according to political innovation. If a policy innovation is effective in one region, it may be spread to other regions, resulting in additional economic growth potential.

2.4 Empirical literature review

Many empirical studies have been sparked by the popularity of fiscal decentralization and the opposing arguments for and against it. Generally speaking, the numerous studies analyzing the relationship between economic growth and income inequalities can be categorized in to two sub groups, cross country and single country studies.

2.4.1 Cross country studies

According to Baskaran et al. (2014), a meta-analysis of the empirical literature on fiscal decentralization and economic growth, no conclusive conclusion on the influence of decentralization on economic growth can be established without first agreeing on how to quantify decentralization. Canare (2021) conducted a comprehensive evaluation of the empirical literature on decentralization and development outcomes. Fiscal decentralization and fiscal independence appear to be the decentralization kinds most positively connected with development outcomes. There is no obvious trend in expenditure decentralization, according to the study.

Through transmission channels, Stojcic and Tolic (2018) investigated the direct and indirect impacts of decentralization on economic growth. The results showed that decentralization has both direct and indirect effects on economic growth. Local governments that rely on their own earnings rather than handouts from the federal government are wealthier. Jin and Rider (2020) used panel data from China and India to examine the effects of spending decentralization and

fiscal equalization on short- and long-run economic development and to construct two-step generalized method of moment (GMM) simultaneous equations models. At conventional levels, expenditure decentralization has a negative and statistically significant influence on short-run economic growth in both China and India.

Tarigan (2003) used a pooled data set of thirty-four nations from 1979 to 1999 to investigate the link between fiscal decentralization and economic progress. The findings demonstrate a small but substantial negative link between real per capita GDP growth and fiscal decentralization. Using panel data, Pasichnyi et al. (2019) examined the link between the appropriate amount of fiscal decentralization and economic development for 27 established and emerging nations in Europe from 1992 to 2017. Revenue decentralization was shown to be related with lower growth rates; however spending decentralization was found to modestly promote economic development. Although the overall decentralization index had a negative impact on development, the link was not strong.

Davoodi and Zou (1998) explored the link between fiscal decentralization and economic growth using a panel data set of 46 nations from 1970 to 1989. In developing nations, the study discovered a negative relation between fiscal decentralization and growth, but none in developed nations. Kwon (2011) investigated if there is a causal relationship between fiscal decentralization and economic growth, as well as the direction of causality. The Granger-causality test is used to panel data from 21 nations between 1975 and 1995, and discovered that fiscal decentralization does not cause economic growth.

Slavinskait (2017) examined the effects of fiscal decentralization on economic growth in European Union unitary nations from 2005 to 2014. According to the findings, there is a positive association between fiscal decentralization and economic growth in low-income nations, while no such relationship exists in high-income ones. Ismail et al. (2004) tried to figure out how fiscal decentralization affects economic growth and found that revenue decentralization leads to economic growth using an econometric study of a panel of four Muslim nations. In the OECD, Bodman and Ford (2006) looked at the interplay between fiscal decentralization and economic growth. The study concluded that there is no evidence of a direct link between fiscal decentralization and output growth. Faridi et al. (2019) examined the influence of fiscal on South

Asian nations' economic growth. The conclusions that spending and revenue decentralization had substantial positive and negative effects on economic development, respectively, were supported up by empirical data from a panel pooled mean group of Auto Regressive Distributed Lag.

The impact of fiscal decentralization on economic growth was studied by Göcen et al. (2017) first theoretically, and then the OECD nations were examined using panel data from 1995 to 2012. The study discovered that various decentralization measuring criteria and empirical approaches had distinct growth effects. Hanif et al. (2020) explored how fiscal decentralization has influenced the economic growth of a group of developing nations regarded to be federal (Forum of Federations). The findings revealed that both tax income and expenditure decentralization have a large, beneficial influence on economic growth in federal developing nations.

Martnez-Vazquez and McNab (2006) considered the potential direct link between decentralization and growth, as well as the indirect impact of decentralization on growth via its impact on macroeconomic stability. Decentralization appears to have a favorable impact on price stability in industrialized nations, while the impact in emerging and transitional countries is less evident. The study also found evidence that decentralization in higher-income nations might have a direct and negative impact on economic growth. Blöchliger (2013) offered empirical evidence on the impact of fiscal decentralization on a variety of outcomes, including GDP, productivity, public investment, and school performance. The findings indicated that decentralization is positively related to GDP per capita levels, as measured by revenue or spending shares. Canavire-Bacarreza et al. (2019) reviewed the link between fiscal decentralization and economic growth by addressing the endogeneity problem caused by reverse causality and unobserved variables that hampered prior studies. The study concluded that, on average, a 10% rise in subnational spending or revenue shares will boost GDP per capita growth.

Thießen (2000) looked at the experiences of 17 Western European nations in an attempt to add to empirical study and found that, there is a link between fiscal decentralization and economic development in middle-income nations. Thießen (2001) empirically examined the link between fiscal decentralization indicators and per capita economic growth, capital formation, and total

factor productivity growth, for high-income OECD nations. The data tends to support the idea that fiscal decentralization has modest effects on economic growth and capital formation.

2.4.2 Single country/Country specific Studies

The study by Akai and Sakata (2002) used evidence from state-level cross-section data for the United States to show that fiscal decentralization adds to economic growth and that developed nations' fiscal decentralization may enhance their economic growth. Lin and Liu (2000) looked into the impact of fiscal decentralization on GDP per capita growth in China. The research revealed that fiscal decentralization has boosted economic growth significantly. Lozano and Julio (2016) presented evidence supporting fiscal decentralization's favorable benefits on regional economic growth in Colombia. Swasono (2007) provided evidence of decentralization's influence on Indonesia's growth. The study evaluated the influence of two decentralization measures, the own source revenue ratio and the spending ratio, on growth using panel data from 1991 to 2005. Fiscal decentralization has historically had a negative influence on growth in Indonesia, according to the findings.

Cahyadi (2019) looked at the theoretical and empirical evidence on the impact of fiscal decentralization on economic growth in Indonesia, based on data from the lowest levels of government and the most recent data from 2010 to 2017. To reflect the multifaceted character of fiscal decentralization, the study employed five decentralization measures. The results demonstrated that fiscal decentralization is both significantly and negatively associated to economic growth.

Using an ARDL/Bounds Testing technique and data from 1980 to 2012, Udoh et al (2015) analyzed how Nigeria's decentralized spending structure influenced human resource development and economic growth and concluded that in the long run, the pattern and character of spending decentralization in Nigeria appeared to favor inefficient resource allocation and raised governance costs rather than assuring cost effectiveness in the provision of public services. Using time series data, Ewetan et al (2016) investigated the long term and causal link between fiscal decentralization and economic development in Nigeria from 1970 to 2012. The results of a multivariate VAR model show that fiscal decentralization and economic development in Nigeria have a long-term link. Fiscal decentralization has a positive and substantial association

with economic growth. In Nigeria case again, Atan and Esu (2021) reexamined the impact of decentralization on economic growth. The findings revealed, among other things, that while fiscal decentralization may not have a direct impact on economic development, its impacts may be communicated through an efficient economic management process, which might be a result of well-managed fiscal decentralization procedures.

Samimi et al. (2010) investigated the link between fiscal decentralization and economic development in Iran from 2001 to 2007 throughout the country's 30 regions. The model is a nonlinear fixed effect panel. The findings indicated that fiscal decentralization has a favorable impact on Iran's economic growth. Using the ARDL model, Kang and Arshad (2012) looked at the link between fiscal decentralization and economic growth in Pakistan and discovered that fiscal decentralization is positively associated to economic growth. The research by Faridi (2011) is based on yearly time series data from 1972 to 2009 using an Autoregressive model. Both fiscal decentralization factors, such as spending authority and revenue autonomy, have a favorable and substantial influence on economic growth, according to the findings.

Carrion-i-Silvestre et al. (2008) investigated the role of fiscal decentralization in boosting economic growth in Spain. The data was analyzed using a panel data technique. The process of decentralization of duties to Autonomous Communities has had a favorable influence on global and regional economic growth, according to the major conclusion. Nantharath et al. (2020) investigated the impact of fiscal decentralization on Thailand's economic growth. According to the study, there is empirical evidence that fiscal decentralization contributed favorably to Thailand's economic development between 2004 and 2017. Anna and Donghui (2020) tried to figure out what are the main factors that drive regional economic growth in Ukraine. The study was conducted over four years on a data panel of 24 Ukrainian provinces using a non-linear fixed effect approach. Decentralization of revenue has a negative relationship with per capita gross regional product (per cap GRP).

In a basic model of endogenous growth with expenditure by several levels of government, Xie et al (1999) showed how fiscal decentralization influences the economy's long-run growth rate. The analysis found that the present expenditure percentages for state and municipal governments are compatible with growth maximization when applied to the US economy. Iqbal et al. (2012) tried

to figure out how fiscal decentralization affects economic growth. It also looked at how fiscal decentralization and democratic institutions work together to promote growth. Composite decentralization has a positive impact on economic growth, suggesting that simultaneous revenue and spending decentralization boosts economic growth. The theoretical and empirical relationship between fiscal decentralization and economic growth was examined by Yushkov (2015) of Russian regions from 2005 to 2012. Excessive expenditure decentralization within the area is significantly and negatively associated to regional economic growth, according to the conclusion of the study.

The link between fiscal decentralization and local economic growth in Serbia is investigated by Bartlett et al (2018). The research is based on a cross-section time-series regression model in which the local employment rate is used as a proxy for local economic progress. The research's key finding is that fiscal decentralization has aided local economic growth in Serbia. Devkota (2014) examines the changing pattern of fiscal decentralization in Nepal and its influence on district-level per capita GDP development. Fiscal decentralization has been demonstrated to have a favorable impact on per capita district GDP development.

In Ethiopian case there is no country specific study regarding the relationship between fiscal decentralization and economic growth. Generally speaking, the Ethiopian literatures regarding fiscal decentralization analyzed the effects of fiscal decentralization on education and health sectors (Vander Naald, 2007; Weldemariam, 2010; Faguet, 2019), the practices and challenges of fiscal decentralization at country level (Mhreteab, 2000; Moges, 2003; Baraki, 2015; Assefa, 2015; Yesigat, 2016; Defere, 2018), at regional and local levels (Mulugeta, 2014; Mentta et al, 2014; Mekonne and Kassie, 2014; Ansaw, 2017; Legas, 2018; Alam and Debela, 2019), and the impact of fiscal decentralization on poverty and equitable development (Agegnehu and Dibu, 2016; Dera, 2021).

2.5 Analytical Framework

The link between fiscal decentralization and economic growth is not explicitly considered in the classical theory of fiscal decentralization. There is no clear theoretical framework for examining the relation between fiscal decentralization and economic growth empirically. There is no model that completely specifies the parameters that should be kept constant while analyzing the

relationship between growth and the economic variable of interest. In order to justify fiscal decentralization, economists have examined and adopted a variety of economic growth models, using them to identify a possible link between decentralization and economic growth and using various econometric approaches to empirically confirm this link (Yushkov, 2015).

There are two basic approaches for empirical research of the links between FD and economic growth. The first method is based on cross-country growth accounting, which has only been utilized in one earlier research on fiscal decentralization and economic growth. Informal growth regressions are the second and most prevalent strategy. Formal theoretical models may be used to support the inclusion of FD, or some of the control variables, in the growth regression in the later situation, although the econometric specification is mostly driven by past literature results (Bodman and Ford, 2006).

Cross-country growth accounting model entails regressing the growth rate of output on the growth rate of inputs. A portion of the model could be written to account for variations in total factor productivity (TFP) growth caused by certain factors. Fiscal decentralization, thus, can be introduced due to its effect on efficiency. Eller (2004) employed this framework to analyze the relationships between efficiency growth and fiscal decentralization in his study.

There are several flaws in this model. Because few measurements accurately reflect real changes in fiscal decentralization, estimation of this model may be subject to significant measurement error. Despite the fact that this model incorporates the efficiency channels via which fiscal decentralization affects growth, it can still be critiqued because it does not distinguish between consumer and producer efficiency (Bodman and Ford, 2006).

Informal growth regressions are a more popular approach in studies of fiscal decentralization and economic growth. Popular economic growth models (such as the Solow model, Borro's endogenous growth model, and Diamond's overlapping generations' model) have been revised to include a possible link between decentralization and economic growth (Davoodi and Zou ,1998; Thiessen 2003; Brueckner, 2006)

The model proposed by Davoodi and Zou (1998), which is a modified version of Borro's endogenous growth model, is the most prevalent analytical framework that ties expenditure

decentralization to growth. A number of single country studies have used the Davoodi and Zou (1998) approach, which uses a simple theoretical model to support the inclusion of expenditure decentralization in growth regressions. Other control variables are often picked from the literature, such as those used by Levine and Renelt (1992).

The augmented Solow model (Mankiw, Romer and Weil (MRW) model) also serves as a foundation for econometric examination of the fiscal decentralization-growth link (Thiessen, 2003). This approach is used by Lin and Liu (2000), Thieben (2003), Martinez-Vazquez and McNab (2006), and Bodman and Ford (2006). Following Mankiw et al. (1992), these authors employ Solow's (1956) exogenous growth model and incorporate fiscal decentralization as a variable explanatory of production per capita growth.

According to Lin and Liu (2000), the growth rate of output per capita is determined by two factors: the rate of capital per capita growth and the pace of technological progress. The rate of technological advancement is determined by two factors, namely, fiscal decentralization and resource endowment. Thiessen (2003) uses fiscal decentralization and other conditioning factors as independent variables in the empirical specification, in addition to standard economic growth determinates derived from the Solow model.

Brueckner (2006) uses Diamond's Overlapping Generations (OLG) model to demonstrate the theoretical benefits of decentralization. Decentralization and centralization are two systems that Brueckner compares. A perfect Tiebout-sorting system is supposed to allow individuals to sort themselves into two demand-homogeneous jurisdictions with varying levels of public benefit provision under decentralization. A common level of public good is supplied for all individuals under the centralized system. In the decentralized equilibrium, time spent on education and levels of physical capital are higher than in any centralized equilibrium. As a result, decentralization leads to higher economic growth, as measured by the rate of increase in human capital. This model, which is overly abstract and hence impossible to test empirically, sheds light on how decentralization can boost growth (Yushkov, 2015).

Following Barro (1990), Zhang and Zou (2001) and Arshad (2010), an endogenous growth model consisting of a production function with several inputs is assumed to build analytical model to study the relationship between fiscal decentralization and economic growth.

CHAPTER THREE

Research Methodology

3.1. Research approach

The study's objective is to look at the link between economic growth and fiscal decentralization. In this regard, the study follows an explanatory study approach by employing a quantitative research method, as this is the most effective method for testing hypotheses and identifying factors that impact outcomes.

3.2. Data types and sources

To analyze the relationship between fiscal decentralization and economic growth the study employed time-series data. The time period for this study is from 1996/97-2020/21, a total of 25 years of data. This study mainly utilizes secondary data collected from various institutions. Data for GDP per capita, labour force, physical capital accumulation (GCF), inflation, and trade openness was collected from National Bank of Ethiopia (NBE). Data for fiscal decentralization and related indicators was collected from Ministry of Finance (MoF). Finally, data for human capital (primary school enrollment) was collected from Ministry of Education.

3.3. Methods of Analysis

Both descriptive and econometric analytic approaches were used in the study. Tables, graphs, and charts were used to examine aspects of fiscal decentralization as well as overall economic growth performance and other explanatory variables. In addition to graphical and tabular analysis of the variables, the maximum, minimum, and average of the variables under consideration was employed in the descriptive analysis section.

Furthermore, as an econometric analysis method, the Auto Regressive Distributed Lag (ARDL) co-integration technique developed by Pesaran and Shin (1999) and Pesaran et al. (2001) was employed to determine whether causalities exist between the independent variables (mainly fiscal decentralization) and the dependent variable (economic growth), and if so, the directions and magnitudes of the effects.

3.3.1 Econometrics Model Specification

Following Barro (1990), Zhang and Zou (2001) and Arshad (2010), an endogenous growth model consisting of a production function with several inputs is assumed to build analytical model to study the relationship between fiscal decentralization and economic growth.

Following Arshad (2010), an endogenous growth model consisting of a production function with several inputs is assumed: labour force, physical capital, human capital, trade openness, inflation and fiscal decentralization. The production function is given as;

$$Y_t = F (FD_t, L_t, PC_t, HC_t, INF_t, OPN_t) \text{ ----- (3.1)}$$

Where Y is GDP per capita, FD is fiscal decentralization, L is labour force, PC is physical capital accumulation, HC is human capital accumulation, INF is inflation and OPN is trade openness.

Using Cobb-Douglas production function the above function in term of explicit form and including dummy variable for local level decentralization, it can be written as:

$$Y_t = A (FD_t)^{\beta_1} (PC_t)^{\beta_2} (HC_t)^{\beta_3} (L_t)^{\beta_4} (INF_t)^{\beta_5} (OPN_t)^{\beta_6} (Dt)^{\beta_7} \text{ ----- (3.2)}$$

For estimation purpose, by introducing the intercept term and the error term into the above equation, equation (2) can be specified as follows:

$$\ln(Y_t) = \beta_0 + \beta_1 \ln(FD_t) + \beta_2 \ln(PC_t) + \beta_3 \ln(HC_t) + \beta_4 \ln(L_t) + \beta_5 \ln(INF_t) + \beta_6 \ln(OPN_t) + \beta_7 Dt + \varepsilon_t \text{ ----- (3.3)}$$

Where Y is GDP per capita, L is labour force, PC is physical capital accumulation, HC is human capital accumulation, FD is fiscal decentralization, INF is inflation, OPN is trade openness, D is dummy for local fiscal decentralization, β coefficient to be estimated and ε_t error term.

3.3.2 Definition of Variables, Measurement and Hypothesis

GDP per capita: The total monetary or market worth of all final goods and services produced inside a country's boundaries in a certain time period is known as GDP. It serves as a complete assessment of a country's economic health since it is a wide measure of entire domestic

production. GDP per capita (a country's GDP divided by its total population) is used as a measure of economic growth in this study.

Fiscal Decentralization: is the transfer of revenue collection and expenditure duties from the central/federal government to the sub-national governments. This study employs fiscal decentralization measure developed by Martinez-Vazquez and Timofeev (2009) that incorporate both aspects of expenditure and revenue, named Composite Ratio (CR). Fiscal decentralization is expected to have positive/negative relation with economic growth.

Labour Force: is made up of people who are economically active. These are individuals who provide labor for the creation of products and services for a set length of time. People who are classified as labor force in Ethiopia are individuals who are 15 to 64 years old, including employed and unemployed. Labour force is expected to be positively related with economic growth.

Physical Capital Accumulation: is measured in gross capital formation (GCF). According to World Bank Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Physical capital accumulation is expected to have a positive impact on economic growth.

Human Capital Accumulation: is the collective of skills, knowledge, or other intangible assets of individuals that can be used to create economic value for the individuals, their employers, or their community. It is difficult to measure human capital in economics. As a result researchers use different proxy to human capital (i.e. school enrolment like primary, secondary, tertiary level or literacy rate and life expectancy; expenditure to education and health). This study employ primary school enrollment rate as proxy for human capital accumulation. Human capital accumulation is expected to have a positive impact on economic growth.

Inflation: is the gradual loss of a currency's purchasing power over time. The increase in the average price level of a basket of selected goods and services in an economy over time can be

used to calculate a quantitative estimate of the pace at which buying power declines. This study will use average annual inflation rate (CPI growth rate) to calculate inflation. Inflation is expected to have negative relation with economic growth.

Trade Openness: is one measure of the extent to which a country is engaged in the global trading system. Trade openness is usually measured by the ratio between the sum of exports and imports and gross domestic product (GDP). Trade openness is expected to have positive relation with economic growth.

Dummy Variable: the dummy variable is local level fiscal decentralization which was introduced in 2002 in Ethiopia. Thus one will be used for post 2002 period and zero for pre 2002 period. Local level fiscal decentralization is expected to influence economic growth positively.

3.4 Estimation Procedure

The use of suitable technique for time series data is the most important aspect of time series analysis, since incorrect model specification or use of the wrong method results in biased and erroneous estimations. The unit root test findings, which determine the stationarity of the variable, are used to pick the method for time series analysis. Non-stationary time series cannot be analyzed using methods that are usually used to examine stationary time series at $I(0)$ or $I(1)$. The process becomes straightforward if all of the variables of interest are stationary at the same level. In this scenario, unbiased estimates can be obtained using ordinary least square (OLS) or vector autoregressive (VAR) models. If all of the variables of interest are non-stationary, OLS or VAR models may not be suitable for analyzing the relationship; instead, the Johansen test should be used. If the variables are non-stationary, we will use the first difference to convert the variables to stationary $I(1)$. When the variables in the study are of mixed type, i.e., some are stationary and others are non-stationary, the use of the ARDL technique to co-integration in this scenario will yield realistic and efficient estimates (Nkoro and Eko, 2016)

In this study Autoregressive distributed lag (ARDL) model will be employed to identify the existence of a long-term and short term relationship between economic growth and fiscal decentralization in Ethiopia. This model is followed for the reasons listed below. First, ARDL model can be used if the underlying variables are $I(0)$, $I(1)$, or a mix of both. This avoids the pre-

testing issues that come with standard co-integration analysis, which needs the categorization of the variable into I(0) and I(1) categories (1). When there is a single long run relationship between the underlying variables, the bound testing process does not require pre-testing of the variable included in the model for unit root and robust. Second, if the F-statistics show that just one long-run link exists and the sample size is small or finite. The error correction representation in ARDL improves in efficiency. Third, because the ARDL approach is clear of residual correlation, endogeneity is less of an issue (i.e. all variable are assumed endogenous) Pesaran, Smith, and Shin (2001). Fourth, the error correction model (ECM) can be derived from the ARDL model using a simple linear transformation, which integrates short-run dynamics with long-run equilibrium without sacrificing long-run information and avoids problems like spurious relationships caused by non-stationary time series data.

3.4.1 ARDL Model

With respect to Equation (3.3) it is assumed that there is a long-run relationship among economic growth, labour force, physical capital, human capital, trade openness, inflation and fiscal decentralization. As the direction of long-run relationship among the variables is unknown, a priori, the following unrestricted error correction model can be regressed for determination of long-run relationship:

$$\begin{aligned} \Delta \ln(Y)_t = & \alpha_0 + \sum \alpha_{1i} \Delta \ln(Y)_{t-i} + \sum \alpha_{2i} \Delta \ln(FD)_{t-i} + \sum \alpha_{3i} \Delta \ln(PC)_{t-i} + \sum \alpha_{4i} \Delta \ln(HC)_{t-i} \\ & + \sum \alpha_{5i} \Delta \ln(L)_{t-i} + \sum \alpha_{6i} \Delta \ln(INF)_{t-i} + \sum \alpha_{7i} \Delta \ln(OPN)_{t-i} + \sum \alpha_{8i} \Delta D_{t-i} + \beta_1 \ln(FD)_{t-1} + \\ & \beta_2 \ln(PC)_{t-1} + \beta_3 \ln(HC)_{t-1} + \beta_4 \ln(L)_{t-1} + \beta_5 \ln(INF)_{t-1} + \beta_6 \ln(OPN)_{t-1} + \beta_7 D_{t-1} + v_t \text{ -----} \\ & \text{-----}(3.4) \end{aligned}$$

Where ‘ Δ ’ is first difference operator, ‘i’ is the number of lags, ‘n’ is the optimal lags length which can be chosen either Akaike Information Criterion (AIC) or Schwarz Bayesian Criterion (SBC) before the given model is estimated by OLS and v_t is the error term.

Whereas, $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8$ characterize the coefficient of the short run dynamics of the model while, $\beta_1 \beta_2 \beta_3 \beta_4 \beta_5 \beta_6 \beta_7$ coefficient show the long run relationship. The F-test is used for validating of long-run relationship. The null hypothesis for no long-run relationship amongst the variables in equation (3.4) is

$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = 0$ (no long run relationship) against

$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq 0$ (long run relationship)

Two critical values [$I(0)$ and $I(1)$] are taken from Pesaran (2001). The value $I(0)$ shows the lower bound while $I(1)$ represent the upper bound. If computed F-statistics is greater than upper bound, the null hypothesis of no long-run relationship can be rejected. Conversely, if computed value of F-statistics is lower than lower bound, the null hypothesis cannot be rejected. Finally, if computed F-statistics falls between lower and upper bounds, the results are inconclusive.

If there is evidence of long run relationship (co-integration) of the variable, the following long run model is estimated:

$$\ln(Y)_t = \beta_0 + \beta_1 \ln(FD)_{t-1} + \beta_2 \ln(PC)_{t-1} + \beta_3 \ln(HC)_{t-1} + \beta_4 \ln(L)_{t-1} + \beta_5 \ln(INF)_{t-1} + \beta_6 \ln(OPN)_{t-1} + \beta_7 D_t + v_t \text{ -----(3.5)}$$

After the long run model is estimated the ARDL specification of the short run dynamic can be derived by constructing an error correction model (ECM) of the following form;

$$\begin{aligned} \Delta \ln(Y)_t = & \alpha_0 + \sum \alpha_{1i} \Delta \ln(Y)_{t-i} + \sum \alpha_{2i} \Delta \ln(FD)_{t-i} + \sum \alpha_{3i} \Delta \ln(PC)_{t-i} + \sum \alpha_{4i} \Delta \ln(HC)_{t-i} \\ & + \sum \alpha_{5i} \Delta \ln(L)_{t-i} + \sum \alpha_{6i} \Delta \ln(OPN)_{t-i} + \sum \alpha_{7i} \Delta \ln(OPN)_{t-i} + \sum \alpha_{8i} \Delta D_{t-i} + \lambda ECT_{t-1} + v_t \\ & \text{-----(3.6)} \end{aligned}$$

Where $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8$ are coefficients of short-run dynamic parameters and λ captures the speed of adjustment and tells us how much of the adjustment to equilibrium takes place each period, or how much of the equilibrium error is corrected.

3.4.2 Stationary test

The majority of time series analyses modeling techniques are primarily focused with data stationarity. The first step is to visually inspect and statistically check the qualities of a series. Graphs are the most basic tool for determining whether or not a series is stationary. Statistical tests, on the other hand, are necessary for a final decision. According to Gujarati (2004), a stochastic process is said to be stationary if its mean and variance remain constant over time and

the value of covariance between two time periods is determined solely by the distance or gap between the two time periods, not by the actual time at which the covariance is computed.

Regression with non-stationary variables frequently leads to the problem of spurious regression, according to Granger and Newbold (1973); the residual from a spurious regression acts like a unit root process. A spurious regression is one in which the model's outcome has a high and significant t-statistic but a very low Durbin-Watson (DW) statistic, indicating that the results have no economic significance. Furthermore, it suggests that the variables simply have a temporal link, not a meaningful causal relationship. The presence of a unit root in a series is one source of non-stationarity. The existence of a unit root indicates that a time series is non-stationary, whereas the absence of one indicates that it is stationary.

3.4.3 Unit root test methods

The unit root test is a statistical approach for determining the stationarity of a series. The question of whether a time series is trend stationary (TS) or difference stationary (DS) has consequences for both economics and statistics. As a result, testing the unit root is necessary. The Augmented Dickeye-Fuller (ADF) test and the Phillipse-Perron (PP) test are two often used stationarity test techniques.

The Augmented Dickeye-Fuller (ADF) test is the most common method for testing unit root. In practice, an ADF value with less than its critical value shows that the underlying series is non-stationary. Contrarily, when an ADF value that is greater than its critical value shows that the underlying series is stationary. However, the null hypothesis cannot be rejected about non-stationarity based on ADF test, since its power is not strong as such. This decision can be verified using other related tests of Philips-Perron (PP) test. PP test has the same null hypothesis as ADF, and its asymptotic distribution is the same as the ADF test statistic.

Because of its widespread usage and popularity, the Augmented Dickey-Fuller (ADF) test is regarded better. The ADF test modifies the DF test by adding the dependent variable's lagged difference term to account for any autocorrelation in the error terms. The PP test accounts for autocorrelation in the error term, and its asymptotic distribution is identical to that of the ADF test statistic. ADF, on the other hand, is widely utilized because to its ease of application.

3.4.4 Bound Co-integration test

After confirming that the variables are stationary, the next step is to determine if they have a co-integration relationship. For non-stationary time series, conventional least square or other comparable algorithms may provide erroneous conclusions. In other words, regression test results may indicate the existence of a substantial link between two uncorrelated variables. The non-stationarity of the time series utilized in the regression model causes this form of regression, which is known as "spurious regression." Two or more variables, on the other hand, may create a long-term equilibrium connection even if they diverge from it in the short run. Engle and Granger (1987) established the co-integration test method to investigate the relationships among non-stationary variables as a result of these challenges. This co-integration testing approach enables us to determine whether or not the underlying variables in the models are co-integrated.

3.4.5 Diagnostic tests of Autoregressive Distributed Lag (ARDL) model

We must determine the fitness of the estimated model by evaluating goodness of fit statistics and running diagnostics tests in order to make it robust and unbiased. R^2 , which reveals a correlation in the multivariate regression situation and hence the value closer to 1 is deemed to be better, is a common test for goodness of fit. Adjusted R^2 is used instead of R^2 in multivariate regression. R^2 grows as the number of variables increases, but adjusted R^2 only increases when the additional variable enhances prediction power. The autocorrelation (also known as serial correlation) in residuals from regression analysis is measured using the Breusch-Godfrey serial correlation LM test. The diagnostic test also examines normality test (Jaque- Bera test) functional form (Ramsey RESET test), and heteroscedasticity test associated with the model. The structural stability test is conducted by employing the Cumulative residual (CUSUM) and the Cumulative sum of squares of recursive residuals (CUSUMSQ).

CHAPTER FOUR

Result and Discussions

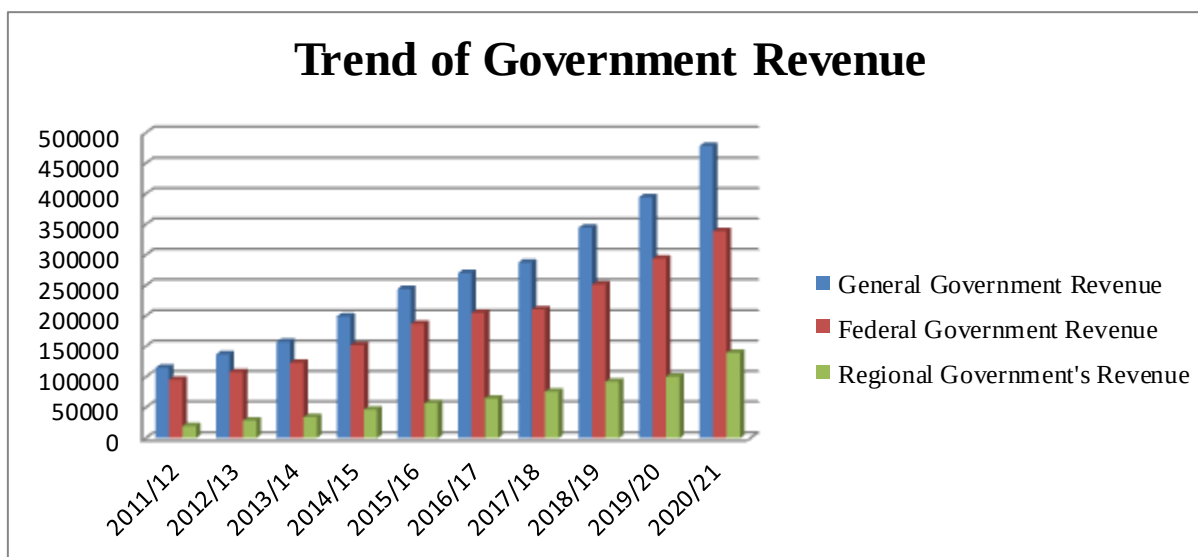
This chapter presents the results from both descriptive and econometric analysis into three sections. The first section deals with descriptive analysis of the features of fiscal decentralization in Ethiopia. Followed by descriptive statistics of variable, while the second portion of this chapter takes on the econometric analysis and discussion.

4.1 Features of Fiscal Decentralization in Ethiopia

In this section features of fiscal decentralization will be discussed. First trends in revenue and expenditure decentralization will be discussed followed by discussion and analysis of three accepts of fiscal decentralization namely, Vertical fiscal imbalance, Horizontal Fiscal imbalance and Intergovernmental transfers/grants.

4.1.1 Revenue and Expenditure Decentralization

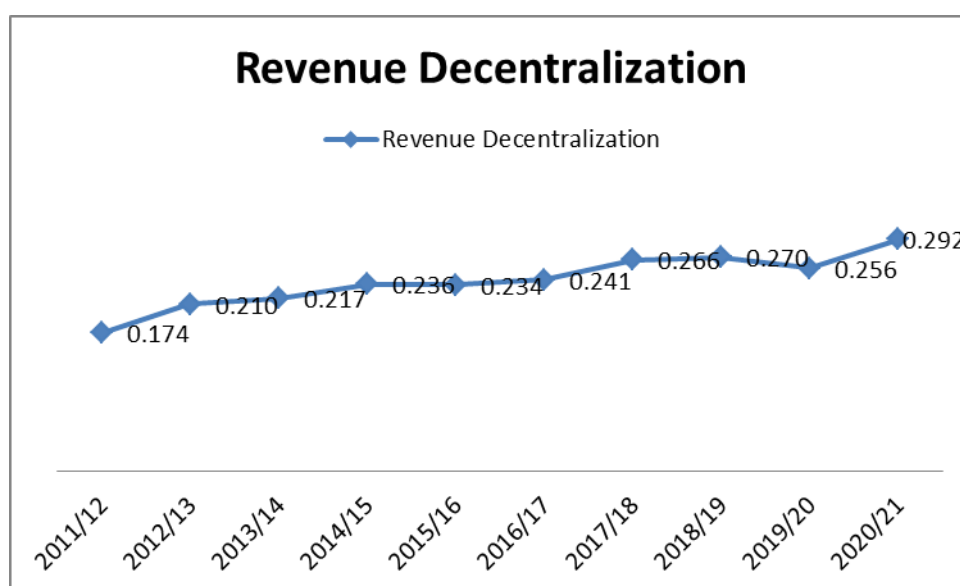
Revenue and expenditure decentralization are the two basic aspects of fiscal decentralization. Revenue decentralization is the division of revenue collection, in general, and taxing powers, specifically, among different tiers of government. In Ethiopia regions have their own autonomy to raise revenue to sustain their expenditure.



Source: Authors computation from MoF (2021)

Figure 4.1; Trend of General, Federal and Regional Government revenue

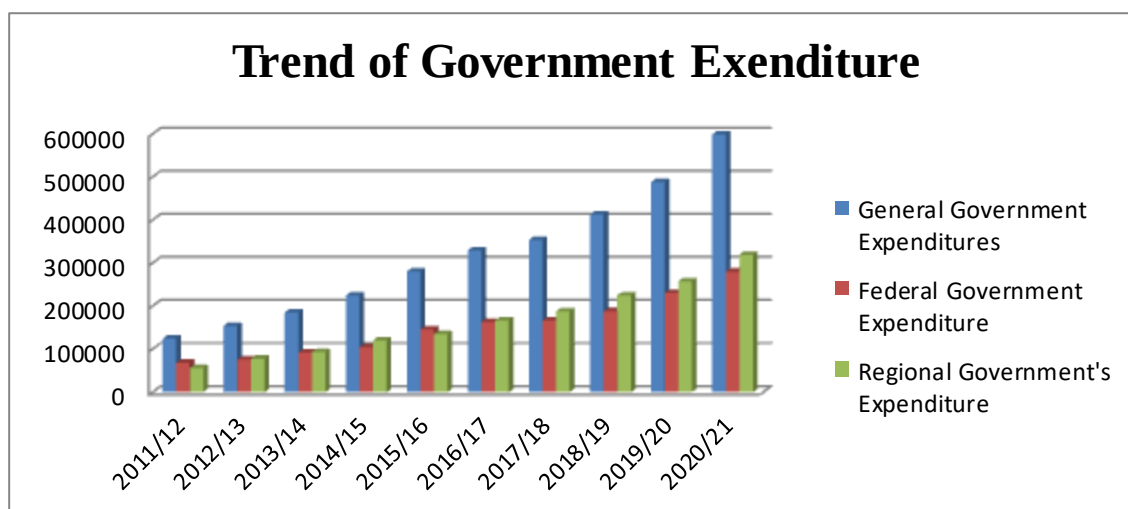
In the first year of full implementation of fiscal decentralization, all regions collected a total of 1.35 billion ETB in 1996/97 fiscal year, while the federal government collected 7.68 billion ETB in the same fiscal year. In 1996/97 fiscal year the total share of regional revenue collection to that of the general government (sum of regional revenue and federal government revenue) was only 15%. Since its introduction, regional revenue mobilization is increasing substantially. For the past ten years it has grown on average by 24.5% annually. In 2020/21, the total revenue raised by regions reached 139.9 billion ETB and its share to the general government revenue increased to 29.2%.



Source: Authors computation from MoF (2021)

Figure 4.2; Trend of revenue decentralization ratio

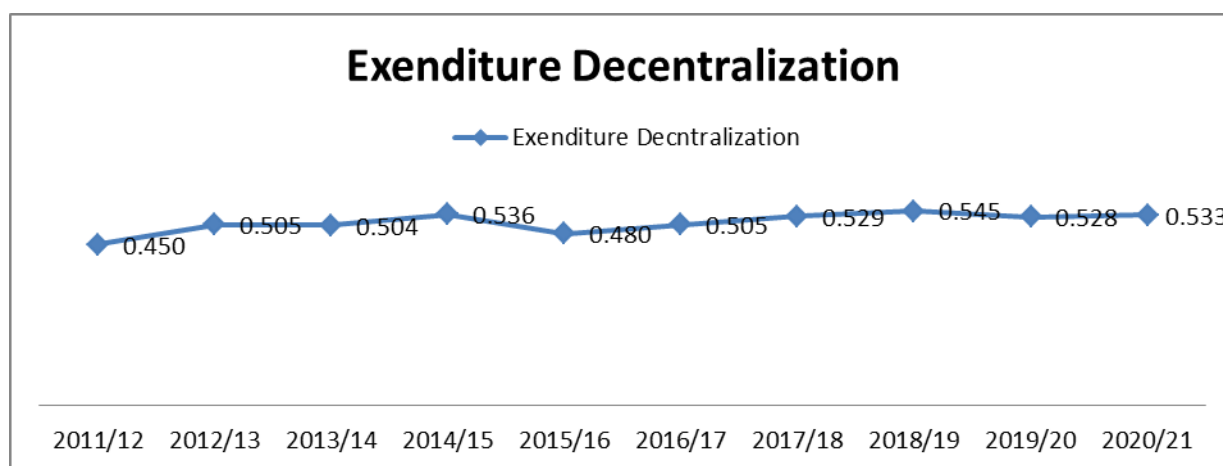
Revenue decentralization ratio, measured as the share regional revenue to general government revenue (sum of regional revenue and federal government revenue) increased from 0.174 in 2011/12 to 0.292 in 2020/21. For the past ten years revenue decentralization ratio grew by an average rate of 6 percent yearly.



Source: Authors computation from MoF (2021)

Figure 4.3; Trend of government expenditure

In 1997/98 fiscal year in total regional governments spent a total of 4.94 billion ETB, while the federal government expenditure was 6.28 billion ETB in the same fiscal year. In the same fiscal year the total share of regional expenditure to that of the general government's expenditure (sum of regional expenditure and federal government expenditure) was around 44%. Since its introduction, regional government's expenditure is increasing substantially. For the past ten years it has grown on average by 21.6% annually. In 2020/21, the total expenditure by all regions reached 319.1 billion ETB and since 2012/13 fiscal year sum of regional expenditure surpassed the federal government expenditure.



Source: Authors computation from MoF (2021)

Figure 4.4; Trend of expenditure decentralization

Expenditure decentralization ratio, measured as the share regional expenditure to general government expenditure (sum of regional expenditure and federal government expenditure) increased from 0.45 in 2011/12 to 0.53 in 2020/21. For the past ten years expenditure decentralization ratio grew by an average rate of 2 percent annually.

4.1.2 Vertical fiscal imbalance

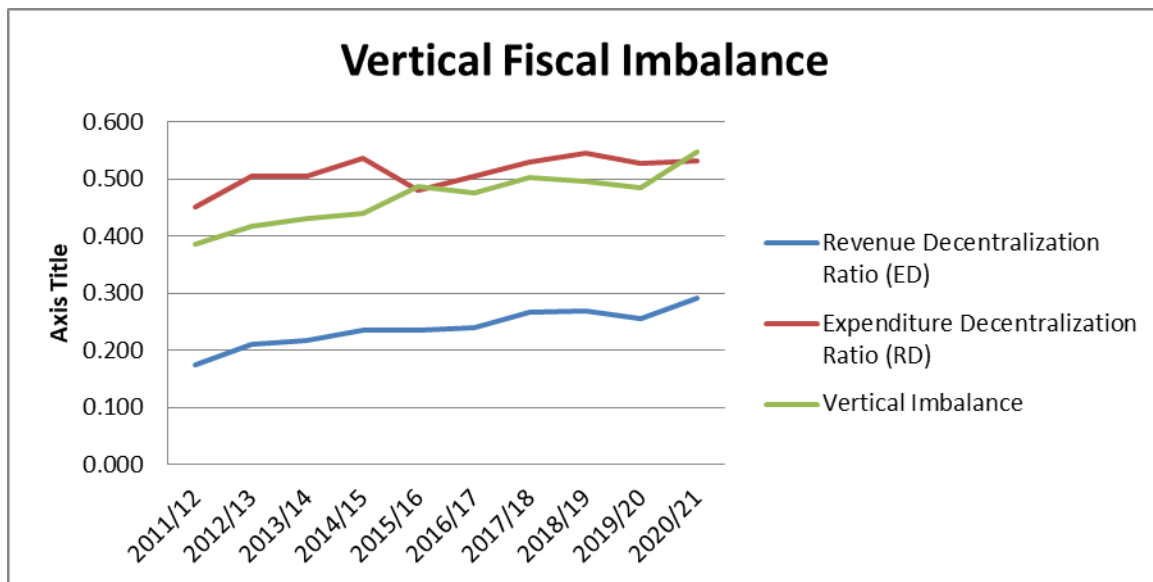
When there is a mismatch between the expenditure duties allocated to each level of government and the fiscal resources available to carry out those tasks, a vertical fiscal imbalance emerges (Boex, 2004). Ebel and Yilmaz (2002) also attempt to define vertical fiscal imbalance as a mismatch between the two tiers of government's expenditure responsibility and revenue-raising capability. Vertical fiscal imbalance can be calculated by taking the ratio of revenue decentralization index and expenditure decentralization index.

Table 4.1; Trend of Vertical fiscal imbalance

	2011/ 12	2012/ 13	2013/ 14	2014/ 15	2015/ 16	2016/ 17	2017/ 18	2018/ 19	2019/ 20	2020/ 21
Vertical Imbalance	0.387	0.416	0.431	0.440	0.488	0.477	0.504	0.495	0.484	0.548
Revenue Decentralization Index	0.174	0.210	0.217	0.236	0.234	0.241	0.266	0.270	0.256	0.292
Expenditure Decentralization Index	0.450	0.505	0.504	0.536	0.480	0.505	0.529	0.545	0.528	0.533

Source: Authors computation from MoF (2021)

As it can be shown in table 4.1 vertical fiscal imbalance increased from 0.387 to 0.548 from 2011/12 to 2020/21. Between 2011/12 and 2020/21, the decentralized expenditure ratio surpassed the income share of subnational governments by 27.2 percent, as assessed by the gap between regions' own revenue and their expenditure requirements. That is to say, their revenue-raising capabilities fell short of their expenditure requirements.



Source: Authors computation from MoF (2021)

Figure 4.5; Trend of vertical fiscal imbalance

In the above figure 4.5 it can be seen that revenue decentralization index is increasing however its level is by far lower than that of expenditure decentralization index, meaning revenue mobilization capacity of regions fall short of covering their expenditures.

4.1.3 Horizontal Fiscal imbalance

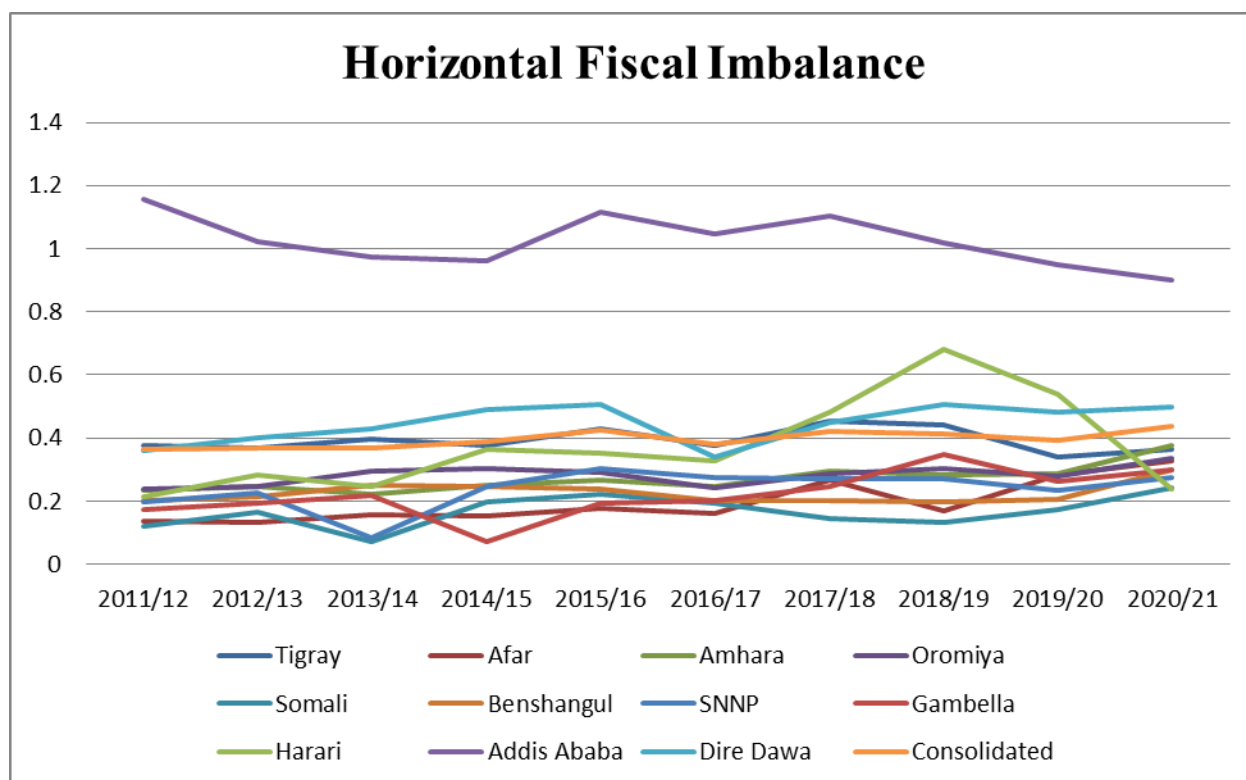
Horizontal fiscal imbalance is an issue in all multi-tiered government systems, because subnational governments at the same level generally never have the same budgetary capability. Horizontal fiscal imbalance occurs when government entities at the same level are required to provide essentially the same services but have different revenue capacities and face different cost dissimilarities in providing these standard services due to an inevitable and "unavoidable" exogenous reason (Brain, 2008). Furthermore, Richer and Tarasov (2002) describe horizontal fiscal imbalance as a discrepancy of resources among various provinces, with some provinces being wealthy and others being impoverished.

Table 4.2 Horizontal fiscal imbalance

Year	2013/ /14	2014/ 15	2015/ 16	2016/ 17	2017/ 18	2018/ 19	2019/ 20	2020/ 21	Average
Tigray	0.40	0.38	0.43	0.38	0.45	0.44	0.34	0.37	0.39
Afar	0.16	0.15	0.18	0.16	0.27	0.17	0.28	0.33	0.20
Amhara	0.22	0.25	0.27	0.25	0.30	0.28	0.29	0.38	0.27
Oromia	0.30	0.30	0.29	0.24	0.29	0.30	0.28	0.34	0.28
Somali	0.07	0.20	0.22	0.19	0.14	0.13	0.18	0.24	0.17
Benshangul	0.25	0.24	0.24	0.20	0.20	0.20	0.21	0.30	0.23
SNNPR	0.08	0.25	0.30	0.28	0.27	0.27	0.23	0.28	0.24
Gambella	0.22	0.07	0.20	0.20	0.25	0.35	0.26	0.30	0.22
Harari	0.24	0.36	0.35	0.33	0.48	0.68	0.54	0.24	0.37
Sidama	-	-	-	-	-	-	-	0.42	0.42
Addis Ababa	0.97	0.96	1.11	1.05	1.10	1.02	0.95	0.90	1.02
Dire Dawa	0.43	0.49	0.50	0.34	0.45	0.51	0.48	0.50	0.45
Total Regional Revenue	0.37	0.39	0.43	0.38	0.42	0.41	0.39	0.44	0.40

Source: Authors computation from MoF (2021)

The magnitude of Ethiopia's horizontal fiscal imbalance is shown in Table 4.2. Across 2013/14 and 2020/21, there was a large disparity between the regions, ranging on average from 17 percent for the Somali region to 102 percent for the Addis Ababa City Administration. Dire Dawa, Sidama, Tigray, Harari, Oromia, and Amhara regions follow Addis Ababa, which cover 45, 42, 39, 37, 28, and 27 percent of their total expenditure and SNNPR, Benishangul-Gumuz, Gambella, and Afar have funded 24, 23, 22, and 20% of their expenses, respectively, from their own revenues.



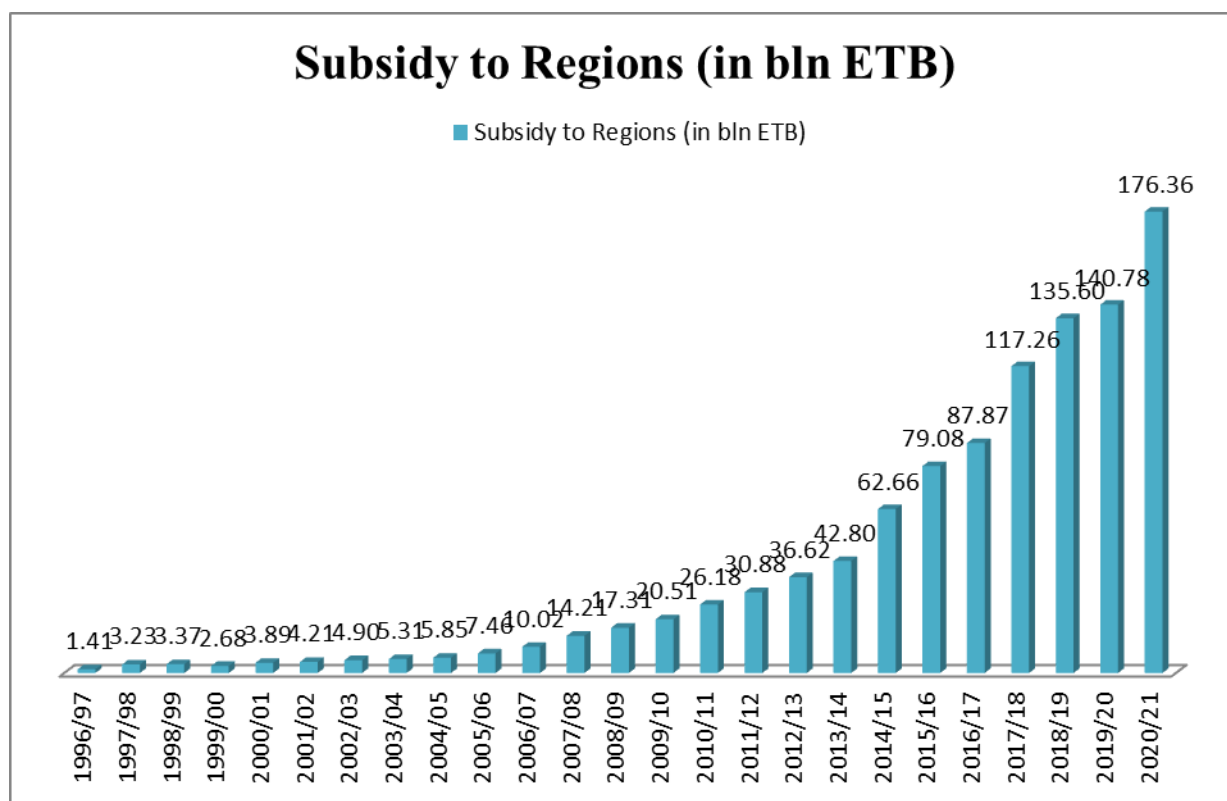
Source: Authors computation from MoF (2021)

Figure 4.6; Trend of horizontal fiscal imbalance

The above figure depicts how Addis Ababa is the only region (City) with high revenue and expenditure flow and capable of covering its expenditure fully from its own sources. The recent decline in the Horizontal fiscal imbalance shows an increasing trend in expenditure compared with its revenue. Excluding Addis Ababa, on average regions are capable of covering only 29.5 percent of their expenditure. The substantial horizontal fiscal imbalance between regions indicates the amount of regional economic activity, Addis Ababa being the concentration of economic activities has the capacity to raise more revenue compared with other regions.

4.1.4 Subsidy to Regions

Subsidy from the Federal government to regional governments increased exponentially from 1.4 billion ETB in 1996/97 to that of 176.4 billion ETB in 2020/21. On average from 1996/97 to 2020/21 subsidy to regions grew by 24 percent annually.



Source: Authors computation from MoF (2021)

Figure 4.7; Trend of subsidy to regions

The subsidy to regions seems to increase exponentially since 2014/15 two of the many reasons for this increment is inflation and revenue mobilization capacity. On the one hand inflation increased the nominal value of regional subsidy while in reality the real value is stagnant. On the other hand, revenue mobilization capacity of the federal government showed improvements in the said period.

From the above mentioned amount Oromia (34.4 %), Amhara (21.6%) and SNNPR (20.1%) regions take the line share of 76.1 % of the entire allocated budget. The remaining regions take only 23.9% of it.

4.2 Descriptive Statistics of Variables

The acquired data is examined and described using the descriptive analysis namely maximum, minimum, mean, and standard deviation. The notion of a variable's mean value conveys information about the central tendency of its values. The concept of standard deviation describes how far spaced away from the mean value a variable's values are.

Table 4.3; descriptive statistics of variables

Variable	Maximum	Minimum	Mean	Standard Deviation
<i>Real GDP per Capita (In Birr)</i>	21862.5	950.3	7430.148	6982.784
<i>Fiscal Decentralization (CR)</i>	0.625137	0.18889	0.343684	0.140821
<i>Labor Force</i>	57203468	21356568	39098361	10311693
<i>Physical Capital /GCF (in Millions ETB)</i>	1216585	13533.38	297597.2	369757.7
<i>Human Capital (Primary NER)</i>	100.3	21.6	71.068	24.44805
<i>Inflation (CPI growth rate)</i>	36.4	-10.6	11.364	10.43527
<i>Openness</i>	51.99685	24.6554	39.00721	7.672349

Source: Authors computation

The above Table 4.3 shows the maximum, minimum, mean and standard deviation of GDP per capita, fiscal decentralization (measured in composite ratio), labour force, physical capital (measured in Gross capital formation), human capital (Measured in net primary school enrollment), Inflation (annual CPI growth rate) and trade openness (export plus import divided by GDP).

4.3 Econometric estimation

4.3.1 Unit Root Test

In the study of time series models and co-integration, testing for the presence of unit roots is of great importance. The existence of a unit root indicates that the time series is non-stationary, whereas the lack of a unit root indicates that the stochastic process is stationary. As a result, unit root test is used to see if the data is stationary. The presence of I(2) variables is no longer acceptable in the ARDL model since it is dependent on the assumption that the variables are I(0) or I(1). As a result, the inclusions of unit root test in the ARDL technique is required to verify that no variables of order two or higher are integrated. To validate the order of integration of the variables, the standard Augmented Dicky-Fuller (ADF) test is used. This test is carried out for two different specifications: with a constant but no trend and with both a constant and a trend.

Table 4.4; Augmented Dicky-Fuller (ADF) unit root testing

ADF Tests Results				
Level				
Variables	Intercept		Trend and intercept	
	t-statistics	Critical value	t-statistics	Critical value
LnGDPPC	-0.541813	-2.635542	-2.963062	-3.243079
LnFD	-0.630319	-2.635542	-2.522395	-3.243079
LnLF	-0.203531	-2.635542	-5.136071	-4.532598
LnPC	-1.815833	-2.650413	-4.058887	-3.673616
LnHC	-4.639439	-3.752946*	-1.896217	-3.243079
LnInf	-3.899272	-3.737853*	-4.412135	-4.394309
LnOpn	-0.289331	-2.635542	-1.119652	-3.243079
Dummy	-1.816591	-2.635542	-1.605121	-3.243079
First Difference				
Variables	Intercept		Trend and intercept	
	t-statistics	Critical value	t-statistics	Critical value
LnGDPPC	-3.236187	-3.004860**	-4.810047	-4.416345
LnFD	-6.600511	-3.752946*	-6.928686	-4.416345
LnLF	-9.868908	-3.857386*	-19.97983	-4.571559
LnPC	-2.816888	-2.660551***	-0.761292	-3.268973
LnHC	-2.509351	-2.638752	-4.422063	-4.416345
LnInf	-7.401431	-3.752946	-5.263673	-4.440739
LnOpn	-3.565621	-2.998064**	-4.113577	-3.673616
Dummy	-4.940218	-3.752946*	-4.810047	-4.416345

Note: *, ** and *** indicate the rejection of a null hypothesis of non-stationary at 1%, 5% and 10% level of significance, respectively.

Source: Model result

ADF critical values are used to reject the null hypothesis (that there is unit root). The ADF unit root test reveals that two variables (LnHC and LnInf) are stationary at level, while the remaining variables are stationary in their first difference; with constant and/or intercept constant and trend. In other words, no variable is stationary in second difference, and this result of the ADF unit root test is one argument for employing Pesaran, Shin, and Smith's (2001) ARDL technique (bounds test approach of co-integration). Therefore, ARDL or bound testing approach to cointegration is the preferred and appropriate method of regression in this case.

4.3.2 Bound Co-integration test

Given the unit-root properties of the variables, we can estimate whether there is a long -run co-integration relationship between dependent and independent variables by using Autoregressive Distributive Lag Approach (ARDL) approach to co-integration. The first phase in the ARDL method to Co-integration is to check for the presence of co-integration or a long-term link between the variables. The F-statistic is used to test for a long-term association. Due to the yearly time series data and short number of observations used in the study, the maximum order of lags in the ARDL model is n=1. Selected Model for ARDL is (1, 1, 1, 1, 1, 0, 1, 1) for LNGDPPC LNFD LNHC LNINF LNLN LNPN LNPC and DUMMY respectively.

Table 4.4 shows the estimated F-statistics for the co-integration test for equation (3.1), which covers all variables. The distribution of the F-test is non-standard. The critical value bounds for the F-test are determined using Pesaran et al. (1997).

Table 4.5; F-statistics for the co-integration tests

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	22.63538	10%	2.03	3.13
k	7	5%	2.32	3.5
		2.5%	2.6	3.84
		1%	2.96	4.26

Source: model result

The calculated F-statistics is 22.6 and this value is higher than the upper bound, i.e. I (1), critical values at 1%, 5% and 10% level of significance. The results indicate that there is strong evidence of long-run relationship or co-integration between log of GDP per capita and the remaining variables i.e. log of Fiscal decentralization, log of physical capital, log of human capital, log of labour force, log of inflation, log of openness and dummy for local level decentralization . Thus, the null hypothesis of no co-integration between log of GDP per capita and its fundamentals is rejected.

4.3.3 Long Run ARDL Model Results

By applying bound test we have confirmed that there is long run relationship between log GDPC per capita and other explanatory variable. After confirming the existence of a long-run relationship among log of GDP per capita, log of Fiscal decentralization, log of human capital, log of physical capital, log of openness, log of inflation, log of labour force and dummy for local fiscal decentralization, the next critical step is estimating the long-run coefficients of log of GDP per capita (lnGDPPC) on its regressors. The results are reported in Table 4.8.

Table 4.6: Estimated long run coefficients for ARDL

Long Run Coefficients			
<i>Variable</i>	<i>Coefficient</i>	<i>Std.Error</i>	<i>t-Statistic</i>
C	67.04*	11.121	6.027777
LNFD	0.31**	0.125	2.440260
LNHC	0.83*	0.139	5.948717
LNINF	-0.02	0.031	-0.601524
LNLF	-4.83*	0.685	-7.041193
LNOPN	-1.05*	0.128	-8.238968
LNPC	0.78*	0.075	10.64529
DUMMY	0.59*	0.109	5.374681

Note: *, ** and *** indicates 1%, 5% and 10% level of significance, respectively.

Source: Model result

The above empirical results of the long run model shows that, among the variables which appear to affect log of GDP per capita, log of Fiscal decentralization, log of human capital, log of

physical capital, log of openness, log of labour force and dummy for local fiscal decentralization are statistically significant factors whereas log of inflation is insignificant factor in the long run.

The Long-run estimation shows statistically significant relationship between GDP per capita (lnGDPPC) and fiscal decentralization (lnFD). The result shows positive relationship between log of GDP per capita (lnGDPPC) and log of fiscal decentralization (lnFD) which indicate 10% increase in the growth of fiscal decentralization results in 3.05 % increase in GDP per capita. The result shows there is positive relationship between fiscal decentralization and economic growth in Ethiopia case. The positive relationship implies that growth and expansion of fiscal decentralization will foster growth in GDP per capita. Hence, this finding also suggested that, fiscal decentralizations is one of the macroeconomic factors influencing economic growth in Ethiopia. This finding is in line with other research's in this topic, namely Akai & Sakata(2002), Iimi (2005), Jin & Zou (2005), Canavire-Bacarreza et al, (2019), Ginting et al (2019) and Hanif et al. (2020). The result confirms the validity of null hypothesis that fiscal decentralization affects economic growth directly and significantly.

A positive and significant relationship between GDP per capita and human capital in the long-run shows that 10% increase in human capital formation will lead to 8.3% increase in GDP per capita. This implies that increment in human capital measured in primary school enrolment will result in growth of GDP per capita. This result is in support of the theoretical assumption that higher human capital leads high economic growth. This study confirms the empirical result by Mulugeta (2017) who investigated the impact of human capital formation on economic growth in Ethiopia covering the period 1981-2014. The study result showed that human capital formation had a significant and positive relationship with the long-run growth of GDP per capita.

Long-run estimation shows negative and significant relationship between GDP per capita and labour force. A 1% increase in labour force leads to 4.8% reduction in GDP per capita. The labour force includes people who are either employed or unemployed. In Ethiopian case, the number of unemployed person is increasing from the labor force thus this is one reason that there is negative relation between economic growth and labor force.

The long-run relationship between economic growth and trade openness is negative and statistical significant which shows that 1% increase in trade openness result in 1.05% decrease in

GDP per capita. This implies that as the country opens up for external trade the overall growth of the economy measured in GDP per capita will shrink. This finding can be explained borrowing the conclusion of Kim (2011), where openness to trade has a detrimental influence on growth in low-financial-development countries, but has no effect in high-financial-development countries. In low-inflation countries, trade openness promotes economic growth, whereas in high-inflation countries, it has little impact. Thus, as Ethiopia is a country with low financial development and high inflation, openness is expected to affect GDP per capita negatively.

Results of the estimation show a significant relationship between economic growth and physical capital. A 1% increase in physical capital will lead to 0.78 % increment on GDP per capita. This implies that more physical capital accumulation measured in Gross Capital Formation (GCF) will increase GDP per capita growth through enhancing investment. This finding is in line with the theoretical assumption that an economy with more physical capital will be able to grow more than one with less. Savings and investment increase the stock of capital; hence more capital investment leads to higher economic growth. Finally, the long run estimation suggests that the introduction of local level fiscal decentralization contributes around 0.59% in GDP per capita growth.

In general, the estimated long run equation can be presented as follows:

$$\begin{aligned} \text{LN (GDPPC)} = & 67.04 - 0.3049*\text{LNFD} + 0.8253*\text{LNHC} - 0.0185*\text{LNINF} - 4.8252*\text{LNLF} - \\ & 1.0524*\text{LNOPN} + 0.7824*\text{LNPC} + 0.5883*\text{DUMMY} \end{aligned}$$

4.3.4 Short Run ARDL Model Estimation Results

Short run relationships between economic growth and its explanatory variables are examined with the Error Correction model (ECM) based on the ARDL approach. It shows how fast the dependent variables converge to the long run equilibrium, and the coefficient of the ECM, which must be negative and statistically significant, demonstrates how quickly the dependent variables adapt to restore equilibrium in the dynamic model. Results of the error correction model based on the ARDL model are presented in table 4.9

Table 4.7; Error Correction Representation for the Selected ARDL Model

ECM Regression result			
<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>
C	67.04*	3.736	17.94206
D(LNFD)	0.12*	0.031	3.782861
D(LNHC)	0.09	0.049	1.806884
D(LNINF)	0.01	0.009	1.420547
D(LNLF)	-4.65*	0.265	-17.50531
D(LNPC)	0.74*	0.041	18.29649
D(DUMMY)	-1.72*	0.097	-17.62988
CointEQ(-1)*	-0.82*	0.046	-17.94228

R-Squared	0.976099
Adjusted R-squared	0.965642
Log likelihood	64.74638
F-statistic	93.34730
Prob(F-statistic)	0.000000

*Note: *, ** and *** indicates 1%, 5% and 10% level of significance, respectively.*

Source: Model result

The short-run ARDL estimate above indicates that fiscal decentralization is positively related with GDP per capita and it is statistically significant. The result shows a 10% increase in fiscal decentralization leads to 1.2 percent increment in GDP per capita in the short-run. This implies that in the short run increase in fiscal decentralization will lead to more GDP per capita. The result is consistent with the long run estimates of positive relationship between economic growth and fiscal decentralization. When compared to earlier research, the findings are consistent with those of Iimi (2005), who examined 51 developed and developing countries from 1997 to 2001 and found a substantial positive effect of decentralization in his short term analysis.

From the table above the coefficient of differences of human capital and inflation are positively related but both are statistically insignificant. While the result shows that negative and significant relationship between GDP per capita and labour force. A 1% increase in labour force leads to 4.6% reduction in GDP per capita.

The short run effect of physical capital on GDP per capita is positive and statistically significant. Meaning that, 10% increase in physical capital will lead to 7.4% increment in GDP per capita. Finally, the short run estimation suggests that the dummy of local level fiscal decentralization contributes around 1.7% in GDP per capita growth.

There is evidence of co-integration since the error correction coefficient CointEQ (-1) has a negative sign and is statistically significant. The value -0.823 suggests a high adjustment to long-run equilibrium following a short-term shock. This implies deviation from the long-run equilibrium is corrected by 82.3% over each year. In other words, for the current year, about 82.3 percent of the disequilibrium from the previous year's shock converges back to the long run equilibrium, confirming the presence of a stable long-run equilibrium connection among the variables.

4.3.5 Diagnostics Test

I) Test of Serial correlation

Serial correlation is frequently caused by a function form specification issue. It is used to determine whether or not a serial residual is serially associated. Our model is the best if the residual is not serially correlated. Table (4.7) shows result of the Breusch-Godfrey serial correlation LM test. The test result clearly reveals that the null hypothesis cannot be rejected with a p-value of 0.4595 (45.95%), which is more than 5%. There is no serial association, according to our null hypothesis. As a result, the model is sound regression model.

Table 4.8; Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey serial Correlation LM Test			
<i>Null hypothesis: No serial correlation at up to 1 lag</i>			
F-statistic	0.603824	Prob.F(1,8)	0.4595
Obs*R-squared	1.684340	Prob. Chi-square(1)	0.1943

Source: Model Result

II) Test for Normality

The normality test is used to determine whether or not our model's residual follows a normal distribution. The P-value for the Jaque- Bera test is 0.513 (51.3percent), which is larger than 5%, indicating that we accept the null hypothesis. The normal distribution of the residuals is the null

hypothesis. This indicates that our model's residual is normally distributed. As a result, the model is an effective regression model.

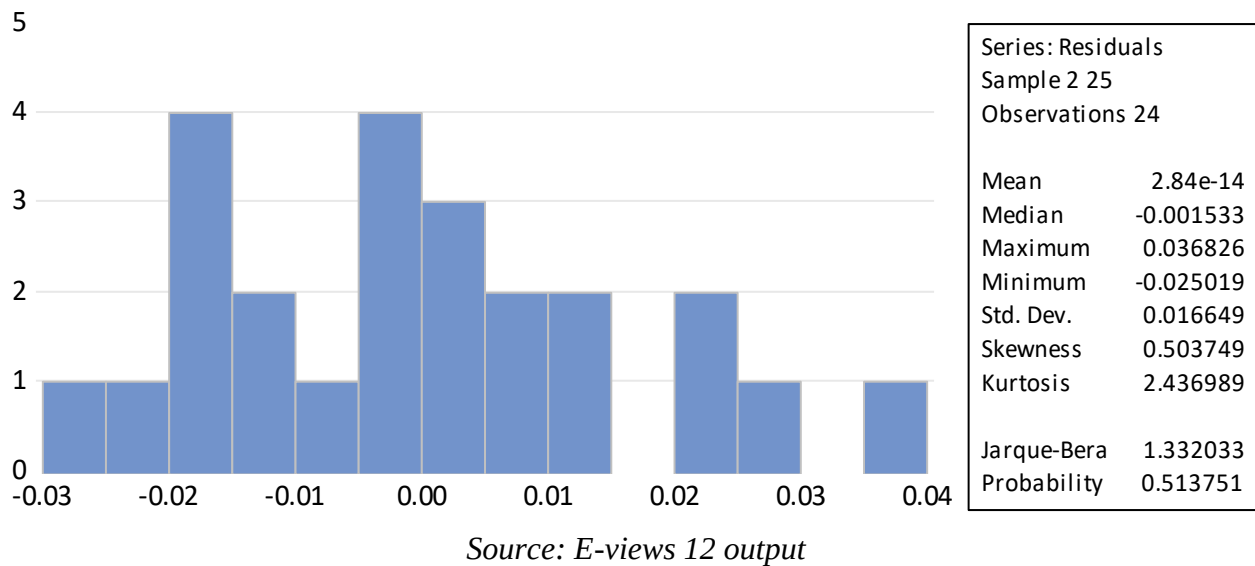


Figure 4.8; Jaque- Bera test- Normality Test

III) Test for Heteroscedasticity

The heteroskedasticity test involves a systematic variation in the distribution of residuals throughout the measure value range. It's used to see if the residuals are heteroskedastic or not, which indicates that for a model to be the best, the residuals must be homoscedastic. The p-values of both the F- and χ^2 versions of the test statistic, as well as the P-value of scaled explained SS more than 5%, are shown in Table 4.8, indicating that the null hypothesis can be accepted. Our null hypothesis is that there is no residual heteroskedasticity. As a result, our model is sound.

Table 4.9; Heteroskedasticity test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
<i>Null hypothesis: No serial correlation at up to 1 lag</i>			
F-statistic	0.494124	Prob.F(14,9)	0.8856
Obs*R-squared	10.43023	Prob. Chi-square(14)	0.7301
Scaled explained SS	1.053852	Prob. Chi-square(14)	1.0000

Source: Model Result

IV) Test of functional form (Ramsey RESET test)

The Ramsey RESET test is a linear regression model general specification test. It tells if the models are well-built or not. If the null hypothesis is rejected, there is an indication of misspecification or, more specifically, non-linearity in the data. The P-value of 0.0697 (7 percent), which is larger than the 5% level of significance, is shown in the below table. We should not reject the null hypothesis in this circumstance. That is, the results showed that the model had no omitted variable bias and that the model was well-specified.

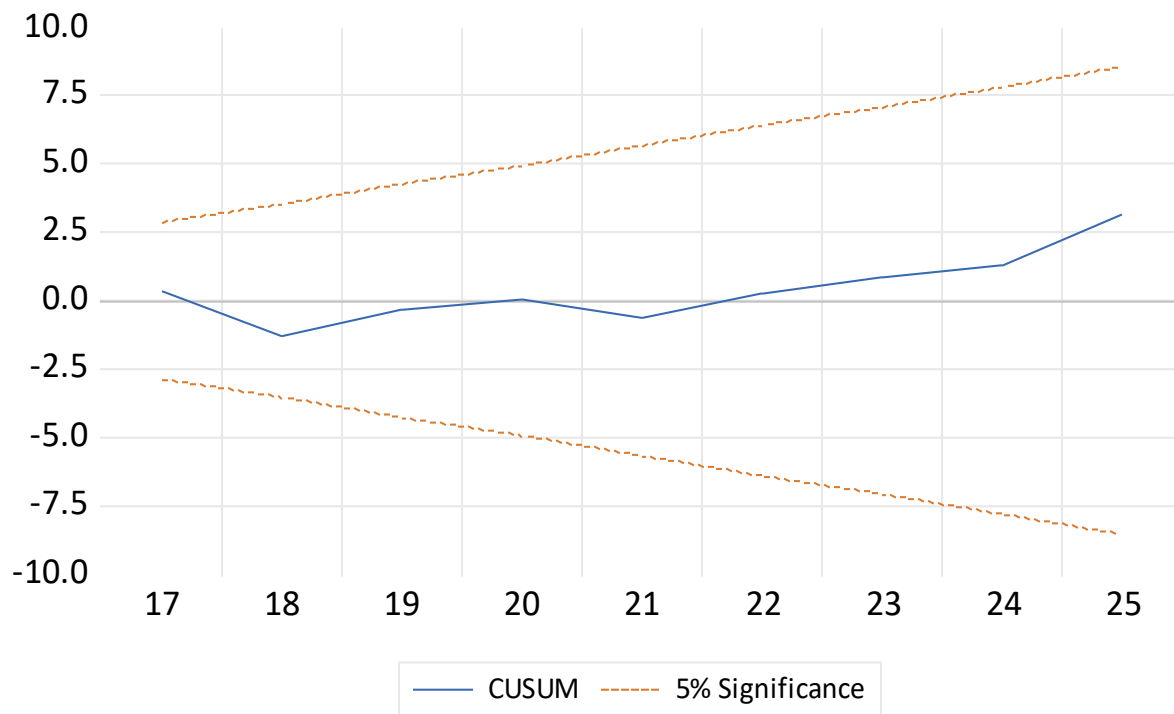
Table 4.10; Test of functional form (Ramsey RESET test)

Ramsey RESET test			
<i>Specification: LNGDPPC LNGDPPC(-1) LNFD LNFD(-1) LNHC LNHC(-1) LNINF LNINF(-1) LNLF LNLF(-1) LNOPN LNPC LNPC(-1) DUMMY DUMMY(-1) C</i>			
	<u>Value</u>	<u>df</u>	<u>Probability</u>
t-statistic	2.092644	8	0.0697
F-statistic	4.379161	-1.8	0.0697
Likelihood	10.47775	1	0.0012
F-test summary:			
	<u>Sum of Sq.</u>	<u>df</u>	<u>Mean squares</u>
Test SSR	0.002255	1	0.002255
Restricted SSR	0.006375	9	0.000708
Unrestricted SSR	0.004120	8	0.000515

Source: Model Result

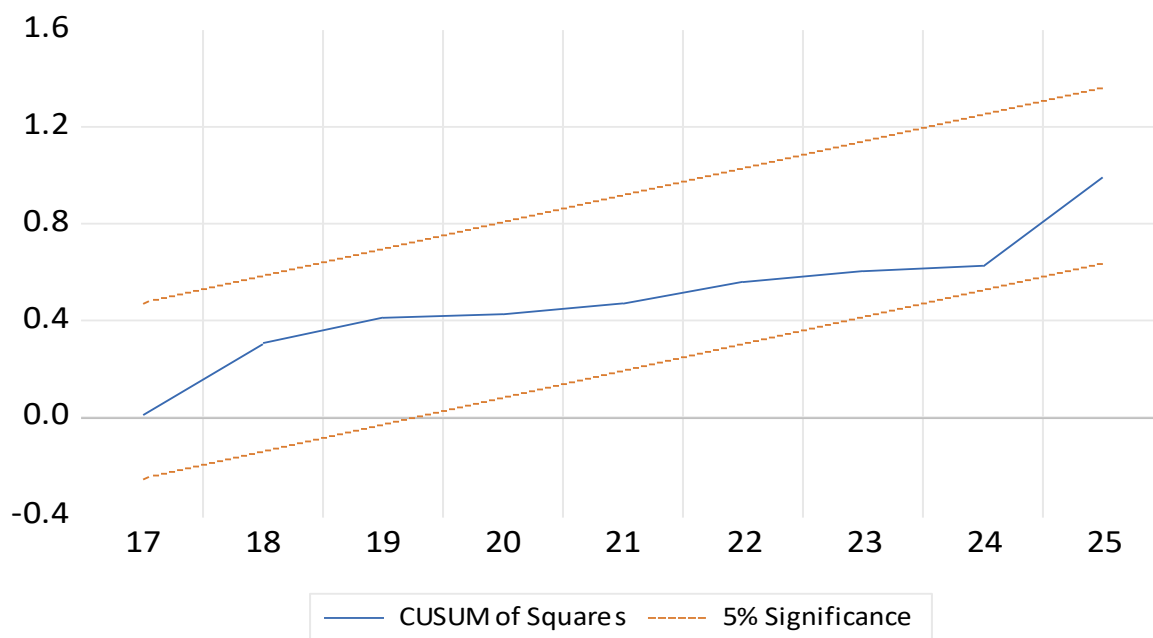
V) Stability Test

In addition to the aforementioned diagnostic test, the sensitivity analysis of the cumulative sum of recursive residuals (CUMSUM) and Cumulative sum of squares recursive residuals (CUMSUMSQ) tests proposed by Pesaron (2001) are used to see if long-run estimates are stable. The graph plots of both the cumulative sum of recursive residuals (CUMSUM) and Cumulative sum of squares recursive residuals (CUMSUMSQ) tests for the stability test, indicating that the model is significant at the 5% critical level of significance. As a result, the model appears to be stable and efficient in estimating short and long term relationships between the dependent variable and the explanatory variables included in the model.



Source: E-views 12 output

Figure 4.9: Plot of Cumulative Sum of Recursive Residuals



Source: E-views 12 output

Figure 4.10: Plot of Cumulative Sum of Squares of Recursive Residuals

CHAPTER FIVE

Conclusions and Recommendations

The results and discussions of the study were provided in the previous chapter, and the study will be concluded in this chapter. This chapter is divided into three sections: the first gives the study's conclusion, followed by recommendations based on the study's findings and finally provides a focus for future research.

5.1 Conclusions

Even though international literatures regarding the relationship between fiscal decentralization and economic growth are abundant, literatures in Ethiopian case are very limited. In this study, the researcher assessed features of fiscal decentralization and investigated the long run relationship and short run dynamics between fiscal decentralization and economic growth. The features of fiscal decentralization were assessed using Revenue Decentralization Index, Expenditure Decentralization Index, Vertical Fiscal Imbalance, Horizontal Fiscal Imbalance and Regional subsidy.

The study used the Auto Regressive Distributed Lagged (ARDL) model to evaluate the presence of short and long run relationships between economic growth, fiscal decentralization, and chosen macroeconomic variables from both theoretical and empirical literature to achieve the intended goal. The model was estimated using annual data of 25 years for the period ranging between 1996/97 to 2020/21. Besides Economic growth and fiscal decentralization, the study variables include labour force, human capital, physical capital, inflation, trade openness and dummy for local/district level decentralization.

The model exhibits all of the characteristics of a good regression model. The model passed all serial correlation, normality, Heteroskedasticity, and Ramsey RESET tests, according to the diagnostic testing findings. The diagnostic test's robust findings show that the ARDL model's output is reliable and efficient. The long-run and short-run estimations, in addition to this diagnostic test, are pretty stable.

The Long-run estimation of the econometric analysis shows statistically significant relationship between GDP per capita ($\ln\text{GDPPC}$) and fiscal decentralization ($\ln\text{FD}$) in Ethiopian case. The

result shows there is positive relationship between fiscal decentralization and economic growth. That is, 10% increase in the growth of fiscal decentralization results in 3.05 % increase in GDP per capita. The result confirms the validity of null hypothesis that fiscal decentralization affects economic growth directly and significantly.

The result provides positive and significant relationship between GDP per capita and, human capital and physical capital. In contrast, it shows negative and significant relationship between GDP per capita and, labour force and trade openness. However, the long-run relationship is insignificant for inflation, thus inflation rate has no significant influence in GDP per capita in the long-run. Finally, the long run estimation suggests that the introduction of local level fiscal decentralization has positive contribution for GDP per capita growth.

On the other hand, the short-run ARDL estimate indicates that fiscal decentralization is positively related with GDP per capita and it is statistically significant. The result is consistent with the long run estimates of positive relationship between economic growth and fiscal decentralization. The coefficients of human capital and inflation are positively related but both are statistically insignificant. While the result shows that negative and significant relationship between GDP per capita and labour force. The short run effect of physical capital on GDP per capita is positive and statistically significant. Finally, the short run estimation suggests that the dummy of local level fiscal decentralization positively contribute to GDP per capita growth. The result also suggests that deviation from the long-run equilibrium is corrected by 82.3% over each year.

5.2 Recommendations

This study has the following recommendations regarding fiscal decentralization in general and its relationship with economic growth in particular: -

- ❖ The major finding of this study reveals that fiscal decentralization has positive impact in Ethiopia's economic growth. Thus the government can use fiscal decentralization as one tool to increase economic growth by devolving fiscal responsibilities to lower levels of government, strengthening local level institutions and enhancing competency of lower level officials.

- ❖ To alleviate the problems of high vertical and horizontal fiscal imbalance, the Ethiopian authorities need to work on expanding the limited revenue autonomy of regional governments and enhance their mobilization capacity, decrease transfer dependency, lift subnational borrowing restrictions with strong institutional capacity for check and balance and moreover creating an enabling environment for decentralization both at regional and local levels.
- ❖ Local and regional governments should focus on finding alternative approaches to increase their revenue other than tax revenues and create business friendly environment to attract more investment. This will help create positive competition among regions and will thus lead to less concentration of business in one area (like that of Addis Ababa).

5.3 Areas for future research

Even though this study investigated the relationship between fiscal decentralization and economic growth in Ethiopian context, as it mentioned in the scope and limitation of the study, this study has limitations and future researches can use it as input., This study is limited to the two tiers of government i.e. Federal and Regional governments, thus future researchers can expand the scope and include local/woreda level decentralization in their study.

To better understand the role of fiscal decentralization, precise decentralization indicators must be developed that represent the political and institutional processes that assign authority to levy taxes and spend public funds. Thus future studies should consider fiscal decentralization measure comprehensive of the abovementioned features.

Although the findings of this research shows that fiscal decentralization contributes to economic growth, it doesn't show how the mechanism fiscal decentralization contributes to economic growth. To elucidate the mechanisms involved, more study based on theoretical models is necessary.

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Appendixes

Year	Horizontal Imbalance	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Average
Tigray	Revenue	2748.23	3252.04	4094.33	4673.38	5870.05	6944.40	5746.96	2969.09	4030.34
	Expenditure	6949.78	8617.49	9581.94	12429.55	12978.78	15787.53	16834.90	8105.60	10204.06
	Ratio	0.40	0.38	0.43	0.38	0.45	0.44	0.34	0.37	0.39
Afar	Revenue	313.70	449.58	562.24	658.78	897.54	653.39	1307.55	1873.44	729.83
	Expenditure	1990.02	2945.44	3136.44	4077.93	3382.53	3905.72	4628.31	5689.03	3406.59
	Ratio	0.16	0.15	0.18	0.16	0.27	0.17	0.28	0.33	0.20
Amhara	Revenue	3865.09	5700.30	6836.35	8172.07	9741.67	11628.07	13737.16	22730.44	8865.52
	Expenditure	17342.43	22703.05	25595.10	33056.80	32805.46	40881.20	48029.89	60474.51	30673.34
	Ratio	0.22	0.25	0.27	0.25	0.30	0.28	0.29	0.38	0.27
Oromia	Revenue	7429.02	9920.75	11275.06	11371.82	14158.51	19248.18	20425.23	33071.90	13621.27
	Expenditure	25179.49	32623.35	38736.49	47038.04	49542.09	63557.91	73230.73	98243.08	46645.47
	Ratio	0.30	0.30	0.29	0.24	0.29	0.30	0.28	0.34	0.28
Somali	Revenue	335.73	1524.36	1901.82	2143.09	1858.19	2245.93	2949.28	5536.73	1974.50
	Expenditure	4624.68	7705.67	8549.08	11124.63	12859.45	16929.47	16821.02	22930.08	10993.69
	Ratio	0.07	0.20	0.22	0.19	0.14	0.13	0.18	0.24	0.17
Benshangul	Revenue	360.34	509.03	529.19	590.73	672.13	656.13	747.67	1287.68	582.36
	Expenditure	1437.35	2078.54	2213.96	2946.74	3313.18	3303.98	3607.49	4299.17	2544.80
	Ratio	0.25	0.24	0.24	0.20	0.20	0.20	0.21	0.30	0.23
SNNPR	Revenue	1284.00	4852.05	6335.58	7551.44	8460.23	10111.86	9819.49	10958.70	6423.95
	Expenditure	15240.47	19706.16	20909.45	27326.89	31127.22	37240.84	42240.00	39771.42	25627.45
	Ratio	0.08	0.25	0.30	0.28	0.27	0.27	0.23	0.28	0.24
Gambella	Revenue	217.43	88.34	349.21	361.45	443.19	603.81	594.47	956.77	389.39
	Expenditure	992.11	1206.88	1785.87	1787.63	1793.47	1727.66	2277.12	3180.37	1627.83
	Ratio	0.22	0.07	0.20	0.20	0.25	0.35	0.26	0.30	0.22
Harari	Revenue	193.00	343.96	348.84	489.64	585.31	710.81	719.81	812.46	446.82
	Expenditure	789.24	942.39	991.61	1490.50	1215.79	1046.23	1340.64	3396.95	1224.59
	Ratio	0.24	0.36	0.35	0.33	0.48	0.68	0.54	0.24	0.37
Addis Ababa	Revenue	17173.23	19712.54	24306.45	28281.98	33072.58	39054.31	43662.18	53944.33	28159.94
	Expenditure	17656.43	20495.30	21802.45	26991.02	30014.47	38322.42	46021.07	60011.97	28213.27

	<i>Ratio</i>	<i>0.97</i>	<i>0.96</i>	<i>1.11</i>	<i>1.05</i>	<i>1.10</i>	<i>1.02</i>	<i>0.95</i>	<i>0.90</i>	<i>1.02</i>
Dire Dawa	<i>Revenue</i>	432.75	686.78	838.15	798.54	912.85	1136.09	1267.53	1553.60	817.72
	<i>Expenditure</i>	1011.79	1405.61	1660.79	2341.56	2035.82	2241.92	2632.52	3122.68	1789.12
	<i>Ratio</i>	<i>0.43</i>	<i>0.49</i>	<i>0.50</i>	<i>0.34</i>	<i>0.45</i>	<i>0.51</i>	<i>0.48</i>	<i>0.50</i>	<i>0.45</i>
Total Regional Revenue	<i>Revenue</i>	34353.2	47039.7	57377.2	65092.9	76576.9	92992.9	100977.	139884.	66451.1
	<i>Expenditure</i>	93213.7	120429.	134963.	170611.	181068.	224944.	257663.	319114.	163879.
	<i>Ratio</i>	<i>0.37</i>	<i>0.39</i>	<i>0.43</i>	<i>0.38</i>	<i>0.42</i>	<i>0.41</i>	<i>0.39</i>	<i>0.44</i>	<i>0.40</i>

Dependent Variable: LNGDPPC

Method: ARDL

Date: 06/02/22 Time: 14:17

Sample (adjusted): 2 25

Included observations: 24 after adjustments

Maximum dependent lags: 1 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (1 lag, automatic): LNFD LNHC LNINF LNLF LNOPN

LNPC DUMMY

Fixed regressors: C

Number of models evaluated: 128

Selected Model: ARDL(1, 1, 1, 1, 1, 0, 1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNGDPPC(-1)	0.177156	0.086308	2.052595	0.0703
LNFD	0.118268	0.064447	1.835128	0.0997
LNFD(-1)	0.132588	0.067627	1.960581	0.0816
LNHC	0.090146	0.130570	0.690408	0.5074
LNHC(-1)	0.588928	0.162173	3.631474	0.0055
LNINF	0.008434	0.013462	0.626458	0.5466
LNINF(-1)	-0.023665	0.022893	-1.033756	0.3282
LNLF	-4.645445	0.714713	-6.499733	0.0001
LNLF(-1)	0.675060	0.111476	6.055651	0.0002
LNOPN	-0.865972	0.135707	-6.381203	0.0001
LNPC	0.743330	0.090518	8.211945	0.0000
LNPC(-1)	-0.099559	0.093626	-1.063367	0.3153
DUMMY	-1.717232	0.263839	-6.508632	0.0001
DUMMY(-1)	2.201319	0.342052	6.435634	0.0001
C	67.03572	11.12113	6.027778	0.0002
R-squared	0.999567	Mean dependent var	5.872579	
Adjusted R-squared	0.998893	S.D. dependent var	0.799944	
S.E. of regression	0.026615	Akaike info criterion	-4.145532	
Sum squared resid	0.006375	Schwarz criterion	-3.409248	
Log likelihood	64.74638	Hannan-Quinn criter.	-3.950195	
F-statistic	1483.496	Durbin-Watson stat	2.207159	
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent tests do not account for model selection.

Breusch-Godfrey Serial Correlation LM Test:
Null Hypothesis: No serial correlation at up to 1 lag

F-statistic	0.603824	Prob. F(1,8)	0.4595
Obs*R-squared	1.684340	Prob. Chi-Square(1)	0.1943

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/02/22 Time: 14:18
Sample: 2 25
Included observations: 24
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDPPC(-1)	-0.023286	0.093221	-0.249796	0.8090
LNFD	0.000269	0.065915	0.004079	0.9968
LNFD(-1)	0.015463	0.071972	0.214847	0.8353
LNHC	-0.019256	0.135822	-0.141771	0.8908
LNHC(-1)	0.071508	0.189683	0.376988	0.7160
LNINF	-0.002822	0.014240	-0.198184	0.8478
LNINF(-1)	-0.001043	0.023452	-0.044490	0.9656
LNLF	-0.497740	0.971921	-0.512120	0.6224
LNLF(-1)	0.019596	0.116769	0.167819	0.8709
LNOPN	-0.080132	0.172912	-0.463427	0.6554
LNPC	0.048165	0.111413	0.432310	0.6769
LNPC(-1)	0.005583	0.096027	0.058138	0.9551
DUMMY	-0.166047	0.344206	-0.482405	0.6424
DUMMY(-1)	0.210306	0.442306	0.475476	0.6472
C	7.937643	15.28790	0.519211	0.6177
RESID(-1)	-0.426779	0.549222	-0.777061	0.4595
R-squared	0.070181	Mean dependent var	2.84E-14	
Adjusted R-squared	-1.673230	S.D. dependent var	0.016649	
S.E. of regression	0.027221	Akaike info criterion	-4.134963	
Sum squared resid	0.005928	Schwarz criterion	-3.349594	
Log likelihood	65.61956	Hannan-Quinn criter.	-3.926605	
F-statistic	0.040255	Durbin-Watson stat	2.157854	
Prob(F-statistic)	1.000000			

Ramsey RESET Test

Equation: UNTITLED

Omitted Variables: Squares of fitted values

Specification: LNGDPPC LNGDPPC(-1) LNFD LNFD(-1) LNHC LNHC(-1)

LNINF LNINF(-1) LNLF LNLF(-1) LNOPN LNPC LNPC(-1) DUMMY

DUMMY(-1) C

	Value	df	Probability
t-statistic	2.092644	8	0.0697
F-statistic	4.379161	(1, 8)	0.0697
Likelihood ratio	10.47775	1	0.0012

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.002255	1	0.002255
Restricted SSR	0.006375	9	0.000708
Unrestricted SSR	0.004120	8	0.000515

LR test summary:

	Value
Restricted LogL	64.74638
Unrestricted LogL	69.98525

Unrestricted Test Equation:

Dependent Variable: LNGDPPC

Method: Least Squares

Date: 06/02/22 Time: 14:19

Sample: 2 25

Included observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDPPC(-1)	0.410054	0.133424	3.073311	0.0153
LNFD	0.360379	0.128083	2.813638	0.0227
LNFD(-1)	0.417263	0.147752	2.824070	0.0224
LNHC	0.234880	0.131066	1.792076	0.1109
LNHC(-1)	1.643487	0.522564	3.145047	0.0137
LNINF	0.009732	0.011496	0.846564	0.4218
LNINF(-1)	-0.076912	0.032069	-2.398298	0.0433
LNLF	-12.99626	4.036818	-3.219431	0.0122
LNLF(-1)	1.833440	0.561650	3.264381	0.0115
LNOPN	-2.765330	0.914982	-3.022279	0.0165
LNPC	2.184390	0.692943	3.152338	0.0136
LNPC(-1)	-0.278001	0.116808	-2.379975	0.0445
DUMMY	-4.796832	1.488727	-3.222104	0.0122
DUMMY(-1)	6.184513	1.925641	3.211665	0.0124
C	184.5838	56.96682	3.240199	0.0119
FITTED^2	-0.167992	0.080277	-2.092644	0.0697

R-squared	0.999720	Mean dependent var	5.872579
Adjusted R-squared	0.999195	S.D. dependent var	0.799944
S.E. of regression	0.022693	Akaike info criterion	-4.498771
Sum squared resid	0.004120	Schwarz criterion	-3.713402
Log likelihood	69.98525	Hannan-Quinn criter.	-4.290412
F-statistic	1904.752	Durbin-Watson stat	2.614469
Prob(F-statistic)	0.000000		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

Null Hypothesis: Homoskedasticity

F-statistic	0.494124	Prob. F(14,9)	0.8856
Obs*R-squared	10.43023	Prob. Chi-Square(14)	0.7301
Scaled explained SS	1.053852	Prob. Chi-Square(14)	1.0000

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/02/22 Time: 14:19

Sample: 2 25

Included observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.125678	0.163378	0.769245	0.4615
LNGDPPC(-1)	-5.01E-05	0.001268	-0.039492	0.9694
LNFD	0.000197	0.000947	0.208114	0.8398
LNFD(-1)	0.001088	0.000993	1.095528	0.3017
LNHC	-0.001312	0.001918	-0.683880	0.5113
LNHC(-1)	0.002459	0.002382	1.032102	0.3290
LNINF	-0.000121	0.000198	-0.609452	0.5573
LNINF(-1)	4.52E-05	0.000336	0.134434	0.8960
LNLF	-0.008532	0.010500	-0.812599	0.4374
LNLF(-1)	0.001301	0.001638	0.794600	0.4473
LNOPN	-0.001730	0.001994	-0.867971	0.4080
LNPC	0.001888	0.001330	1.420037	0.1893
LNPC(-1)	-0.001564	0.001375	-1.136824	0.2850
DUMMY	-0.002667	0.003876	-0.688075	0.5087
DUMMY(-1)	0.003399	0.005025	0.676361	0.5158

R-squared	0.434593	Mean dependent var	0.000266
Adjusted R-squared	-0.444930	S.D. dependent var	0.000325
S.E. of regression	0.000391	Akaike info criterion	-12.58660
Sum squared resid	1.38E-06	Schwarz criterion	-11.85032
Log likelihood	166.0392	Hannan-Quinn criter.	-12.39126
F-statistic	0.494124	Durbin-Watson stat	2.433014
Prob(F-statistic)	0.885567		

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNGDPPC)
Selected Model: ARDL(1, 1, 1, 1, 1, 0, 1, 1)
Case 3: Unrestricted Constant and No Trend
Date: 06/02/22 Time: 14:20
Sample: 1 25
Included observations: 24

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	67.03572	11.12113	6.027778	0.0002
LNGDPPC(-1)*	-0.822844	0.086308	-9.533793	0.0000
LNFD(-1)	0.250856	0.094399	2.657404	0.0262
LNHC(-1)	0.679074	0.099811	6.803604	0.0001
LNINF(-1)	-0.015232	0.025320	-0.601566	0.5623
LNLF(-1)	-3.970386	0.669588	-5.929596	0.0002
LNOPN**	-0.865972	0.135707	-6.381203	0.0001
LNPC(-1)	0.643771	0.100591	6.399858	0.0001
DUMMY(-1)	0.484087	0.107116	4.519263	0.0014
D(LNFD)	0.118268	0.064447	1.835128	0.0997
D(LNHC)	0.090146	0.130570	0.690408	0.5074
D(LNINF)	0.008434	0.013462	0.626458	0.5466
D(LNLF)	-4.645445	0.714713	-6.499733	0.0001
D(LNPC)	0.743330	0.090518	8.211945	0.0000
D(DUMMY)	-1.717232	0.263839	-6.508632	0.0001

* p-value incompatible with t-Bounds distribution.

** Variable interpreted as $Z = Z(-1) + D(Z)$.

Levels Equation Case 3: Unrestricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFD	0.304865	0.124931	2.440260	0.0373
LNHC	0.825276	0.138732	5.948717	0.0002
LNINF	-0.018511	0.030774	-0.601524	0.5623
LNLF	-4.825197	0.685281	-7.041193	0.0001
LNOPN	-1.052413	0.127736	-8.238968	0.0000
LNPC	0.782373	0.073495	10.64529	0.0000
DUMMY	0.588310	0.109459	5.374681	0.0004

EC = LNGDPPC - (0.3049*LNFD + 0.8253*LNHC -0.0185*LNINF -4.8252
*LNLF -1.0524*LNOPN + 0.7824*LNPC + 0.5883*DUMMY)

F-Bounds Test Null Hypothesis: No levels relationship				
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	22.63538	10%	2.03	3.13
k	7	5%	2.32	3.5
		2.5%	2.6	3.84
		1%	2.96	4.26
Actual Sample Size 24 Finite Sample: n=35				
		10%	2.3	3.606
		5%	2.753	4.209
		1%	3.841	5.686
Finite Sample: n=30				
		10%	2.384	3.728
		5%	2.875	4.445
		1%	4.104	6.151

t-Bounds Test Null Hypothesis: No levels relationship				
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-9.533793	10%	-2.57	-4.23
		5%	-2.86	-4.57
		2.5%	-3.13	-4.85
		1%	-3.43	-5.19

ARDL Error Correction Regression
Dependent Variable: D(LNGDPPC)
Selected Model: ARDL(1, 1, 1, 1, 1, 0, 1, 1)
Case 3: Unrestricted Constant and No Trend
Date: 06/02/22 Time: 14:20
Sample: 1 25
Included observations: 24

ECM Regression Case 3: Unrestricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	67.03572	3.736233	17.94206	0.0000
D(LNFD)	0.118268	0.031264	3.782861	0.0043
D(LNHC)	0.090146	0.049891	1.806884	0.1042
D(LNINF)	0.008434	0.005937	1.420547	0.1892
D(LNLFF)	-4.645445	0.265373	-17.50531	0.0000
D(LNPC)	0.743330	0.040627	18.29649	0.0000
D(DUMMY)	-1.717232	0.097405	-17.62988	0.0000
CointEq(-1)*	-0.822844	0.045861	-17.94228	0.0000
R-squared	0.976099	Mean dependent var		0.083661
Adjusted R-squared	0.965642	S.D. dependent var		0.107689
S.E. of regression	0.019961	Akaike info criterion		-4.728865
Sum squared resid	0.006375	Schwarz criterion		-4.336180
Log likelihood	64.74638	Hannan-Quinn criter.		-4.624686
F-statistic	93.34730	Durbin-Watson stat		2.207159
Prob(F-statistic)	0.000000			

* p-value incompatible with t-Bounds distribution.

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	22.63538	10%	2.03	3.13
k	7	5%	2.32	3.5
		2.5%	2.6	3.84
		1%	2.96	4.26

t-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-17.94228	10%	-2.57	-4.23
		5%	-2.86	-4.57
		2.5%	-3.13	-4.85
		1%	-3.43	-5.19

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.