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Impact of Government Education Expenditure on Economic Growth in Ethiopia: ARDL Approach to Co-integration

Emebet Ferede*; Deresse Mersha**; Kassa Teshager***

**Corresponding Author: PhD candidate at Ethiopian Civil Service University; College of Finance Management and Development; Department of Public Financial Management and Accounting. E-mail: Emuuo97@yahoo.com*

***Associate Professor; Ethiopian Civil Service University, College of Finance Management and Development: Department of Public Financial Management and Accounting. E-mail: deresmersha@gmail.com*

****Associate Professor of Development studies; Ethiopian Civil Service University; College of Finance Management and Development, Department of Development Economics and Management. E-mail: ktshager@yahoo.com*

Abstract

A wide range of theoretical and empirical research has recognized the importance of investment on human capital as an engine for economic growth and development. No country has achieved long-term economic expansion without making large investments in human capital. As a result, over the past decades education has been given high priority in Ethiopia's development strategy. However, despite the high priority given to the education sector and the increase in government education expenditure as a result, the country is experiencing low literacy rate which accounts 52% in 2021 indicating a very low performance as compared to developed countries and even Sub Saharan African countries average literacy rate which accounts 67.27% in 2021. Hence a study on how this government education expenditure is contributing to the economic performance of the country is important. The main objective of this study is to investigate the impact of government education expenditure on economic growth in Ethiopia. The study used explanatory research design and quantitative research approach. Secondary data from Ethiopian Ministry of Education, Ethiopian Ministry of Finance, World Development Indicators, and National Bank of Ethiopia covering the years from 1988 to 2022 G.C were used as data source. To study this relationship between dependent and independent variables Autoregressive Distributed Lag (ARDL) bounds test approach to co- integration was used. The findings of the study revealed a positive and statistically significant relationship between government education expenditure and economic growth in Ethiopia under the study period both in the long run and short run. Moreover, the control variables used in this study; export, official exchange rate and labor force participation rate were found to be statistically significant. However, the results related to gross fixed capital formation rate was found statistically insignificant for the selected lag length. This may be due to the sensitivity of tine series data to sample size and lag lengths or other reasons which requires further study. To check the robustness of the long run ARDL model, the Fully Modified Least Squares (FMOLS) and Canonical Co-integrating Regression (CCR) tests were made and the results of the two methods were consistent with the long run ARDL model for the variables government education expenditure, labor force participation rate, export and exchange rate in their log form. Based on the findings of this study, the researcher recommends that the government of Ethiopia should continue increasing the education expenditure in order to address the country's increasing population growth but should also ensure that education expenditure is efficiently utilized to enhance the existing low literacy rate and the level of its contribution to the economic performance of the country through proper monitoring and evaluation.

Key words: *Economic growth, Government education expenditure, ARDL, Co-integration.*

1. Introduction

The fact that the market mechanism alone cannot perform all economic functions calls for government intervention in an economy. Therefore, the classical economists' theory of state non-intervention and the self-correcting mechanism of an economic system appear to have failed since government expenditure continued to increase significantly in absolute terms and as a share of GDP both in established and developing economies (Metteo,2013). So, governments intervene in the economy by supplying and funding a wide range of crucial public services and initiatives, regulating the private sector, and redistribute income and wealth in order to maintain the health of the market system and promote economic progress. Spending in social welfare activities such as education and health are among the major compositions of government expenditure for both developed and developing countries. There is a growing consensus among economists and policymakers that state intervention through social welfare policies can assure continuous economic growth, even though the amount of spending varies between the two (Khan & Bashar, 2015). Increase in government expenditure on socioeconomic activities such as education, health and infrastructure stimulate economic growth by providing positive externalities (Altaf, 2013).

In order to address the goal of ensuring continuous economic growth, which is a crucial element for sustainable development by reducing wide spread poverty, governments of developing countries must gather resources from the economy in a sufficient and suitable manner; allocate and employ these resources in a responsive, efficient, and effective way. As a result, it is acknowledged that overall government expenditure has increased globally during the past several years in terms of both spending per person and as a proportion of national GDP (Metteo, 2013). Ethiopia is not an exception to this. According to the Ministry of Finance's official statistics, in order to keep up with the rising demand brought on by the country's political unrest, own-financed megaprojects, and population growth, total annual government spending increased from 20.52 billion ETB in 2003/4 to 756 billion ETB in 2021/22. Among the major compositions of this Ethiopian government expenditure, education expenditure took the lion's share.

A wide range of theoretical and empirical research has recognized the importance of investment on human capital as an engine of economic growth and development. No country has achieved long-term economic expansion without making large investments in human capital (Ozturk, 2001). The formal education system is one of the ways that countries make investment on human capital. The achievement of literacy, a sustainable rate of economic growth, and an equitable distribution of income can be hastened through investment in education. According to Ziberi (2022) investment on education is an important factor for sustainable economic growth. Improving the knowledge of a given nation through education can lead more productivity, improves entrepreneurship ability, brings technological advancement and more efficient fiscal resources allocation and better economic performance as a result. Hence, governments invest on education.

Based on the above fact, the education sector in Ethiopia has been given high priority than other sectors during the past years. The Ethiopian government is regularly investing a significant proportion of public resources in the sector. This high level of budget allocated to the education

sector is one indicator of government's strong commitment to education. The total budget allocated to education has increased from ETB 86.2 billion in 2016/17 to ETB 137.2 billion in 2020/21(UNICEF, 2021). In 2020/21 education accounts a 24 per cent share of the total national budget. This 24% share of education budget is greater than the internationally agreed targets set out by the Education for All (EFA) coalition, which recommends the education budget to be 20 per cent of the total national budget (UNICEF, 2021). Moreover, according to latest data from the World Bank, for which data is available Ethiopian government spending on education as a percentage of GDP was 5.07% which is higher than Sub-Saharan Africa (3.8% of GDP) in the same year (WB, 2022). Currently, there is also a strong commitment by the government of Ethiopia to invest in the education sector as human capital development program in order to achieve the sustainable development goal towards education (SDG 4) which calls for focus on quality, inclusion and equity in education and lifelong learning opportunities for all (MoE, 2021). Following this the government of Ethiopia is formulating a 10 year prosperity development plan for the period 2019/20 to 2029/30 G.C which is fully aligned to the 2030 agenda and SDGs. The SDGs recognized that ending poverty must go hand-in-hand with strategies that build economic growth and address a range of social needs including education.

However, despite the high priority given to the education sector and the increase in government education expenditure as a result, the country is experiencing low literacy rate which is 52% in 2021 indicating a very low performance as compared to developed countries and even Sub Saharan African Countries average literacy rate which shows 67.27% in 2021 (WBI, 2021). This indicates that a high proportion of the country's population which is 48% is still illiterate demanding the government to make more investment on education and understand how this investment on education is contributing to the economic performance of the country. This understanding will help the government to design specific policies and strategic measures that enhance the accumulation of skilled human capital and improve the literacy rate of the country that brings a sustainable rate of economic growth. Hence this study tried to investigate the impact of the government education expenditure on economic growth of Ethiopia between the periods 1988 and 2022 G.C using a robust ARDL econometric model. Specifically, the study aims to examine the long run impact of government education expenditure on economic growth and investigate the short run effect of government education expenditure on economic growth.

2. Review of Related Literature

2.1.Theoretical Literature Review

The role of investment on education in increasing stock human capital and enhancing economic growth has been widely acknowledged in theoretical literature by scholars such as Schultz (1960) and Becker (1964). Similarly endogenous growth model promoters such as Lucas, (1988), Romer (1990), Barro (1991) and Mankiw, Romer & Weil (1992) proved that investment on education is essential for enhancing economic performance and concluded that expenditures made for education as an investment on human capital has a positive impact on the economy. This theory is built on the idea that improvements in innovation, knowledge, and human capital lead to increased productivity, positively affecting economic growth. According to these theories education

expenditure is an investment on human capital which may alter the attitude to work, consumption preferences, saving propensities, economic rationality, adaptability, innovativeness, flexibility, attitude towards family size, and various social attitudes relevant from the economic point of view towards more productive sectors of the economy resulting in rise in GDP and per capita income. Increasing investment on human capital through education also imparts the knowledge to develop abundant complementary resources that may be substitutes for comparatively scarce and thus promotes efficient use of existing resources and improves productivity which contributes to economic growth. Moreover investment on education increases skilled labor force participation rate to the economy which is expected to have positive contribution to economic growth. According to these theories, countries having greater investment on human capital through education, research and development will enjoy faster rate of economic growth.

2.2 Empirical Literature Review

Empirically a number of studies were conducted to study the relationship between government education expenditure and economic growth. The following are some of the empirical evidences that show the relationship between government education expenditure and economic growth.

Using data covering the period 1970-2012 of Turkey, Mercana & Sezerb (2014) conducted a study on the association between education expenditure and economic growth. The results of the study showed a positive relationship between education expenditure and economic growth in the Turkish economy for the period under study.

Chika & Ogugua (2014) conducted a study to examine the relationship between education expenditure and economic growth of Nigeria using time series data from 1981 to 2012. The study employed Johansen's co-integration and ordinary least square (OLS) econometric techniques to analyze this relationship. The results of study confirmed the existence of a positive relationship between education expenditure and economic growth in the short run. However, a long run relationship was not observed between the dependent and independent variables under the study period.

Dinkneh & Jiang (2015) conducted a study to analyze the nexus between human capital proxied by education and health expenditure and economic growth of Ethiopia using secondary data covering the period from 1980 to 2013. The results of the study indicate the existence of a positive and statistically significant long run and short run relationship between public expenditure on education and economic growth of Ethiopia under the study period.

Similarly using 37 years annual data from 1974/75-2010/11, Kidanemariam (2015) conducted a study to examine the impact of human capital on economic growth in Ethiopia. The researcher employed Auto Regressive Distributive Lag (ARDL) approach to Co-integration to analyze this relationship. The results of the co-integration test confirmed the existence of a stable long run relationship between the real GDP per capita and education human capital for Ethiopian economy under the study period.

Using balanced panel data from 1973 to 2012, Lingaraj et al. (2016) examined the patterns of spending on education and economic growth in 14 major Asian nations. According to the Pedronico-integration test results, all countries have long-run equilibrium relationship between economic growth and education spending.

Based on data of West African countries covering the period 1990 to 2016, Lloyd (2016) investigated the impact of government education expenditure on economic growth of 15 selected countries of West African. The results of the study revealed that in the long run there exists a positive and significant relationship between government education expenditure and economic growth.

Using a secondary time series data from 1987 to 2016, Ayeni & Omobud (2018) examined the relationship between educational expenditure and economic growth in Nigeria. Education expenditure was disaggregated into two as recurrent and capital expenditure. The study employed Autoregressive Distributed Lag (ARDL) bound test approach co-integration. The results of the study revealed the existence of a positive and significant long-run co-integration between recurrent education expenditure and economic growth while the impact of capital education expenditure on economic growth was found insignificant for Nigerian economy under the study period.

Kouton (2018), using time series data from the period 1970 to 2015 investigated the nexus between education expenditure and economic growth of Côte d'Ivoire. The researcher applied Auto Regressive Distributive Lag (ARDL) bounds test approach co-integration to test the co-integration between the dependent and independent variables and a causality test of Toda and Yamamoto (1995) for the directional casualty between the variables. The results of the co-integration test revealed that, in the long run there exists a significant but negative relationship between government education expenditure and economic growth while no significant relationship was observed for the variables under the study period in the short run.

Based on secondary sources of annual data from for the period 2009 to 2015, Kumar (2019) conducted a study to analyze the impact of education expenditure on economic growth of Ethiopia. Real GDP was used as a proxy for economic growth which is considered as dependent variable whereas the independent variables selected for the study include education expenditure, primary education enrolment, secondary education enrolment and tertiary education enrolment. The researcher used multiple linear regression analysis. The findings of the study showed the existence of a positive and statistically significant relationship between education expenditure and economic growth in Ethiopia.

Using secondary data for the period 1975/76 to 2011/12 of Ethiopia, Bazezew (2020) attempted to examine the impact of educational expenditure on the economic growth. The study employed Vector Auto Regressive (VAR) and Vector Error Correction model for analysis. The findings of the study revealed that a long run and short run relationship exists between education expenditure and economic growth of Ethiopia under the study period.

Similarly from the context of Ethiopia, Shemsedin(2020) investigated the nexus between expenditure on education and health as a proxy to human capital and economic growth for the period 1980 to 2018. The study employed Vector Auto regressive Model (VAR) model for analysis. The findings of the study revealed the existence long run relationship between ratios of government expenditure on education and economic growth (GDP) on the Ethiopian economy. However, in the short run government expenditure on education was found to have insignificant impact on the economy of Ethiopia.

Ziberi (2022) conducted a study to examine the impact of government education expenditure on economic growth of North Macedonia. The researcher used secondary data covering the period from 1917 to 2020 and used Instrumental Variable Two-Stage Least Square econometric model for analysis. Gross Domestic Product (GDP) is used as a proxy for economic growth which the was the dependent variable in the model whereas public expenditure on education, labor force participation rate, gross capital formation, unemployment, industry, wages, employment, information, and communication technology, and the instrumented variable is tertiary enrolment used as independent variables. The findings of the study showed the existence of a positive and significant relationship between public expenditures on education and economic growth in North Macedonia under the study period.

Hinsene et al. (2023) conducted a study to examine the impact of human capital on economic growth of Ethiopia using annual data covering the period for 1980 to 2020 and ARDL model. The findings of the study revealed the existence of long run relationship between real GDP and education expenditure under the study period.

Esen, Kantarc & Değiş (2023), using annual data for the period 1997-2020 of Turkey, examines the impact of public education expenditures on real GDP per capita. Autoregressive distribute lagged (ARDL) bound test was used by the authors to estimate the long-run and short-run relationship between the dependent and independent variables. The findings of the study confirmed the existence of a positive long-run relationship between education expenditures and real GDP per capita for Turkey's economy under the study period.

This study is different from the above studies conducted in Ethiopia on one hand it incorporated the most recent data and used the most robust ARDL model of time series data analysis for co-integration as this model has many advantages as compared other co-integration methods explained in the methodology part below whereas other researchers such as Bazezew (2020) conducted on the same topic from Ethiopian context using VAR model for the period 1975/76 to 2011/12. Moreover this study focused on government education expenditure and other control variables specified in the model whereas the studies conducted by Kidanemariam (2015), Hinsene et al. (2023) focused on impact of human capital on economic growth of Ethiopia using ARDL approach to co-integration. Similarly, Dinkneh & Jiang (2015) & Shemsedin(2020) conducted a study on impact of human capital on economic growth of Ethiopia using Johansson Co-integration test and VAR model for different time periods respectively and hence this study is conducted and is expected to contribute to the existing body of knowledge by providing additional empirical

evidence specifically on impact of government education expenditure on economic growth of Ethiopia.

2.3. Conceptual Framework

Based on the theoretical and empirical literature and assuming a linear relationship between the dependent and independent variables selected for this study, the following conceptual framework is developed:

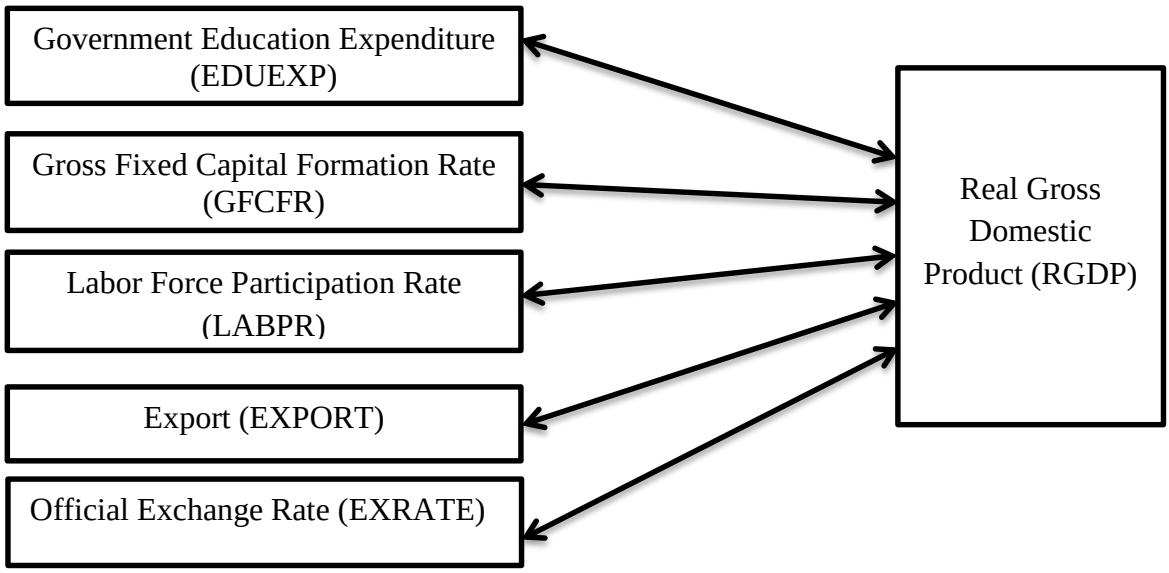

Figure 1: Conceptual Framework

Source: Researchers own compilation based on empirical and theoretical literature

3. Materials and methods

3.1 Description of the study Area

Ethiopia is a landlocked country located in the Horn of Africa (Cummey & Donald, 2023). The land area of the country covers 1,112,000 square kilometers (Ethiopia, 2023). The population of the country as of 2023 is around 116.5 million making it the 13th-most populous country in the world and the 2nd-most populous country in Africa after Nigeria (CIA, 2023). Education is among the services which the Ethiopian government has dedicated its resources. The literacy rate of the county by 2021 was about 52% (WB, 2021).

3.2. Type and source of data

This study had been conducted using a secondary time series data on government education expenditure in Ethiopia spanning from the period 1988 to 2022 G.C. gathered from different sources such as Ethiopian Ministry of Education, Ethiopian Ministry of Finance, World Development Indicators and National Bank of Ethiopia. The study employed explanatory research

design since it tries to investigate the causal relationship between government education expenditure and economic growth using a quantitative research approach.

3.3 Data Analysis

To investigate the impact of government education expenditure on economic growth of Ethiopia, the researcher employed Autoregressive Distributed Lag (ARDL) bounds test approach to co-integration and analyzed using Eviews 10 computer software. The ARDL method was introduced and developed by Pesaran & Shin (1998) and was refined a few years later by Pesaran, Shin & Smith (2001). Autoregressive distributed lag (ARDL) model is a robust econometric model which is applicable for a stationary time series data with mixed order of integration. Using F-test, ARDL approach first investigates the existence of a long run co-integration between the dependent and independent variables and if the existence of a long run co-integration is confirmed from the results of F-test, then estimates of the long run and the short run model parameter coefficients will be done.

The ARDL bounds test approach to co-integration is preferred than other methods since this approach is robust method and has many benefits than other conventional co-integration tests. ARDL bound test can be applied to test co-integration among variables when the underlying variables are integrated of order zero I (0), integrated of order one, I(1) or a combination of both as compared to the conventional Johansen co-integration test that can be used only when all the variables are integrated of order one I(1). Another advantage of ARDL bounds test approach is its applicability to study small sample size unlike the conventional Johansen co-integration test which needs large sample size for results to be valid, ARDL approach is efficient in a finite and small sample study (Narayan, 2005). ARDL bounds test approach is also useful since it permits the introduction of optimal lags of both the dependent and explanatory variables thus allowing flexibility in terms of the structure of lags in the ARDL model unlike the co-integration VAR models where all variables are expected to have the same lags. Moreover, ARDL approach effectively reduces the possible endoginty problem of explanatory variables (Pesaran et al., 2001).

3.4. Model Specification

Economic growth proxied by real GDP is the dependent variable for this study. The independent variables selected for the study are government education expenditure, physical capital proxid by gross fixed capital formation rate, labor force participation rate, export and official exchange rate where government education expenditure is the variable of interest and others are control variables. Thus, based on the following aggregate production function and endogenous growth theory discussed in the theoretical and empirical literature the following model used in this study.

$$\mathbf{Y_t = AK_t^{\alpha} L_t^{\beta} H_t^{\gamma}}$$

Where $\mathbf{Y_t}$ is real GDP, K_t is physical capital, L_t labor force participation, H_t is human capital, A is the technology parameter, t is the observation subscript, and α, β, and γ are elasticity's of the

parameters to be estimated. Human capital is proxied by government education expenditure as investment. Thus the following model is used to study the impact government education expenditure, physical capital, labor force participation rate, export and exchange rate on economic growth, expressed in the following linear functional form.

$$RGDP = f\{EDUEXP, GFCFR, LAFPR, EXPORT, EXRATE\}$$

Where RGDP is real gross domestic product; EDUEXP is government education expenditure as a proxy for investment on human capital, GFCFR is gross fixed capital formation as a percentage of GDP a proxy for physical capita, LAFPR is the labor force participation rate, EXPORT is the level of Ethiopian export, EXRATE is the official exchange rate of Ethiopia (USD to Birr).

Based on the theoretical and empirical literature presented above and assuming a linear relationship between the dependent and independent variables, the following general endogenous growth model specification is used to determine this relationship:

$$RGDP_t=\beta_{0+}\beta_1\ EDUEXP_t+\beta_2\ GFCFR_t+\beta_3\ LAFPR_t+\beta_4\ EXPORT_t+\beta_5\ EXRATE_t+\varepsilon_t \quad \text{(eq.1)}$$

Transformed in to natural logarithm as follows to make the data as "normal" as possible and thus, increase the validity of the associated statistical analysis.

$$LnRGDP_t=\beta_{0+}\beta_1\ LnEDUEXP_t+\beta_2\ LnGFCFR_t+\beta_3\ LnLAFPR_t+\beta_4 LnEXPORT_t+\beta_5\ LnEXRATE_t+\varepsilon_t \quad \textit{(eq.2)}$$

Where; $\mathbf{lnRGDP_t}$ is the natural logarithm of the real GDP at time t; $LnEDUEXP_t$ is the natural logarithm of government education expenditure at time t; $\mathbf{LnGFCFR_t}$ is the natural logarithm of gross fixed capital formation rate at time t; $\mathbf{LnLAFPR_t}$ is the natural logarithm of labor force participation rate at time t; $\mathbf{LnEXPORT_t}$ is the natural logarithm of export at time t; $\boldsymbol{LnEXRATE_t}$ is the natural logarithm of official exchange rate at time t; and $\boldsymbol{\varepsilon_t}$ is the random error term used to represent the effect of other variables which affect economic growth but which are not incorporated in the specified the model.

Thus the error correction version of the ARDL model used for this study is characterized by the following equation:

$$\begin{aligned}\Delta LnRGDP_t =& \beta_0 + \sum_{i=1}^{p}\beta_1\,\Delta LnRGDP_{t-1} + \sum_{i=0}^{q}\beta_2\,\Delta\,LnEDUEXP_{t-1} \\ &+ \sum_{i=0}^{q}\beta_3\,\Delta\,LnGFCFR_{t-1}+\sum_{i=0}^{q}\beta_4\,\Delta LnLAFPR_{t-1} \\ &+ \sum_{i=0}^{q}\beta_5\,\Delta LnEXPORT_{t-1} \\ &+ \sum_{i=0}^{q}\beta_6\,\Delta LnEXRATE_{t-1} + \delta_1\,LnRGDP_{t-1} + \delta_2 LnEDUEXP_{t-1} \\ &+ \delta_3 LnGFCFR_{t-1} + \delta_4 LnLAFPR_{t-1} + \delta_5 lnEXPORT_{t-1} \\ &+ \delta_6 lnEXRATE_{t-1} + U_t \quad \textit{(eq.3)}\end{aligned}$$

Source: Constructed by researcher based on empirical and theoretical literature

Where; $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and β_6 represents the coefficients of parameters of short run model; $\delta_1, \delta_2, \delta_3 \delta_4, \delta_5,$ and δ_6 represents the coefficients of the parameters of long run model; β_0 *and* Ut represents the constant and the error term respectively; Δ is the first difference operator for the short run model; p and q are the lag length of the dependent and independent variables respectively.

4. Results and Discussions

4.1. Variables Used, Unit of Measurement and Source of Data

Table 4.1 Variables, unit of measurement & source of data

No	Variables	Unit of Measurement	Source of Data
1	Real gross domestic product (RGDP)	Real gross domestic product at constant market price in Millions of Birr (local Currency unit).	WDI
2	Government Education Expenditure(EDUEXP)	Refers to expenditures, which are done for improving the skills and knowledge of the labor force in the economy in Millions of Birr	MoF
3	Gross Fixed Capital Formation Rate(GFCFR)	Gross Fixed Capital Formation Rate: is the Gross Fixed Capital Formation as a percentage of GDP.	WDI
4	Labour Force Participation Rate (LABPR)	Labour Force Participation Rate : is the proportion of the population ages 15-64 and older that is economically active:	WDI
5	Export(EXPORT)	Exports refer to the goods or services being offered by a home country to a foreign country (in millions of Birr)	NBE
6	Official Exchange Rate (EXRATE)	The official exchange rate of Ethiopian USD to Ethiopian Birr.	WDI &NBE

Source: Research's compilation, 2023

4.2. Selection of Lag Length for the variables

Determining the maximum length of lag for the variables used in the study is an important first step in ARDL model time series analysis. This step is important because a change in the lag length of the variables affects the estimation results of the variables. The maximum lags indicate the maximum lag(s) lengths that are going to be included for the variables selected and hence these variables can have lag lengths less than the one automatically selected by the criteria. Among the various information criterions used for selecting maximum lag length of the variables used are Likelihood Ration (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwartz Information Criterion (SC), Hannan-Quinn Information Criterion (HQIC). This Information Criteria automatically select the maximum lag length of variables to be included into the specified model. The selection of these criteria depends on the sample size used in a specified model. For small sample size (<60) AIC and FPE are appropriate whereas when the sample size is larger (> 60) SC and HQIC are more appropriate criterion (Hinsene et al., 2023). Therefore, this study used the Akaike Information Criterion (AIC) since the sample size used the study is small. The following table 4.2 shows the maximum lag length automatically selected by the criteria which is indicated by * mark. As shown on table 4.2 below except SC, all criteria selected an optimum

lag length of three for the specified model which is indicated by * mark and hence lag three is used for the analysis of the variables under the study.

Table 4.2: Lag order selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	100.1074	NA	1.12e-10	-5.881712	-5.606886	-5.790615
1	313.1413	332.8655	1.84e-15	-16.94633	-15.02256*	-16.30866
2	362.4753	58.58411	1.03e-15	-17.77971	-14.20698	-16.59545
3	430.5887	55.34216*	3.01e-16*	-19.78680*	-14.56511	-18.05596*

Source: Researcher's computation using E-Views 10, 2023

4.3. Testing for Unit Roots

Once the maximum lag length to be incorporated in a specified ARDL model is selected, unit root testing of the variables for stationarity is an important next step. Unit root testing is important to check whether the variables are stationary at level or becomes stationary after first differencing so that the ARDL model results can be free from spurious results. Moreover, unit root test is also crucial to know whether the variables become stationary at levels I(0) or after first differencing I(1) and no variable is integrated of order 2 I(2) so that ARDL bounds test can be applied and the results would be realistic. If any of the variables are integrated of order 2 (I (2) ARDL would not appropriate (Akhtar, 2021). The following table 4.3 indicates the unit root tests used for this study. Augmented Dickey–Fuller (ADF) and the Phillips–Perron (PP) unit root testing methods are used for this purpose.

Table 4.3: Augmented Dickey-Fuller and Phillips-Perron Unit Root Tests

Variables at Level & first difference	**Augmented Dickey-Fuller (ADF)**			**Phillips-Perron Unit Root Tests(PP)**			
	With Constant	With Constant & Trend	Without Constant & Trend	With Constant	With Constant & Trend	Without Constant & Trend	Order of Integration
LNRGDP	1.0690 no	-1.3990 no	3.1535 no	1.7107 no	*0.1297 no*	5.2406 no	
ΔLNRGDP	-3.9168***	-4.3521***	-0.7576 no	-3.9158***	-4.3521***	-1.9399*	I(1)
LNEDUEXP	0.9505 no	-1.5774 no	8.8537 no	0.9284 no	-2.7569 no	8.5204 no	
ΔLNEDUEXP	-5.1741***	-5.2040***	-0.4218 no	-5.169***	-5.2010***	-1.8482*	I(1)
LNGCFR	-1.2910 no	-1.7346 no	-0.0567 no	-1.4456 no	3.6926 no	-0.0661 no	
ΔLNGCFR	-7.1859***	-7.1859***	-7.1955***	-7.2981***	-7.6594***	-7.2685***	I(1)
LNLAFPR	2.1666 no	-3.6640 no	0.6473 no	-1.5546 no	-0.9236 no	1.0536 no	
ΔLNLAFPR	-1.8806 no	-3.0780 no	-1.7792*	-2.6841*	-3.0134 no	-2.5397**	I(1)
LNEXPORT	-0.0329 no	-2.8835 no	2.3967 no	0.1533 no	-2.8655 no	2.5397 no	
ΔLNEXPORT	-4.5877***	-5.0123***	-4.0849***	-5.0961***	-4.9712***	-4.0849***	I(1)
LNEXRATE	-0.6676 no	-2.3805 no	-4.0849 no	-0.2601 no	-1.9764 no	3.5375 no	
Δ LNEXRATE	-4.0879***	-4.0879**	-2.7748***	-3.426**	-3.3502*	-2.7506***	I(1)

Source: Researcher's computation using E-Views 10, 2023

Note: *The values represent t-statistics of the ADF and PP unit root tests. The asterisks ***, **, and * denote the statistical significance of the test at 1, 5, and 10 percent levels of significance respectively and no denotes not significant and* ***no denotes that the variables are not stationary at level****.*

As shown in table 4.3 above, both versions of the unit root test indicated that all the variables become stationary after first differencing that means the variables are integrated of order one I (1) and no variable is integrated of order 2 I (2). Hence it is possible to apply ARDL model.

4.4. Co-integration Test

After selecting the maximum lag length for the variables, conducting unit root tests for stationary and running the conditional ARDL model, a test for co-integration is done. This test helps to know whether co-integration exists among the variables. The test is also useful to decide whether a long-run or short-run model is appropriate. This study used ARDL bounds test for co-integration. The ARDL bound test depends on F-statistics. F-statistics has a lower and upper bound values. If the F-statistics value lies below the lower bound, it indicates no co-integration exists between the variables and no need of estimating the long run ARDL model and hence only the short run model will be estimated. However, if the value of the F-statistics is greater than the upper bound of the F-statistics, it indicates the existence of long run relationship between the variables and estimation of both the long run ARDL model and short run model would be appropriate. On the other hand if the F-statistics value lies between the lower and upper bound the result would be inconclusive (Pesaran et al., 2001). Table 4.4 below shows the results of ARDL Bound test for long-run relationship estimated using Eviews 10.

Table 4.4: ARDL Bound test for Long-run relationship

F-Bounds Test	Value	**Null Hypothesis: No levels of relationship**		
Test Statistic		Level of Significance	I (0)	I (1)
			Asymptotic: n = 1000	
F-statistic	14.65863	10%	2.26	3.35
k	5	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68

Source: Researcher's computation using E-Views 10, 2023

As indicated in table 4.4 above the F-statistic value, 14.65863 is greater than the upper bond values at 10%,5%,2.5% and 1% level of significance and the null hypothesis of no level relationship is rejected indicating the existence of log run co-integration between the dependent and independent variables included in the model. Hence estimation of the long run and short-run models for ARDL and ECM parameters would be appropriate. Table 4.5 below shows the long run ARDL parameter estimates.

Table 4.5: The Long-Run ARDL Parameter Estimates

Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEDUEXP	0.411885	0.021016	19.59846	0.0000
LNGCFR	-0.054083	0.076324	-0.708604	0.4894
LNLAFPR	-1.458606	0.555062	-2.627827	0.0190
LNEXPORT	0.088200	0.020637	4.273976	0.0007
LNEXRATE	-0.214678	0.030604	-7.014629	0.0000

EC = LNRGDP - (0.4119*LNEDUEXP -0.0541*LNGCFR -1.4586*LNLAFPR +
0.0882*LNEXPORT -0.2147*LNEXRATE)

Source: Researcher's computation using E-Views 10, 2023

Table 4.5 above indicates the results of the long-run ARDL model. LNRGDP, which is the log of real gross domestic product is the dependent variable whereas government education expenditure (LNEDUEXP), gross fixed capital formation rate (LNGFCFR), labor force participation rate (LNLAPR), export(LNEXPORT) and official exchange rate (LNEXRATE) are explanatory variables represented in logarithm form. The results indicated that in the long run, government education expenditure (LNEDUEXP), labor force participation rate(LNLAFPR), export(LNEXPORT) and official exchange rate (LNEXRATE) are statistically significant since the p values are less than 5%. Government education expenditure (LNEDUEXP) and export (LNEXPORT) have positive and statistically significant impact on economic growth. That is a 1% increase in government education expenditure results a 0.411885% increase in real GDP keeping the other variables constant where as a 1% increase in export will result 0.088200% increase in real GDP keeping the other variables constant. Labor force participation rate (LNLAFPR) and official exchange rate (LNEXRATE) show a negative and statistically significant effect on economic growth. That is a 1% increase in labor force participation rate will result a 1.458606% decrease in real GDP keeping the other variables constant and a 1% increase in exchange rate of USD to Ethiopian Birr would result a 0.214678% decrease in real GDP keeping the other variables constant. This result of negative effect of Labor force participation rate and official exchange rate may be due to high unemployment rate prevailing in the country for different reasons and the depreciation of the Ethiopian currency against US dollar since the country is experiencing high level of inflation rate negatively affecting economic growth. However, gross fixed capital formation shows insignificant result for the selected lag length which is consistent with results of Kidanemariam (2015). This may be due to the sensitivity of tine series data to sample size and lag lengths or other reasons which requires further study. The results of a positive and statistically significant long run relationship between government education expenditure and economic growth are consistent with the endogenous and human capital theories and the empirical study results of Mercana & Sezerb (2014), Chika & Ogugua (2014), Dinkneh & Jiang (2015), Lingaraj et al. (2016),Bazezew(2020), Shemsedin(2020), Ziberi (2022), Hinsene et al. (2023), Esen et al.(2023) among others.

4.6. Diagnostic and Stability Tests

To assure the robustness of the model and the reliability of the estimated ARDL model results, post estimation diagnostic tests and tests of stability are needed (Mallik, 2008). The most widely used model diagnostic tests are; tests of normality, autocorrelation test for serial correlation, heteroscedasticity test and stability tests. Table 4.6 below shows the Jarque Bera test statistics of normality, the Breusch Godfrey Lagrange Multiplier test of autocorrelation, and the Breusch-Pagan-Godfrey test for Heteroskedasticity. The model passed all post-estimation diagnostic tests as it fails to reject the null hypothesis of normality of errors, no residual autocorrelation, and homoscedasticity at 5% level of significance respectively. The Ramsey RESET test of linear functional specification also fails to reject the linear relationship between dependent and explanatory variables since its p value is greater than 5%.

Table 4.6: Summary of Diagnostics Tests

Types of tests	F-statistics	Df	Prob.	Prob. Chi-Square
Normality test (JB statistics)	2.087417		0.352146	
Breusch-Godfrey autocorrelation Test	0.313317	F(3,12)	0.8155	0.5079
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.889713	F(16,15)	0.5917	0.4825
Ramsey RESET Test	1.452546	(1, 14)	0.2481	

Source: Researcher's compilation from diagnostics tests using E-Views 10, 2023

4.7. Model Stability Test

Testing for the stability of a model in time series data analysis is also an important diagnostic test required to check reliability of the ARDL model estimation results and its robustness. The cumulative sum of recursive (CUSUM) test and CUSUM of squares graph are frequently used tests of model stability used in literature. These tests are based on the residuals from the recursive estimates. If the graph of cumulative sum of recursive (CUSUM) and CUSUM of squares lie within the bounds of the critical region at a 5% level of significance, it is an indication that the model is stable (Akhtar, 2021). Hence the null hypothesis of the cumulative sum of recursive (CUSUM) and cumulative sum of squares of recursive (CUSUM) is symmetrically distributed is failed to be rejected when the graph of CUSUM statistics lies within the bounds of the critical region at a 5% level of significance. The cumulative sum of recursive (CUSUM) test and CUSUM of squares graph tests of model stability used in this study are presented in Figure 1 and 2 below.

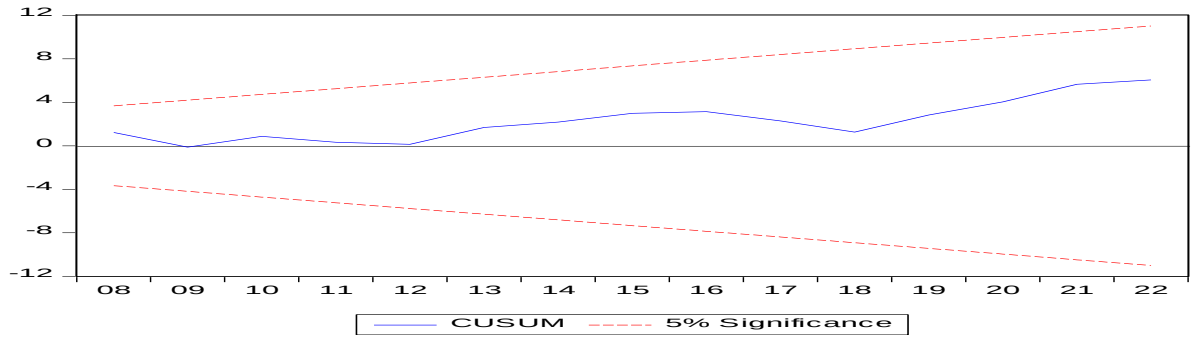

Figure 1. Graph of the cumulative sum of recursive residuals

Source: Model diagnostics test result using EViews 10, 2023

Note: The straight lines represent critical bounds at 5% significance level

Figure 1 above shows the plot of the CUSUM for this study. The plot lies within the 5 percent lower and upper critical limit which confirms the stability of the parameters.

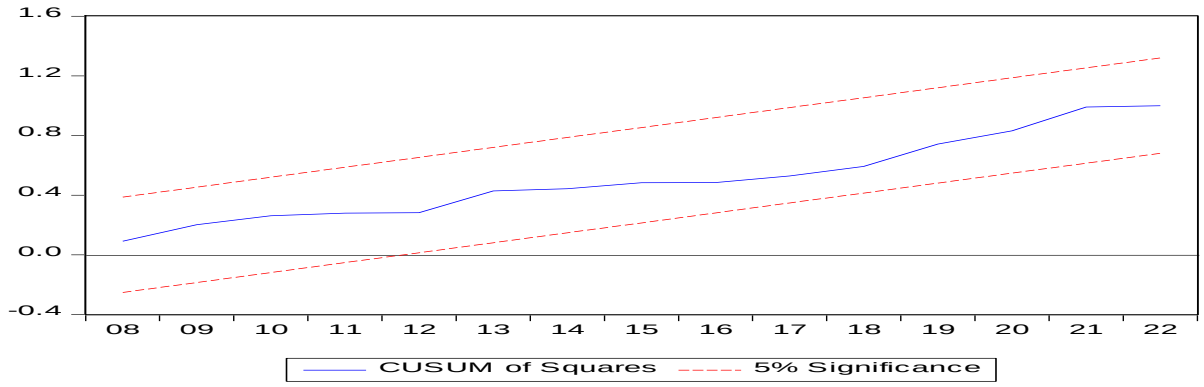

Figure 2: Graph of cumulative sum of squares of recursive residuals
Source: Model diagnostics test result using EViews 10, 2023

Note: The straight lines represent critical bounds at 5% significance level

Similarly Figure 2 above shows the graph of the cumulative sum of squares of recursive (CUSUM) of squares. The graph of CUSUM of squares statistics lies within the bounds of the critical region at a 5% level of significance confirming the stability of the model hence the estimated results of ARDL model are efficient and reliable.

4.8. The Short-run ARDL Model Estimation Result

The short run ARDL error correction model can be estimated after the presence of a long-run relationship between the variables is confirmed by the ARDL co-integration test. Table 4.7 below reports the results obtained from ARDL error correction model regression. The error correction

coefficient in the short-term ARDL error correction model is found statistically significant and negative (-1.046629) as expected. The coefficient of error correction (-1.046629) indicates the speed of adjustment towards the long run equilibrium. That means about 100% of the previous year's disequilibrium between the dependent and independent variables is eliminated in the current year. The short run parameter estimates indicate that, the one period lagged value of the dependent variable, the current value of government education expenditure show a positive and statistically significant relationship to real GDP, whereas one period and two periods lagged value of government education expenditure a negative and statistically significant relationship to real GDP. The short run model results of this study are consistent with Chika & Ogugua (2014), Dinkneh & Jiang (2015), Bazezew (2020).

Table 4.7: ARDL ECM Regression

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.82791	1.555492	10.81838	0.0000
D(LNRGDP(-1))	0.443642	0.090200	4.918436	0.0002
D(LNEDUEXP)	0.122121	0.035318	3.457781	0.0035
D(LNEDUEXP(-1))	-0.222744	0.047503	-4.689016	0.0003
D(LNEDUEXP(-2))	-0.152541	0.039642	-3.847986	0.0016
D(LNGCFR)	-0.026365	0.030814	-0.855611	0.4057
D(LNGCFR(-1))	-0.124442	0.031351	-3.969315	0.0012
D(LNGCFR(-2))	-0.073223	0.028337	-2.583998	0.0207
D(LNEXRATE)	-0.051386	0.034749	-1.478776	0.1599
D(LNEXRATE(-1))	0.099651	0.036219	2.751306	0.0148
D(LNEXRATE(-2))	0.179788	0.032927	5.460200	0.0001
CointEq(-1)*	-1.046629	0.096650	-10.82908	0.0000

R-squared	0.933029	Mean dependent var	0.064976
Adjusted R-squared	0.896195	S.D. dependent var	0.054895
S.E. of regression	0.017687	Akaike info criterion	-4.952019
Sum squared resid	0.006256	Schwarz criterion	-4.402368
Log likelihood	91.23231	Hannan-Quinn criter.	-4.769825
F-statistic	25.33052	Durbin-Watson stat	2.115924
Prob(F-statistic)	0.000000		

EC = LNRGDP - (0.4119*LNEDUEXP -0.0541*LNGCFR -1.4586*LNLAFPR + 0.0882*LNEXPORT -0.2147*LNEXRATE)

Source: Researcher's computation using E-Views 10, 2023

4.9. The Pairwise Granger Causality Results

The existence of co-integration does not indicate the directional causality between the dependent variable and explanatory variables. Therefore to identify the direction of causality between the real GDP and the explanatory variables for this study a granger causality test was conducted. The result of the pairwise granger causality test between real GDP and government education expenditure is shown in table 4.8 below. The pairwise granger causality test results revealed that, for the selected lag length of three, significant causality between real GDP and government education expenditure which runs from education expenditure to real GDP was found indicating unidirectional causality.

Table 4.8: Pairwise Granger Causality Test at lag length 3

Null Hypothesis	**F-stat**	**Prob.**
LNRGDP does not Granger Cause LNEDUEXP	0.31948	0.8112
LNEDUEXP does not Granger Cause LNRGDP	4.88073	0.0083**

Source: Researcher's computation using E-Views 10, 2023

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

4.10: Model Robustness

Table 4.9 and 4.10 below presents the results of the Fully Modified Least Squares (FMOLS) and Canonical Co-integrating Regression (CCR) tests conducted to check robustness of the long run ARD model. The results of the two methods indicate the same result for the variables government education expenditure, Labor force participation rate, export and exchange rate in their log form. However gross fixed capital formation has a negative and statistically significant result on economic growth in both FMOLS and CCR tests.

Table 4.9: Method: Fully Modified Least Squares (FMOLS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEDUEXP	0.422110	0.021424	19.70237	0.0000
LNGCFR	-0.126030	0.053223	-2.367959	0.0250
LNLAFPR	-3.003424	0.540571	-5.556023	0.0000
LNEXPORT	0.096416	0.028843	3.342819	0.0024
LNEXRATE	-0.220907	0.037543	-5.884048	0.0000
C	22.91350	2.325916	9.851385	0.0000
R-squared	0.996246	Mean dependent var		13.40759
Adjusted R-squared	0.995576	S.D. dependent var		0.739192
B S.E. of regression	0.049166	Sum squared resid		0.067684
Long-run variance	0.001930			

Source: Researcher's computation using E-Views 10, 2023

Table 4.10 : Method: Canonical Co-integrating Regression (CCR)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEDUEXP	0.421244	0.022338	18.85782	0.0000

LNGCFR	-0.122648	0.049834	-2.461124	0.0203
LNLAFPR	-3.139784	0.511274	-6.141103	0.0000
LNEXPORT	0.098102	0.031049	3.159639	0.0038
LNEXRATE	-0.221985	0.041494	-5.349742	0.0000
C	23.50007	2.205650	10.65449	0.0000

R-squared	0.996192	Mean dependent var	13.40759
Adjusted R-squared	0.995511	S.D. dependent var	0.739192
S.E. of regression	0.049523	Sum squared resid	0.068672
Long-run variance	0.001930		

Source: Researcher's computation using E-Views 10, 2023

5. Conclusion

This study aimed to investigate the impact of government education expenditure on economic growth of Ethiopia using ARDL bounds test approach to co integration. The results of the study indicated that in the long run, government education expenditure, labor force participation rate, export and official exchange rate are statistically significant. Government education expenditure and export have positive and statistically significant impact on economic growth. However, gross fixed capital formation shows insignificant result for the selected lag length which was expected to have a positive and significant effect on economic growth in theory. This may be due to the sensitivity of tine series data to sample size and lag lengths or other reasons which requires further study. Unidirectional causality which runs from education expenditure to real GDP is also observed for the selected lag length under the study period. The error correction coefficient in the short-term ARDL error correction model is -1.046629 which is negative and statistically significant as expected. The coefficient of error correction (-1.046629) indicates the speed of adjustment towards the long run equilibrium. That means about 100% of the previous year's disequilibrium between the dependent and independent variables is eliminated in the current year. In the short run, the one period lagged value of the dependent variable, the current value of government education expenditure, one period and two period lagged values of exchange rate show a positive and statistically significant relationship to real GDP. Whereas the current value of gross fixed capital formation becomes statistically insignificant in the short run. Based on the findings of this study, the researcher recommends that the government of Ethiopia should continue increasing the education expenditure in order to address the country's increasing population growth but the should also ensure the efficient and productive utilization of government education expenditure in order to enhance the existing low literacy rate and level of its contribution to the economic performance of the country through proper monitoring and evaluation.

References

Akhtar, R. (2021): Time Series Data Analysis with Autoregressive Distributed Lag Model (ARDL) using EVIEWS 10 (Vidio).

Ayeni A. & Omobude O.(2018). Educational Expenditure and Economic Growth Nexus in Nigeria (1987-2016): *Journal for the Advancement of Developing Economies* 7(*1*), 59-77, ISSN: 2161-8216 (doi 10.32873/unl.dc.jade7.1.5).

Barro, R. (1991) Economic Growth in a Cross Section of Countries. *The Quarterly Journal of Economics*,106,407-443.http://dx.doi.org/10.2307/2937943

Bazezew, E. (2020). The Impact of Educational Expenditure on Ethiopian Economic Growth: Application of Vector Auto Regressive Model (VAR). *Journal of Economics and Sustainable Development 11*(21), 21-29. DOI: 10.7176/JESD/11-21-02.

Becker,G.S. (1964). Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education. 3rd Edition, the University of Chicago Press, Chicago.

Chika,O.Z. & Ogugua, O.C (2014). Impact of government expenditure on education: The Nigerian experience. *International Journal of Business and Finance management Research*: 2, 42-48, ISSN 2053-1842.

Cummey, Donald (2023). "Ethiopia". Britianica

Dinkneh, G. B. & Jiang, Y. (2015): The Impact of Human Capital on Economic Growth in Ethiopia. *Journal of Economics and Sustainable Development 6*(16,) 47-5, www.iiste.org ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online) doi: 10.11648/j.ajtab.20200604.11.

Embassy of Ethiopia (2023). About Ethiopia: Washington.

Esen, Ö., Kantarcı T. & Değiş, M. (2023). The impact of education expenditures on economic growth in Turkey: Evidence from the ARDL bounds testing approach: *Journal of of Recycling Economy & Sustainability Policy* 2(1), 1-6, doi.org/10.3390/economies10040089

Hinsene, L. W., Sisay T. W. & Negese T. M. (2023): Human capital and its impact on Ethiopian economic growth: ARDL approach to co-integration. *Cogent Economics & Finance*, https://doi.org/10.1080/23322039.2023.2186046)

Irughe, R. & Edafe J. (2020). Education and Economic Growth: Empirical Evidence from Nigeria, Research Paper 407 AERC (African Economic Research Consortium)

Khalifa Y. (2008). Education Expenditure and Economic Growth: Some Empirical Evidence from the GCC Countries. *The Journal of Developing Areas, 42(1),* 69-80. Published by: College of Business, Tennessee State University Stable URL: https://www.jstor.org/stable/40376194

Khan H. & Bashar O. (2015). Social Expenditure and Economic Growth: Evidence from Australia and New Zealand Using Cointegration and Causality Tests. *The Journal of Developing Areas 49(4)*, 285- 300. Published by: College of Business, Tennessee State University Stable URL: https://www.jstor.org/stable/24737383

Kidanemariam, G. G. (2015): The Impact of Human Capital Development on Economic Growth in Ethiopia: Evidence from ARDL Approach to Co Integration. *Journal of Economics and Sustainable Development* 6(13), 155-168. www.iiste.org ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)

Kouton J. (2018). Education Expenditure and Economic Growth: Some Empirical Evidence from Côte d'Ivoire.*Journal of Economics and Sustainable Development* 9*(14),1-17.*

Kumar M. (2019). Impact of Education on Economic Growth in Ethiopia: International Journal of Research in Social Sciences, 9(3), ISSN: 2249-2496, Impact Factor: 7.081

Lingaraj M., Pradeep K., Kalandi C. & Pradhan (2016). Impact of educational expenditure on economic growth in major Asian countries: Evidence from econometric analysis: *Theoretical and Applied Economics,* 13*(2),* pp. 173-186.

Lloyd A. (2016). Government Spending on Education and Economic Growth: A Case Study of West African Countries.

Lucas, Robert E. (1988): On the Mechanics of Economic Development: *Journal of Monetary Economics*, 22, 3–42.

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics*,107(2), 407–437. https://doi.org/10.2307/2118477

Matteo L. (2013). Measuring Government in the Twenty-first Century: An International Overview of the Size and Efficiency of Public Spending: Fraser Institute.

Mercan M. & Sezer S. (2014). The Effect of Education Expenditure on Economic Growth: The case of Turkey. Procedia - *Social and Behavioral Sciences (109*), 925 – 930. Available online at www.sciencedirect.com

Mallik, G. (2008). Foreign Aid and economic growth: A Co-integration Analysis of the Six Poorest African countries. *Journal of Economic Analysis and Policy*, 38(2), 251-260 https://doi.org/10. 1016/S0313-5926(08)50020-8

MoE (2020). Ministry of Education; Education Statistics Annual Abstracts (2015/16-2021/22)

Narayan,P.K.(2005). The saving and investment nexus for China: evidence from co- integration tests: *Applied Economics*, 37(17), 1979-1990.

Ozturk Ilhan, 2001. The Role of Education in Economic Development: A Theoretical Perspective. *Journal of Rural Development and Administration*, 33(1), 39-47

Pesaran, M., Shin Y. & Smith R. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics,* 16, pp. 289-326.

Romer.P.M.(1990). Human capital and growth: Theory and Evidence. Carnegie-Rochester Conference Series on Public Policy, 32,251-286.doi:10.1016/0167-2231(90)90028.j

Schultz (1963). The Economic Value of Education: Columbia University Press, New York

Shemsedin., A.D. (2020): The Impact of Human Capital Development on Economic Growth in Ethiopia. *American Journal of Theoretical and Applied Business.* 6(4), 47-51. doi: 10.11648/j.ajtab.20200604.11.

Teshome K. (2006): The Impact of Government Spending On Economic Growth: The Case of Ethiopia: Unpublished MSc. Thesis, Addis Ababa University.

United Nations Children's Fund (2021). Upholding Public Investment Commitments for Education amidst Covid-19, Ethiopia

World Bank (2020). World-development-indicators https://databank.worldbank.org/source/

World Fact book (2023). Central Intelligence Agency (CIA)

Ziberi B., Donat R., Xhemazie I., & BesnikAvdiaj (2022). Empirical Analysis of the Impact of Education